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Construction: Carpentry and Concentration

Construction: Carpentry Concentration

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The Research and Curriculum Unit (RCU), located in Starkville, Mississippi, as part of Mississippi State University, was established to foster educational enhancements and innovations. In keeping with the land grant mission of Mississippi State University, the RCU is dedicated to improving the quality of life for Mississippians. The RCU enhances intellectual and professional development of Mississippi students and educators while applying knowledge and educational research to the lives of the people of the state. The RCU works within the contexts of curriculum development and revision, research, assessment, professional development, and industrial training.

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Finally, standards in the *Construction Technology Curriculum Framework and Supporting Materials* are based on the following:

Contren Learning Series from the National Center for Construction Education and Research
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Applied Academic Credit Benchmarks
Mississippi Department of Education 2007 Mississippi Mathematics Framework Revised

21st Century Skills and Information and Communication Technologies Literacy Standards
In defining 21st century learning, the Partnership for 21st Century Skills has embraced five content and skill areas that represent the essential knowledge for the 21st century: global awareness; civic engagement; financial, economic, and business literacy; learning skills that encompass problem-solving, critical-thinking, and self-directional skills; and Information and Communication Technology (ICT) literacy.

National Educational Technology Standards for Students
Reprinted with permission from *National Educational Technology Standards for Students: Connecting Curriculum and Technology*, Copyright © 2007, ISTE (International Society for Technology in Education), (800) 336-5191 (U.S. and Canada) or (541) 302-3777 (International), iste@iste.org, www.iste.org. All rights reserved. Permission does not constitute an endorsement by ISTE.

ACT College Readiness Standards

The College Readiness Standards are sets of statements intended to help students understand what is expected of them in preparation for the ACT. These standards are integrated into teaching and assessment strategies throughout the curriculum framework.

Preface

Secondary vocational–technical education programs in Mississippi are faced with many challenges resulting from sweeping educational reforms at the national and state levels. Schools and teachers are increasingly being held accountable for providing true learning activities to every student in the classroom. This accountability is measured through increased requirements for mastery and attainment of competency as documented through both formative and summative assessments.

The courses in this document reflect the statutory requirements as found in Section 37-3-49, Mississippi Code of 1972, as amended (Section 37-3-46). In addition, this curriculum reflects guidelines imposed by federal and state mandates (Laws, 1988, ch. 487, §14; Laws, 1991, ch. 423, §1; Laws, 1992, ch. 519, §4 eff. from and after July 1, 1992; Carl D. Perkins Vocational Education Act IV, 2007; and No Child Left Behind Act of 2001).

Construction: Carpentry Executive Summary

Program Description

Construction is a program or an instructional program that prepares students for employment or continued education in the occupations of carpentry. The curriculum framework for this program was developed in partnership with the Mississippi Construction Education Foundation (MCEF). MCEF is the accredited sponsor for the National Center for Construction Education and Research (NCCER).

When developing this curriculum, writers recognized the importance of differentiating instruction and meeting the needs of the 21st century learner. Teaching strategies included a blend of online and face-to-face instruction. Teaching strategies are aligned with Contren Connect e-books, online lectures, video presentations, online quizzes, active figures, and Spanish content. Students will have access to this information to learn new content as well as review, reinforce, or revise work.

Industry Certification

The NCCER developed and published a set of industry standards that are taught nationwide by contractors, associations, construction users, and secondary and postsecondary schools called the **Contren Learning Series.** When developing this set of standards, the NCCER assembled a team of subject matter experts that represented construction companies and schools across the nation. Each committee met several times and combined experts' knowledge and experience to finalize the set of national industry standards.

As a part of the accreditation process, all Mississippi construction instructors will be required to successfully complete the **Instructor Certification Training Program**. This program ensures that instructors possess a deep knowledge of content of the standards.

This state-of-the-art curriculum is modeled after the eight Mississippi **NCCER Accredited Training and Education Facilities (ATEF)**. In order to become an NCCER ATEF program, school districts must meet a set of guidelines including the following:

1. Use the approved curriculum.
2. All instructors must be NCCER certified.
3. All completed Form 200s and release forms on all student completions are to be forwarded to MCEF for proper approval. MCEF will in turn forward to NCCER for processing.
4. Follow NCCER guidelines on test security and performance profiles.
5. Have an active advisory committee with at least two commercial contractors involved.
6. Follow safety practices and Occupational Safety and Health Administration (OSHA) standards used in the class and lab areas.
7. Involve commercial contractors in class presentations or field trips.
8. All construction programs must be included in the accreditation process.
9. Show active involvement in student leadership development (e.g., VICA and SkillsUSA).
10. Provide demonstrated placement into construction-related occupations, and provide timely reports to MCEF.

Districts will be required to complete a self-evaluation of all programs and host a site visit from industry to ensure proper lab, safety, and instructional procedures are in place.

Assessment

Students will be assessed using the Construction: Carpentry MS-CPAS2 test. The MS-CPAS2 blueprint can be found at http://info.rcu.msstate.edu/services/curriculum.asp. If there are questions regarding assessment of this program, please contact the construction instructional design specialists at the Research and Curriculum Unit at 662.325.2510.

Student Prerequisites

In order for students to be successful in the Construction program, the following student prerequisites are in place:

1. C or higher in English (the previous year)
2. C or higher in Math (last course taken or the instructor can specify the math)

   or
3. Instructor Approval and TABE Reading Score (eighth grade or higher)

   or
4. Instructor Approval

Proposed Applied Academic Credit

Applied Math content from the curriculum was aligned to the 2007 Mississippi Math Framework Revised Academic Benchmarks. It is proposed that upon the completion of this program, students will earn 1/2 Applied Math credit that can be used for graduation requirements.

The applied academic credit has ***not*** been approved by the Mississippi Commission on School Accreditation or by the State Board of Education. If there are questions regarding applied academic credit, please contact the Coordinator of Workforce Education at the Research and Curriculum Unit at 662.325.2510.

Licensure Requirements

Teacher license 977 is required to teach Construction: Carpentry. The requirements for the 977 licensure endorsement are listed below:

1. Applicant must hold a 2-year college degree (associate's degree) or higher from an accredited institution of higher education.
2. Applicant with an associate's degree must have at least 2 years of verifiable occupational experience in the past 10 years. Experience must be appropriate to the subject to be taught. Applicant with a bachelor's or higher degree must have at least 1 year of verifiable occupational experience in the past 10 years. Experience must be appropriate to the subject to be taught.
3. Applicant must enroll immediately in the Vocational Instructor Preparation (VIP) or the Redesign Education Program (REP).
4. Applicant must complete the individualized Professional Development Plan (PDP) requirements of the VIP or REP prior to the expiration date of the 3-year vocational license.
5. Applicant must validate occupational competency by earning a passing score on the Construction Technology assessment through NCCER National Craft Assessment and Certification Program.
6. Applicant must successfully complete the Contren Instructor Certification.

7. Applicant must successfully complete an MDE-approved computer literacy certification exam.
8. Applicant must successfully complete certification for an online learning workshop, module, or course that is approved by the MDE.
9. Applicant must successfully complete the Construction certification workshop, module, or course that is approved by the MDE.

Note: If the applicant meets all requirements listed above, that applicant will be issued a **977** endorsement—a 5-year license. If the applicant does not meet **all** requirements, the applicant will be issued a 3-year endorsement (license), and all requirements stated above must be satisfied prior to the ending date of that license.

Professional Learning

The professional learning itinerary for the middle school or individual pathways can be found at http://redesign.rcu.msstate.edu. If you have specific questions about the content of each training session provided, please contact the Research and Curriculum Unit at 662.325.2510, and ask for the Professional Learning Specialist.

Course Outlines

This curriculum framework allows options for local school districts to meet student needs and scheduling demands. One option groups units into four one-Carnegie-unit courses. The second option groups units into two two-Carnegie-unit courses. A discussion of each option is provided below.

Option 1

Upon completion of this option, the student will be trained to take the **Contren Level 1 Certification** exam. This curriculum consists of four one-credit courses, which should be completed in the following sequence:

1. Safety and Orientation to Construction (Course Code: 993102)
2. Introduction to Construction (Course Code: 993103)
3. Theory and Application of Carpentry I (Course Code: 993111)
4. Theory and Application of Carpentry II (Course Code: 993112)

Course Description: Safety and Orientation to Construction includes an introduction to the field as well as fundamentals of construction safety, tools, math, and blueprint reading and basic carpentry, electrical, masonry, and plumbing skills.

Course Description: Introduction to Construction emphasizes an overview of other construction-related trades such as electrical writing, masonry, and plumbing. This course gives students real-world, hands-on practice in these areas. This one-Carnegie-unit course should only be taken after students successfully pass Safety and Orientation to Construction.

Course Description: Theory and Application of Carpentry I includes an in-depth study of materials used in the carpentry field, foundations, and floor framing. This course also reinforces safety related to the construction industry. This one-Carnegie-unit course should only be taken after students successfully pass Introduction to Construction.

Course Description: Theory and Application of Carpentry II includes an in-depth study of wall and ceiling framing, roof framing, windows and doors, and stair layout. This course also reinforces safety related to

the construction industry. This one-Carnegie-unit course should only be taken after students successfully pass Theory and Application of Carpentry, Part A.

Safety and Orientation to Construction (Course Code: 993102)

Unit		Title	Hours
1		Introduction and Orientation	15
2		Basic Safety	19
3		Basic Math	24
4		Hand and Power Tools	24
5		Introduction to Blueprints	24
6		Introduction to Carpentry	34
			140

Introduction to Construction (Course Code: 993103)

Unit		Title	Hours
7		Introduction to Electrical Wiring	48
8		Introduction to Masonry	48
9		Introduction to Plumbing	44
			140

Theory and Application of Carpentry I (Course Code: 993111)

Unit		Title	Hours
10		Orientation (Review and Reinforcement)	5
11		Basic Safety (Review and Reinforcement)	10
12		Construction Math	30
13		Introduction to Materials Used in Construction	20
14		Footing, Foundation, and Floor Framing	75
			140

Theory and Application of Carpentry II (Course Code: 993112)

Unit		Title	Hours
15		Wall, Ceiling, and Roof Framing	86
16		Windows, Doors, and Stairs	54
			140

Option 2

This option will prepare students for employment in the content area chosen and prepare students to complete the **Contren Level 1 Certification**. Students are encouraged to take this certification exam. This curriculum consists of two two-credit courses, which should be completed in the following sequence:

1. Construction (Course Code: 993101)
2. Carpentry (Course Code: 993110)

Course Description: The Construction course introduces students to fundamentals of construction safety, tools, math, and blueprint reading and basic carpentry, electrical, masonry, and plumbing skills. Upon the completion of this course, students will have knowledge to complete the Contren Core Certification.

Course Description: The Carpentry course consists of an in-depth study of foundations; wall and ceiling framing; room framing; windows and doors; and stair layout. Upon the completion of this course, students will have the knowledge to complete the Contren Level I Certification.

Construction (Course Code: 993101)

Unit		Title	Hours
1		Introduction and Orientation	15
2		Basic Safety	19
3		Basic Math	24
4		Hand and Power Tools	24
5		Introduction to Blueprints	24
6		Introduction to Carpentry	34
7		Introduction to Electrical Wiring	48
8		Introduction to Masonry	48
9		Introduction to Plumbing	44
			280

Carpentry (Course Code: 993110)

Unit		Title	Hours
10		Orientation (Review and Reinforcement)	5
11		Basic Safety (Review and Reinforcement)	10
12		Construction Math	30
13		Introduction to Materials Used in Construction	20
14		Footing, Foundation, and Floor Framing	75
15		Wall, Ceiling, and Roof Framing	86
16		Windows, Doors, and Stairs	54
			280

Blueprint

You will find the blueprint that corresponds to this document at http://redesign.rcu.msstate.edu/curriculum/.

Research Synopsis

By implementing the National Center for Construction Education and Research in the construction skills standards to the Construction Pathway, students who successfully master the curriculum should have the skills required to enter the workforce or pursue an advanced degree. These skills are based on industry-validated performance indicators. The pathway will include applied instruction designed to articulate with programs offered in Mississippi's community and junior colleges.

Industry Job Data – Employment Projections 2004 to 2014 for Mississippi

Note: Compiled by Mississippi Department of Employment Security and Labor Market Information Department

Construction	2004 Employment	2014 Projected Employment	Total Projected Avg. Annual Job Openings	Average Hourly	Average Annual
Construction Managers/Supervisors	14,390	15,940	284	$24.00	$46,080
Construction Workers	37,610	42,620	1,150	$13.60	$26,112
Construction Helpers	4,050	4,740	220	$11.00	$22,830

Industry Comments and Quotes

- A survey of industry representatives provided insight into skills needed for students completing the Construction Pathway.
- Many employers have training programs available to allow employees to advance.
- The expectations of employers primarily centered on employability or "soft" skills. Many indicated that dependability was a prime need for employment.
- Employers expect employees to have integrity, a strong work ethic, a good attitude, and customer service skills. They expect employees to be punctual, willing to stick with the job, able to prioritize and organize, and interested in helping people. Maturity level is the key concern.
- Employees should have skills related to safety, blueprints, hand and power tools, and math and measuring.
- Students should be exposed to the general idea of how a building is constructed but should also have specialized skills.
- Modify Building Trades to have a year of fundamentals and basic construction techniques and a year of specialization in a specific area.
- Retain the 2-year individual programs to include fundamentals and a specialized area to include carpentry, electrical, or masonry.

Articulation

High School Program	Community College Program	Community College Course
Construction Technology: Plumbing	Plumber and Pipefitter/Steamfitter	PPV/PCT 1113 - Fundamentals of Plumbing/Pipefitting
Construction: Carpentry Concentration	Commercial/Residential Maintenance	CRM 1214 - Carpentry
Construction Technology: Electrical	Electrical Tech	ELT 1192 - Fundamentals of Electricity

Academic Integration

The Construction Pathway requires strong basic math and measuring skills and algebra and geometry. Communication skills include written and oral communications, following directions, listening, reading, and problem solving.

Course Content

Fundamentals of Construction	Carpentry	Electrical	Masonry	Plumbing
• Basic safety • Construction math • Hand and power tools • Blueprints • Basic rigging • Communication skills • Employability skills	• Building materials • Ceilings • Foundations • Framing • Floors • Roofing • Windows, doors, and stairs	• Bending • Electrical theory • NEC code • Wiring	• Mortar • Concrete and reinforcing • Masonry units and installation techniques	• Pipe, tubing, and fittings • Drain, waste, and vent systems • Fixtures and faucets • Water distribution systems
The area of specialization will include topics above in more detail.				

Professional Organizations

Association for Supervision and Curriculum Development (ASCD)
1703 North Beauregard Street
Alexandria, VA 22311-1714
(800) 933-ASCD
http://www.ascd.org

Association for Career and Technical Education (ACTE)
1410 King Street
Alexandria, VA 22314
(800) 826-9972
http://www.acteonline.org

Mississippi Association for Supervision and Curriculum Development (MASCD)
P.O. Box 13576
Jackson, MS 39236
(601) 591-2210
http://www.mascd.com

Mississippi Department of Education (MDE)
Office of Vocational Education and Workforce Development
P.O. Box 771
Jackson, MS 39205
(601) 359-3940
http://www.mde.k12.ms.us/vocational/news/

SkillsUSA
14001 SkillsUSA Way
Leesburg, VA 20176
(703) 777-8810
FAX: (703) 777-8999
http://www.skillsusa.org/

Using This Document

Each secondary vocational–technical course consists of a series of instructional units that focus on a common theme. All units have been written using a common format, which includes the following components:

Unit Number and Title

Suggested Time on Task

An estimated number of clock hours of instruction that should be required to teach the competencies and objectives of the unit. A minimum of 140 hours of instruction is required for each Carnegie unit credit. The curriculum framework should account for approximately 75–80% of the time in the course.

Competencies and Suggested Objectives

A competency represents a general concept or performance that students are expected to master as a requirement for satisfactorily completing a unit. Students will be expected to receive instruction on all competencies. The suggested objectives represent the enabling and supporting knowledge and performances that will indicate mastery of the competency at the course level.

Suggested Teaching Strategies

This section of each unit indicates research-based strategies that can be used to enable students to master each competency. Emphasis has been placed on strategies that reflect active learning methodologies. Teachers should feel free to modify or enhance these suggestions based on needs of their students and resources available in order to provide optimum learning experiences for their students.

Suggested Assessment Strategies

This section indicates research-based strategies that can be used to measure student mastery. Examples of suggested strategies could include rubrics, class participation, reflection, and journaling. Again, teachers should feel free to modify or enhance these suggested assessment strategies based on local needs and resources.

Integrated Academic Topics, 21st Century Skills and Information and Communication Technology Literacy Standards, ACT College Readiness Standards, and Technology Standards for Students

This section identifies related academic topics as required in the Subject Area Testing Program (SATP) in Algebra I, Biology I, English II, and U. S. History from 1877, which are integrated into the content of the unit. Research-based teaching strategies also incorporate ACT College Readiness standards. This section also identifies the 21st Century Skills and Information and Communication Technology Literacy skills. In addition, national technology standards for students are associated with the competencies, and suggested objectives for the unit are also identified.

References

A list of suggested references is provided for each unit. The list includes some of the primary instructional resources that may be used to teach the competencies and suggested objectives. Again, these resources are suggested, and the list may be modified or enhanced based on needs and abilities of students and on available resources.

Competency 1: Describe local program and vocational center expectations, policies, and procedures. (DOK 1) [EMP]

Suggested Objectives

a. Describe local program and vocational center policies and procedures including dress code, attendance, academic requirements, discipline, shop/lab rules and regulations, and transportation regulations.
b. Give a brief overview of the course. Explain to students what Construction Technology is, why it is important, and how it will be delivered.
c. Compare and contrast local program and school policies to expectations of employers.
d. Preview course objectives, program policy, and the industry standards.

Suggested Teaching Strategies

- Cover one or more bulletin boards with paper and trim. Leave it bare, and tell students that this is where their high-quality work will be displayed. Display the classroom discipline plan, procedures, calendar, and emergency information in a prominent place. Review these important documents with students. Make sure students understand the proper emergency procedures.
- Post examples of tests students will complete, assignments they will turn in, and projects they will complete throughout the year. Make sure performance assessments completed by previous students are available for current students to see. Allow students to review these samples and ask questions.
- Designate one area of the classroom to list daily objectives and weekly assignments and/or expectations of students. Encourage students to write the weekly assignments in their Construction: Carpentry Concentration I notebook/portfolio.
- Using guided prompts, have students write a reflection describing their history, experience, and feelings about construction. Sample prompts can include the following:
    - What are your expectations for this course?
    - Do you have any experience working with hand and power tools?
    - When was the first time you used a computer? Do you think that technology will be a benefit throughout this course?
    - Do you use the Internet? If so, how do you use it?
    - What kind of community service project would you like to do while you are in this course?
- Using presentation equipment, provide the course goals, objectives, industry standards, and student expectations. Ensure that students understand grading procedures and learning expectations for the course.
- Using a multimedia presentation, discuss the school handbook, the technology acceptable use policy, classroom procedures, and all safety procedures for the classroom level and building level. Read and discuss in detail with students the school acceptable use policy.
- Discuss classroom rules and procedures. Have students use a graphic organizer, such as a Venn diagram, to compare and contrast the classroom/school rules and workplace skills.
- Show samples of Blackboard student portfolios.
- Have students complete a pretest on technology literacy skills; construction skills; and 21st century skills and Information and Communication Technologies.
- Have students interview three construction technology industry members or other professionals

related to the course and determine that the construction industry members work together to enhance everyday life in their community, in their state, nationally, and globally.

- Using bulletin board paper, construction paper, and tape, have students work in collaborative groups to create a classroom bar chart of the quantitative data they received for their industry member interviews. Allow students to discuss their findings and expectations for the course.
- As an extension, have students input data into a spreadsheet application program. Have students create graphs and charts related to the data. Have students integrate the graphs and charts into a word processing or a multimedia presentation program and use the writing process to summarize their findings.
- Use the classroom presentation station to present local program and vocational center policies and procedures. Show students a safety video such as *Farm Bureau Shop and Farm Safety*, and lead a class discussion concerning the importance of safety in the shop. Discuss shop safety rules throughout the course.
- Have students read the handbook to become aware of what is expected of them in relation to the policies and procedures of the school. This should include dress code, attendance, academic requirements, discipline, and transportation regulations. Have students work together in pairs based on reading ability to get a better understanding of the school's program policies and procedures. Have students use the blog tool on the Blackboard Learning System to reflect on the importance of rules and regulations.[R1, R2, R3, R4, R5, R6, CS1,CS2,CS3,CS4,CS5 T1,T2,T3,T4,T5,T6]

Suggested Assessment Strategies

- Assess student orientation, policy, and procedure knowledge through instructor observations and a written unit test. File the completed test to document student mastery of the school and program policies and procedures.
- Have students show mastery of this competency by posting documentation on their Blackboard electronic portfolios.

Competency 2: Describe employment opportunities and responsibilities. (DOK1) [EMP]

Suggested Objectives

a. Describe employment opportunities including potential earnings, employee benefits, job availability, working conditions, educational requirements, required technology skills, and continuing education/training.
b. Describe basic employee responsibilities and appropriate work ethics.
c. Compare and contrast employment responsibilities and expectations to local school and program policies and expectations.

Suggested Teaching Strategies

- Use the classroom presentation station to lead an interactive discussion of employability skills. Have students use electronic resources to measure their aptitudes and abilities for particular careers. Have students use the Internet to research a list of careers for which they will be qualified upon program completion. Have students use available resources (college catalogs and college Web sites) to research information about postsecondary educational opportunities. Have students select a career in the field and outline educational and skill requirements, expected job growth, and entry-level salaries. Utilize the Mississippi State University Experts feature on the MSU Web site (http://www.msstate.edu/web/experts/) to conduct research on the chosen career. Have students use the writing process to summarize their research into an entry that can be uploaded to their Blackboard electronic portfolios.[E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6,

W1, W2, W3, W4, W5, CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6

- Use the Contren Series and the Contren Connect online Core Text, Basic Employability Skills Unit and Carpentry Level I, Orientation to the Trade Unit to define and illustrate trade terms related to basic employability skills. Terms may include but are not limited to mission statement, references, resume, entrepreneurs, critical-thinking skills, problem solving, the problem-solving process, lateness, absenteeism, computers, hardware, software, operating system, electronic mail, Computer Aided Drafting, wireless, computer numerical control (CNC), self-presentation, work ethic, professionalism, confidentiality, initiative, tactful, compromise, constructive criticism, teamwork, goal-oriented, leadership, harassment, sexual harassment, amphetamines, barbiturates, hallucinogens, and stress management. Have students work together to develop a workplace skills weekly checklist. They may use the checklist found at the end of this unit as an example.
- Have students work in teams to develop a list of questions they have about the construction industry. Questions should include information related to potential earnings, employee benefits, job availability, working conditions, educational requirements, required technology skills, and continued education/training. Have students select five to seven employes who are in the carpentry field. Ensure that each student selects a representative from the carpentry, electrical, plumbing, and masonry trades. Have students work in groups to interview industry members and use a digital camera or video camera to take pictures or video of items representing their findings from the interviews. Have students use word processing software and the writing process to publish a mini-report, newsletter, or flier to summarize their findings from the industry interviews. Have students add this project to their Blackboard electronic portfolios.
- Have students use the Internet to research trends and issues in the current construction industry. Have students compare and contrast these trends and issues to national trends and issues in the construction industry. Have students add this research to their Blackboard electronic portfolios.
- Discuss the parts of a resume and cover letter and/or job application, and provide each student a written sample. Have each student use the Internet or newspapers to choose a job for which he or she is qualified and prepare a resume and cover letter that can be used to apply for the selected job. Have students use a peer editing process to produce the highest quality possible. Have students upload their resumes and cover letters to their Blackboard electronic portfolios.
  E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6, W1, W2, W3, W4, W5, CS1,CS2,CS3,CS4,CS5, T2,T3,T4,T5,T6

- To review and reflect upon information learned, have students use a Smart Art graphic from a word processing program or the Inspiration program to compare and contrast skills and knowledge needed to succeed in the classroom to skills and knowledge needed to succeed in the construction industry.

Suggested Assessment Strategies

- Have students evaluate themselves weekly using the **Workplace Skills Weekly Checklist**. Have students submit their evaluations. Have weekly conferences with students comparing the teacher evaluation and the self-evaluation. When appropriate, have students set weekly improvement goals for workplace skills. Have students document their improvement of workplace skills and add to their Blackboard electronic portfolios.
- Have students brainstorm and work as a class to determine a classroom rubric to evaluate the interview activity. Use this rubric to evaluate the interview activity.
- Have students peer review work and make corrections. Have students post to their Blackboard electronic portfolios.
- Use the **Resume Rubric** and the **Cover Letter Rubric** to evaluate the resume and cover letter.

- Have students show mastery of this competency by posting documentation to their Blackboard electronic portfolios.

Competency 3: Research, design, and conduct a project that will integrate the knowledge and skills learned in the Construction Pathway Course in a real-world, unpredictable environment. (DOK3) [EMP]

Suggested Objectives

a. Demonstrate effective team-building and leadership skills.
b. Explore leadership skills and personal development opportunities provided to students by student organizations to include SkillsUSA.
c. Work as a team to design a community service project for which the knowledge and skills learned in the course can be used to improve the lives of others.

Suggested Teaching Strategies

- Invite Habitat for Humanity (http://www.habitat.org/) or other service organizations to present information about their organization, goals, and needs. Have students use the Internet and other resources to conduct additional research related to the local community needs. Assign students mentors who can be used as a guide throughout the research process. The mentors should be members of the local construction industry, perferably a contract construction industry representative.
- Have students periodically interview the mentors to determine how knowledge and skills that are being taught in the Construction Pathway Program are used in real-life situations. Have students organize information learned from the mentors and share it with the class and post it to their Blackboard electronic portfolios.
- Bring a former member of SkillsUSA, preferably one who competed at the state or national level, to discuss the student organization and the impact that information learned from participating in the student organization had on his or her success in his or her current job. Have students brainstorm community service ideas and organize a community service project for which they can use the information learned from this program to improve their community. Have students use technology productivity tools to plan, budget, organize, implement, and evaluate the community service project. Have students develop a rubric for evaluation based on their goals of the project.[E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6, W1, W2, W3, W4, W5 CS1,CS2,CS3,CS4,CS5 T1,T2,T3,T4,T5,T6]
- Have students research leaders in construction and prepare a written/oral presentation. Include leadership responsibilities, qualities, and so forth. Discuss the role of a team member and leader. Assign the students roles within a team, and have them role-play a situation in which there is a conflict that must be resolved. Utilize the lessons from SkillsUSA, Contren Tools for Success, or other resources to provide additional training.[E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6, W1, W2, W3, W4, W5 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6]

Suggested Assessment Strategies

- Use a **Presentation Rubric** to assess the research project.
- Use assessment provided from SkillsUSA and Contren Tools for Success evaluation tools.
- At the beginning of the community service project, have students work together to develop a method of evaluation, preferably a rubric. Use this rubric that students create to guide and evaluate the final community service projects.
- Have students show mastery of this competency by posting documentation on their Blackboard electronic portfolios.

Competency 4: Demonstrate the ability to follow verbal and written instructions and communicate effectively in on-the-job situations. (DOK 2) [COM]

Suggested Objectives

a. Follow basic written and verbal instructions.
b. Effectively communicate in on-the-job situations.

Suggested Teaching Strategies

- Utilize Contren modules and related Contren Connect modules on communication skills to present concepts and ideas. Engage students in a game such as Simon Says to introduce the importance of following instructions. Give students a list of simple tasks that require action. Have students complete tasks according to written instructions only. Give students a list of verbal instructions that require action. Have students complete tasks according to verbal instructions only. Have students discuss the pros and cons of trying to follow written and verbal instructions and the importance of following instructions thoroughly. Have students follow the emergency drill procedures. [E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6]
- Guide students in a brainstorming session of different ways people communicate. Divide students into pairs to simulate an interview process. One student would be the potential employer and be supplied with questions generated by the instructor. The other student would be the applicant. The dialogue could be videotaped and shown to the class for discussion about strengths and weaknesses of the communication. [E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6]
- Assign students to a group project that requires them to make class presentations in various formats such as Photo Story, PowerPoint, or Movie Maker. Assign different formats to each group, and discuss the strengths and weaknesses of each format after the presentation. Have students share information with their industry mentors. [E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6, W1, W2, W3, W4, W5 CS1,CS2,CS3,CS4,CS5 T1,T2,T3,T4,T5,T6]
- As a review and reflection, have groups deliver their presentations to the class. Have students create a blog or wiki summarizing the learning experience. [T1,T2,T3,T4,T5,T6]

Suggested Assessment Strategies

- Observe student participation during classroom discussion.
- Utilize the established **Interview Rubric** to evaluate the mock interviews.
- Utilize the established **Presentation Rubric** for group presentations.
- Have students show mastery of this competency by posting documentation on their Blackboard electronic portfolios.

Standards

21st Century Skills Standards

CS1 Flexibility and Adaptability
CS2 Initiative and Self-Direction
CS3 Social and Cross-Cultural Skills
CS4 Productivity and Accountability
CS5 Leadership and Responsibility

ACT College Readiness Standards

E1 Topic Development in Terms of Purpose and Focus
E2 Organization, Unity, and Coherence
E3 Word Choice in Terms of Style, Tone, Clarity, and Economy
E4 Sentence Structure and Formation
E5 Conventions of Usage
E6 Conventions of Punctuation
R1 Main Ideas and Author's Approach
R2 Supporting Details
R3 Sequential, Comparative, and Cause–Effect Relationships
R5 Meaning of Words
R6 Generalizations and Conclusions
W1 Expressing Judgments
W2 Focusing on the Topic
W3 Developing a Position
W4 Organizing Ideas
W5 Using Language

National Industry Standards

COM - Basic Communication Skills
EMP - Basic Employability Skills

National Educational Technology Standards

T1 Creativity and Innovation
T2 Communication and Collaboration
T3 Research and Information Fluency
T4 Critical Thinking, Problem Solving, and Decision Making
T5 Digital Citizenship
T6 Technology Operations and Concepts

Suggested References

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Mississippi Department of Education Office of Vocational and Technical Education. (n.d.). *SkillsUSA: Champions at work*. Retrieved December 7, 2007, from http://www.mde.k12.ms.us/vocational/SkillsUSA/index.htm

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U.S. Department of Labor, Bureau of Labor Statistics. (n.d.). *Occupational outlook handbook, 2008–09 edition.* Retrieved December 18, 2007, from http://www.bls.gov/oco/home.htm

Suggested Rubrics and Checklists

Cover Letter Rubric

NAME: _____ DATE: _____ PERIOD: _____

	Excellent 4 Points	Proficient 3 Points	Needs Improvement 2 points	Unsatisfactory 1 Point	Score
Layout/Design	Creatively designed, easily read, excellent business letter	Attractive, easy to read, good business letter	Appears busy or boring, difficult to read, needs improvement	Unattractive or inappropriate, very difficult to read, not acceptable	
Information, Style, Audience, and Tone	Accurate and complete information; very well written and presented	Well written and interesting to read	Some information provided but is limited or inaccurate	Poorly written, inaccurate, or incomplete	
Accurate Parts	Complete with all required parts	Some elements missing	Most elements missing or out of place	Proper form for a letter not used	
Grammar, Punctuation, and Wording	Excellent presentation, style, grammar, and punctuation	Fair presentation, style, grammar, and punctuation	Missing information; inaccurate punctuation and/or grammar	Poor grammar, punctuation, and wording	
Following Directions and Guidelines	Always on task; always followed directions	Followed directions with some guidance	Required a good bit of extra guidance	Did not follow directions, and did not ask for extra help	
				Total	

Comments:

Interview Rubric

NAME: DATE: PERIOD:

	Excellent 4 Points	Good 3 Points	Needs Improvement 2 Points	Unacceptable 1 Point	Score
Body language Displays confidence					
Eye contact Maintains good eye contact with interviewer					
Introduction Provides a self-introduction					
Handshakes Extends hand and shakes firmly					
Dress Dressed appropriately for an interview; business attire					
Language Concise and grammatically correct					
Questions Asks appropriate questions; demonstrates a knowledge of the business					
Closure Responds appropriately					
				TOTAL	

Presentation Rubric

NAME: _____ DATE: _____ PERIOD: _____

	Exemplary 4 points	Accomplished 3 points	Developing 2 points	Beginning 1 point	Score
Content	Clear, appropriate, and correct	Mostly clear, appropriate, and correct	Somewhat confusing, incorrect, or flawed	Confusing, incorrect, or flawed	
Clarity	Logical, interesting sequence	Logical sequence	Unclear sequence	No sequence	
Presentation	Clear voice and precise pronunciation	Clear voice and mostly correct pronunciation	Low voice and incorrect pronunciation	Mumbling and incorrect pronunciation	
Visual Aids	Attractive, accurate, and grammatically correct	Adequate, mostly accurate, and few grammatical errors	Poorly planned, somewhat accurate, and some grammatical errors	Weak, inaccurate, and many grammatical errors	
Length	Appropriate length	Slightly too long or short	Moderately too long or short	Extremely too long or short	
Eye Contact	Maintains eye contact, seldom looking at notes	Maintains eye contact most of time but frequently returns to notes	Occasionally uses eye contact but reads most of information	No eye contact because reading information	
				TOTAL	

Comments:

Resume Rubric

NAME: DATE: PERIOD:

	Excellent 25 Points	Well Done 20 Points	Meets Standards 15 Points	Beginning 10 Points	No Evidence 0 Points	Score
Format	Resume contains name, address, objective, education, experience, and references. All words are spelled correctly.	Contains at least six of the criteria and no more than two spelling errors	Contains at least five of the criteria and no more than four spelling errors	Contains minimal information and more than four spelling errors	Assignment not submitted	
Education	Education includes all schools attended, graduation dates, diploma/degree awarded, and major field of study.	Education includes three of the criteria.	Education includes two of the criteria.	Education includes one of the criteria.	Assignment not submitted	
Experience	Experience includes internships, entry-level jobs, and current position.	Experience includes two of the criteria.	Experience includes one of the criteria.	Experience includes current position only.	Assignment not submitted	
Factual	Contains factual names and dates and is believable	Contains fairly believable resume with factual names or dates	Resume has unrealistic dates or names.	Resume is unrealistic and contains conflicting information.	Assignment not submitted	
					TOTAL	

Comments:

Workplace Skills Weekly Checklist

NAME: _____ **DATE:** _____ **PERIOD:** _____

Behavior Skill	Never	Rarely	Most of the Time	Always
On Time and Prepared				
1. Arrives to class on time				
2. Brings necessary materials				
3. Completes homework				
Respects Peers				
1. Respects others' property				
2. Listens to peers				
3. Responds appropriately to peers				
4. Respects others' opinions				
5. Refrains from abusive language				
Respects Teachers/Staff				
1. Follows directions				
2. Listens to teacher and staff				
3. Accepts responsibility for actions				
Demonstrates Appropriate Character Traits				
1. Demonstrates positive character traits (kindness, trustworthiness, and honesty)				
2. Demonstrates productive character traits (patient, thorough, and hardworking)				
3. Demonstrates a level of concern for others				
Demonstrates a Level of Concern for Learning				
1. Remains on task				
2. Allows others to remain on task				

Competency 1: Describe, define, and illustrate general safety rules for working in a shop/lab and how they relate to the construction industry. (DOK 2) [SAF]

Suggested Objectives

a. Describe how to avoid on-site accidents.
b. Explain the relationship between housekeeping and safety.
c. Explain the importance of following all safety rules and company safety policies.
d. Explain the importance of reporting all on-the-job injuries, accidents, and near misses.
e. Explain the need for evacuation policies and the importance of following them.
f. Explain the employer's substances abuse policy and how it relates to safety.
g. Compare and contrast shop/lab safety rules to industry safety rules.

Suggested Teaching Strategies

- Identify, discuss, and demonstrate terms, rules, and procedures related to shop/lab and industry safety. Use the Contren Core Text Basic Safety Unit and Level I Orientation to the Trade Unit and Contren Connect related units as resources. Terms may include but are not limited to apparatus, arch, arc weld, combustible, competent person, concealed receptacle, confined space, cross-bracing, dross, electrical distribution panel, excavation, extension ladder, flammable, flash, flashback, flash burn, flash goggles, flash point, ground, guarded, hand line, hazard communication standard, lanyard, lock-out/tag-out, management system, material safety data sheet (MSDS), maximum intended load, mid-rail, Occupational Safety and Health Administration (OSHA), permit-required confined space, personal protective equipment, planked, proximity work, qualified person, respirator, scaffold, shoring, signaler, slag, stepladder, straight ladder, switch enclosure, toe board, top rail, trench , trencher, welding shield, and wind stock. Provide students with a list of terms and have them define, illustrate, and create an analogy or metaphor for each term. Pair students to quiz each other on the definitions in preparation for a multiple-choice vocabulary exam using the Blackboard Learning System. [E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6]

- Use the guidelines provided for personal safety (i.e., clothing, jewelry, hair, eyes, and ears). Divide the students into pairs, and assign each pair one of the guidelines. Each pair will demonstrate the "do's and don'ts" of the guideline. [E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6]

- Have an industry speaker present to the class the necessity of safety in the work environment. Have students use the writing process to write and illustrate a summary of the presentation and post as a journal or blog entry on the Blackboard Learning System. Divide the students into teams, and have them develop scenarios of hazards and accidents using the Contren Series Core Text Basic Safety Unit and related Contren Connect Module, publications, and the Internet. This will include tools; spills; working around welding; improper use of barriers, ladders, or scaffolds; use of material safety data sheet (MSDS) information; fires; and electrical situations. In a game type situation, one team will read a scenario and the other teams will compete to be the first to provide the proper safety measures that should have been used to prevent the hazardous situation or accident. Points will be awarded to the teams with the correct answers. [E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6]

Note: Safety is to be taught as an ongoing part of the program. Students are required to complete the written safety test with 100% accuracy before entering the shop for lab simulations and projects. This test should be documented in each student's file.

Suggested Assessment Strategies

- Evaluate student terminology knowledge using a multiple-choice exam via the Blackboard Learning System.
- Student participation will be monitored by the teacher, and the written exam will be utilized to test student knowledge.
- Evaluate the "do's and don'ts" exercise with a **Presentation Rubric**.
- The teams will be rewarded according to the points earned from the game. This could be extra points, classroom privileges, and so forth.
- Written exams will be utilized to assess student knowledge of safety procedures.
- Have students show mastery of this competency by posting documentation to their Blackboard electronic portfolios.

Competency 2: Identify and apply safety around welding operations. (DOK 1) [SAF]

Suggested Objectives

a. Use proper safety practices when welding or working around welding operations.
b. Use proper safety practices when welding in or near trenches and excavations.
c. Explain the term "proximity work."

Suggested Teaching Strategies

- Show illustrations of injuries caused by failure to observe safety precautions in welding operations. Have a welding professional, preferably a contract professional, speak to the class concerning safety. Have students write a brief journal entry on the speaker's message and content. Utilize Contren Connect for review and reinforcement. [E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6, W1, W2, W3, W4, W5 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6]
- Have students observe a welding operation and see the firsthand dangers associated with welding. Have students use classroom or electronic resources to create a flowchart describing the safety precautions that should be followed when working around welding operations. [CS1,CS2,CS3,CS4,CS5 T1,T2,T3,T4,T5,T6]
- Have students use the writing process to create a written summary of what all lab safety rules are, why they are in place, and what could happen if the rules were not in place. Have students share this with their industry mentors for feedback. Have students post their summaries in a blog to the class Blackboard Web site.

Suggested Assessment Strategies

- Assess students' journals with the **Journal Rubric**.
- Utilize Contren written and performance assessments.
- Evaluate the blog using the **Blog Rubric**.
- Have students show mastery of this competency by posting documentation to their Blackboard electronic portfolios.

Competency 3: Display appropriate safety precautions to take around common jobsite hazards. (DOK 1) SAF

Suggested Objectives

a. Explain the safety requirements for working in confined areas.
b. Explain and practice lock-out/tag-out procedures.
c. Explain the different barriers and barricades and how they are used.

Suggested Teaching Strategies

- Utilize Contren materials and Contren Connect to provide color-coded illustrations of common safety barriers and barricades. Have students identify common safety colors to demonstrate awareness of coding. Have students use a word processing program to define and illustrate terms related to confined space hazards (terms listed in Competency 1 of this unit). E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6, W1, W2, W3, W4, W5 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6
- Demonstrate lock-out/tag-out procedures, and provide safety rules related to these procedures. Have students create a flowchart that demonstrates the process and safety precautions that should be in place when performing the lock-out/tag-out procedures. Have students perform lock-out/tag-out on a piece of shop or lab equipment. R1, R2, R3, R4, R5, R6 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6
- Utilize Contren Connect for review and reinforcement. Additionally, for review and reinforcement, have students observe other students performing the lock-out/tag-out procedures.

Suggested Assessment Strategies

- Utilize Contren written and performance assessments. Ensure student mastery of the lock-out/tag-out procedure by requiring students to complete the process with 100% accuracy before moving forward.
- Use the **Lock-Out/Tag-Out Checklist** to observe student understanding and mastery of the procedure.
- Have students show mastery of this competency by posting documentation to their Blackboard electronic portfolios.

Competency 4: Demonstrate the appropriate use and care of personal protective equipment. (DOK 1) SAF

Suggested Objectives

a. Identify commonly used personal protective equipment (PPE) items.
b. Understand proper use of PPE.
c. Demonstrate appropriate care for PPE.

Suggested Teaching Strategies

- Use classroom equipment to show students commonly used personal protective equipment items. Have students brainstorm and create scenarios of what would happen if a worker did not have this equipment in place.
- Have students make an industry visit, preferably a contract construction industry, and observe common safety procedures related to PPE, or have an industry speaker present to the class the necessity of safety in the work environment. Have students take notes documenting lessons learned from the industry visit or guest speaker. E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6, W1, W2, W3, W4, W5 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6
- Provide examples of damaged or misused safety equipment, and allow students to identify defects. Have students create a poem, song, or rap that includes relevant information about

using PPE. E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6, W1, W2, W3, W4, W5 CS1,CS2,CS3,CS4,CS5 T1,T2,T3,T4,T5,T6

- Encourage students to produce a short video explaining PPE and showing mastery of the appropriate use and care of PPE. Have students upload their videos to their Blackboard electronic portfolios. Have students utilize Contren Connect for review and reinforcement. T1,T2,T3,T4,T5,T6

Suggested Assessment Strategies

- Utilize the established **Guest Speaker Form** to evaluate student information learned from the guest speaker or industry visit.
- Observe student activity to evaluate concept retention.
- Evaluate student presentations according to the **Student Video Presentation Rubric**.
- Utilize Contren written and performance assessments.
- Have students show mastery of this competency by posting documentation to their Blackboard electronic portfolios.

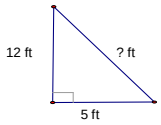
Competency 5: Explain lifting and the use of ladders and scaffolds. (DOK 1) SAF, ALGI4

Suggested Objectives

a. Identify and explain the procedures for lifting heavy objects.
b. Inspect and safely work with various ladders and scaffolds.

Suggested Teaching Strategies

- Have students design posters depicting the correct and incorrect ways to lift. Have students demonstrate safe lifting procedures. E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6, W1, W2, W3, W4, W5 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6
- Discuss ladder safety and OSHA and ANSI requirements related to ladder safety. Have students demonstrate proper ladder usage. E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6
- Have the students solve for the missing side of a right triangle using the Pythagorean theorem. For example, a construction worker needs a ladder to reach the top of a building that is 12 ft high. The ladder will safely rest on the ground 5 ft from the bottom of the building. How long should the worker let out the ladder? M1, M2, M4, M6, M7 CS1,CS2,CS3,CS4,CS5 T1,T2,T3,T4,T5,T6



- Utilize Contren Connect for review and reinforcement.

Suggested Assessment Strategies

- Utilize the established **Poster Rubric** for assessing student work.
- Utilize a **Ladder Safety Checklist** to evaluate student performance.
- Utilize an answer key to evaluate the problem-solving situation.
- Utilize Contren written and performance assessments.
- Have students show mastery of this competency by posting documentation to their Blackboard electronic portfolios.

Competency 6: Explain the material safety data sheet (MSDS). (DOK 1) SAF

Suggested Objectives

a. Explain the function of the MSDS.
b. Interpret the requirements of the MSDS.

Suggested Teaching Strategies

- Use the classroom presentation station to explain to students that an MSDS is a document that must accompany hazardous substances. Use probing techniques to ensure that students understand that the MSDS identifies the substance and gives the exposure limits, the physical and chemical characteristics, the kind of hazard the substance presents, precautions for safe handling and use, and specific control measures. Provide students with examples of MSDS. Explain parts of an MSDS. Have students discuss what could potentially happen if MSDS sheets were not in place.[E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6, CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6]
- Have students work in groups to locate information from an MSDS. Have students work individually to find any hazardous substances in the lab. If there are no hazardous substances in the lab, have students search for sample substances on the Internet. Have students pull the MSDS sheet and identify all of the components. Have students create a flier, song, poem, or journal entry summarizing all of the components of the MSDS sheet and why it is important for people to know about this information.[E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6, W1, W2, W3, W4, W5 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6]
- Have students complete appropriate exercises and activities on the Contren Connect Web site related to fire safety procedures.

Suggested Assessment Strategies

- Utilize the **Group Work Rubric** for evaluating student work.
- Utilize Contren written and performance assessments.
- Have students post proof of mastery by posting the flier, song, poem, or journal entry or a video documenting their knowledge to the Blackboard Web site.
- Have students show mastery of this competency by posting documentation to their Blackboard electronic portfolios.

Competency 7: Display appropriate safety procedures related to fires. (DOK 1) [SAF]

Suggested Objectives

a. Explain the process by which fires start.
b. Explain fire prevention of various flammable liquids.
c. Explain the classes of fire and the types of extinguishers.
d. Illustrate the proper steps to follow when using a fire extinguisher.
e. Demonstrate the proper techniques of putting out a fire.

Suggested Teaching Strategies

- Pose the question, “What is the fire triangle?” Have students use the Internet to find a definition, an illustration, and a quality explanation. Have students create a poster describing the fire triangle.[R1, R2, R3, R4, R5, R6, W1, W2, W3, W4, W5 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6]
- Have students use technology tools to research, define, and illustrate necessary terminology. Terminology should include but is not limited to flash point, fuel, heat, oxygen, reaction, combustibles, firefighting, fire extinguisher, class A fires, class B fires, class C fires, and class D fires. Explain the classes of fires and the applicable fire extinguishers to put out these types of fires.[E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6]
- Have students complete appropriate exercies and activities on the Contren Connect Web site related to fire safety procedures.
- Bring in a local fire department representative to give a fire safety presentation and lead the

class in a discussion about fires. Have the local fire department representative work with students to show the proper way to put out fires. If appropriate, have students practice putting out fires set by the fire department representative.[E1, E2, E3, E4, E5, E6 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6]

- Have students use a Smart Art graphic in a word processing program or the Inspiration program to create a flowchart that illustrates the steps to follow to properly use a fire extinguisher. Have students summarize the steps or process.
- Have students document their mastery of skills and knowledge related to appropriate safety procedures related to fires. Documentation could include a video of the student mastering the skill, a Photo Story presentation, or a report. Have students post this documentation to the Blackboard Learning System.
- Utilize Contren Connect for review and reinforcement.

Suggested Assessment Strategies

- Check terminology through a matching quiz or other objective assessment using tools from the Blackboard Learning System.
- Evaluate the flowcharts for accuracy.
- Use the established **Group/Classroom Discussion Rubric** to evaluate student participation.
- Utilize Contren written and performance assessments.
- Have students show mastery of this competency by posting documentation to their Blackboard electronic portfolios.

Competency 8: Explain safety in and around electrical situations. (DOK 1) [SAF]

Suggested Objectives

a. Explain injuries that can result when electrical contact occurs.
b. Explain safety around electrical hazards.
c. Explain action to take when an electrical shock occurs.

Suggested Teaching Strategies

- Ask students, “Why do construction, masonry, or plumbing workers need to know about electrical safety?” Lead students through a discussion about basic electrical concepts, and have students review terminology related to electrical safety. As a review of basic concepts, have students summarize and illustrate how the human body can become a “path of least resistance” for electricity when the body comes in contact with an electrically energized conductor and the ground at the same time.
- Have students brainstorm potential injuries from electrical shock to check prior knowledge. Use pictures and graphics to illustrate electrical injuries and hazards. Have students complete the Basic Safety: Electrical Safety Module on the Contren Connect Web site.[E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6, CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6]
- Utilize Allied Health students or other medical personnel to explain electrical injury first aid. Have students summarize information learned from the Allied Health students or other medical personnel.[E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6]
- Have students research OSHA guidelines related to electrical safety guidelines. Have students create illustrations that will help them remember these basic electrical safety guidelines. Ensure that students include electrical cord safety and basic symbols that are important to know and understand. Have students contact their industry mentors to discuss the importance of electrical safety. Have students blog about their discussions with their industry mentors. Require students to include digital pictures or video in their blogs.[R1, R2, R3, R4, R5, R6 CS1,CS2,CS3,CS4,CS5 T1,T2,T3,T4,T5,T6]

- Have students document mastery of electrical safety on their Blackboard electronic portfolios. Utilize Contren Connect for review and reinforcement.

Suggested Assessment Strategies

- Use the established **Group/Classroom Discussion Rubric** to evaluate student participation.
- Observe student participation in discussions by outside presenters.
- Utilize Contren Connect written and performance assessments located at the end of this unit.
- Have students show mastery of this competency by posting documentation to their Blackboard electronic portfolios.

Standards

21st Century Skills Standards

CS1 Flexibility and Adaptability
CS2 Initiative and Self-Direction
CS3 Social and Cross-Cultural Skills
CS4 Productivity and Accountability
CS5 Leadership and Responsibility

Mississippi Academic Standards

ALGI 4 Demonstrate and apply various formulas in problem-solving situations.

ACT College Readiness Standards

E1 Topic Development in Terms of Purpose and Focus
E2 Organization, Unity, and Coherence
E3 Word Choice in Terms of Style, Tone, Clarity, and Economy
E4 Sentence Structure and Formation
E5 Conventions of Usage
E6 Conventions of Punctuation
R1 Main Ideas and Author's Approach
R2 Supporting Details
R3 Sequential, Comparative, and Cause–Effect Relationships
R5 Meaning of Words
R6 Generalizations and Conclusions

National Industry Standards

SAF - Basic Safety

National Educational Technology Standards

T1 Creativity and Innovation
T2 Communication and Collaboration
T3 Research and Information Fluency
T4 Critical Thinking, Problem Solving, and Decision Making
T5 Digital Citizenship
T6 Technology Operations and Concepts

Suggested References

American Association for Vocational Instructional Materials. (2002). *Developing safety skills for shop or home.* Winterville, GA: Author.

Bevelacqua, A., & Stilp, R. (1998). *Hazardous materials field guide.* Albany, NY: Delmar.

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Earth Communications. (2004). *Safety on the job part 2: Fire protection, warnings and power tools* [Videotape]. (Available from Earth Communications, 2370 Proffit Rd., Charlottesville, VA 22911)

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Mississippi Municipal Service Company. (n.d.). *Falls* [Videotape]. (Available from Mississippi Municipal Service Company, P.O. Box 2987, Jackson, MS 39207)

Mississippi Municipal Service Company. (n.d.). *Job safety analysis* [Videotape]. (Available from Mississippi Municipal Service Company, P.O. Box 2987, Jackson, MS 39207)

Mississippi Municipal Service Company. (n.d.). *Ladder safety* [Videotape]. (Available from Mississippi Municipal Service Company, P.O. Box 2987, Jackson, MS 39207)

Mississippi Municipal Service Company. (n.d.). *Lifting techniques* [Videotape]. (Available from Mississippi Municipal Service Company, P.O. Box 2987, Jackson, MS 39207)

Mississippi Municipal Service Company. (n.d.). *Lockout–tagout guarding* [Videotape]. (Available from Mississippi Municipal Service Company, P.O. Box 2987, Jackson, MS 39207)

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National Fire Protection Association. (n.d.). Retrieved December 17, 2007, from http://www.nfpa.org/index.asp

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VanCise, D., & VanCise, M. (2004). *Construction industry guide to OSHA for residential and light commercial construction.* Berne, NY: UHAI.

Suggested Rubrics and Checklists

Group/Classroom Discussion Rubric

NAME: DATE: PERIOD:

	Beginning 1 point	Developing 2 points	Accomplished 3 points	Exemplary 4 points	Score
Group Discussions	Rarely contributed to discussions of the group	Contributed good effort to discussions of the group	Contributed great effort to discussions of the group	Contributed exceptional effort to discussions of the group	
On-Task Behavior	Exhibited on-task behavior inconsistently	Exhibited on-task behavior some of the time	Exhibited on-task behavior most of the time	Exhibited on-task behavior consistently	
Helping Others	Did not assist other group members	Seldom assisted other group members	Occasionally assisted other group members	Assisted other group members	
Listening	Ignored ideas of group members	Seldom listened to ideas of group members	Occasionally listened to ideas of group members	Always listened to ideas of group members	
				Total	

Comments:

Group Work Rubric

NAME: DATE: PERIOD:

	Beginning 1 point	Developing 2 points	Accomplished 3 points	Exemplary 4 points	Score
Group Discussions	Rarely contributed to discussions of the group	Contributed good effort to discussions of the group	Contributed great effort to discussions of the group	Contributed exceptional effort to discussions of the group	
On-Task Behavior	Exhibited on-task behavior inconsistently	Exhibited on-task behavior some of the time	Exhibited on-task behavior most of the time	Exhibited on-task behavior consistently	
Helping Others	Did not assist other group members	Seldom assisted other group members	Occasionally assisted other group members	Assisted other group members	
Listening	Ignored ideas of group members	Seldom listened to ideas of group members	Occasionally listened to ideas of group members	Always listened to ideas of group members	
				Total	

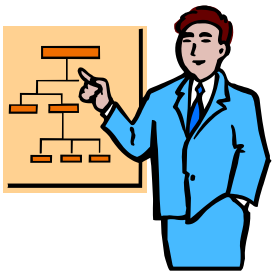
Comments:

Guest Speaker Form

Student's Name: _____

Date: _____

Name of Speaker: _____



1. List five main ideas expressed in the presentation.

   1. _____
   2. _____
   3. _____
   4. _____
   5. _____

2. Write a brief summary relating the topics of the presentation to your life.

_____

_____

_____

_____

_____

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_____

Journal Rubric

NAME: DATE: PERIOD:

CATEGORY	Excellent 4	Very Good 3	Satisfactory 2	Needs Work 1	Score
Writing Quality	There is a strong writing style and ability to express concepts learned. Excellent spelling, grammar, syntax, spelling, etc.	There is a good writing style and ability to express concepts learned. Very good grammar, syntax, spelling, etc.	There is a writing style that conveys meaning adequately. Some minor grammatical, syntax, and spelling errors	There is difficulty in expressing concepts. There is limited syntax. There are noticeable grammatical and spelling mistakes.	
Content	Clear and complete description of the activity is recorded. All major points are documented.	Very good description of the activity is recorded. Most major points are documented.	Good description of the activity is recorded. Some major points have been omitted.	Limited description of the activity is recorded. Very few major points are documented.	
Insight and Understanding	Definite insights into the implications of the activity are recorded. Awareness of complexity of issues and situations is present.	Some insight into the issue or situation is recorded. Some sense of complexity is present.	Insight is present from a more simplistic standpoint.	Only limited insight into the issue or situation is recorded.	
Application	Content of the activity is connected to the student's personal life and goals.	Content of the activity is connected to the field of construction.	Content of the activity is related to life in general.	Only limited connections are made between the content of the activity and the surrounding world.	
				Total	

Comments:

Ladder Safety Checklist

NAME: _____ DATE: _____ PERIOD: _____

_____ The ladder has been properly set up and is used in accordance with safety instructions and warnings.

_____ The body is centered on the ladder.

_____ Hold the ladder with one hand while working with the other.

_____ Move materials with extreme caution.

_____ Climb facing the ladder, and maintain a firm grip.

_____ Move one step at a time firmly setting one foot before moving the other.

_____ Haul materials up on a line.

Lock-Out/Tag-Out Checklist

NAME: _____ DATE: _____ PERIOD: _____

_____1. Identify all sources of electrical energy for the equipment or circuits in question.

_____2. Disable backup energy sources such as generators and batteries.

_____3. Identify all shut-offs for each energy source.

_____4. Notify all personnel that equipment and circuitry must be shut off, locked out, and tagged out. (Simply turning a switch off is NOT enough.)

_____5. Shut off energy sources, and lock switchgear in the **OFF** position. Each worker should apply his or her individual lock. Do not give your key to anyone.

_____6. Test equipment and circuitry to make sure they are de-energized. This must be done by a qualified person.

_____7. Deplete stored energy by bleeding, blocking, grounding, and so forth.

_____8. Apply a tag to alert other workers that an energy source or piece of equipment has been locked out.

_____9. Make sure everyone is safe and accounted for before equipment and circuits are unlocked and turned back on. Note that only a qualified person may determine when it is safe to re-energize circuits.

Source: National Institute for Occupational Safety and Health. (n.d.). Section 7: Safety model stage 3—controlling hazards: Safe work environment. In *Electrical safety: Safety and health for electrical trades student manual*. Retrieved January 10, 2008, from http://www.cdc.gov/niosh/docs/2002-123/2002-123d.html#

Poster Rubric

NAME: _____ DATE: _____ PERIOD: _____

	Exemplary 4 Points	Accomplished 3 Points	Developing 2 Points	Beginning 1 Point	Score
Required Content	The poster includes all required content elements as well as additional information.	All required content elements are included on the poster.	All but one of the required content elements are included on the poster.	Several required content elements are missing.	
Labels	All items of importance on the poster are clearly labeled with labels that are easy to read.	Almost all items of importance on the poster are clearly labeled with labels that are easy to read.	Many items of importance on the poster are clearly labeled with labels that are easy to read.	Labels are too small to read, or no important items are labeled.	
Attractiveness	The poster is exceptionally attractive in terms of design, layout, and neatness.	The poster is attractive in terms of design, layout, and neatness.	The poster is acceptably attractive though it may be a bit messy.	The poster is distractingly messy or very poorly designed.	
Grammar	There are no grammatical or mechanical mistakes on the poster.	There are one to two grammatical or mechanical mistakes on the poster.	There are three to four grammatical or mechanical mistakes on the poster.	There are more than four grammatical or mechanical mistakes on the poster.	
				Total	

Comments:

Presentation Rubric

NAME: _____ DATE: _____ PERIOD: _____

	Exemplary 4 points	Accomplished 3 points	Developing 2 points	Beginning 1 point	Score
Content	Clear, appropriate, and correct	Mostly clear, appropriate, and correct	Somewhat confusing, incorrect, or flawed	Confusing, incorrect, or flawed	
Clarity	Logical, interesting sequence	Logical sequence	Unclear sequence	No sequence	
Presentation	Clear voice and precise pronunciation	Clear voice and mostly correct pronunciation	Low voice and incorrect pronunciation	Mumbling and incorrect pronunciation	
Visual Aids	Attractive, accurate, and grammatically correct	Adequate, mostly accurate, and few grammatical errors	Poorly planned, somewhat accurate, and some grammatical errors	Weak, inaccurate, and many grammatical errors	
Length	Appropriate length	Slightly too long or short	Moderately too long or short	Extremely too long or short	
Eye Contact	Maintains eye contact, seldom looking at notes	Maintains eye contact most of time but frequently returns to notes	Occasionally uses eye contact but reads most of information	No eye contact because reading information	
				TOTAL	

Comments:

Competency 1: Apply the four basic math skills with whole numbers, fractions, decimals, and percents. (DOK 2) MAT, SGM1, PRA1, PRA4,TTA1

Suggested Objectives

a. Define terms related to construction math.
b. Add, subtract, multiply, and divide whole numbers, decimals, and fractions.
c. Convert whole numbers to fractions, and convert fractions to whole numbers.
d. Convert decimals to percents, and convert percents to decimals.
e. Convert fractions to decimals.
f. Convert fractions to percents.
g. Demonstrate reading a tape measure to the nearest 16th.

Suggested Teaching Strategies

- Have students complete a short pretest to apply the four basic math skills with whole numbers, fractions, decimals, and percents (may use Contren Core Text Basic Math Unit). M1, M2, M4, M6, M7 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6
- Have students define, illustrate, and give examples of terms related to construction math. Examples should include how to use these terms in basic math principles as well as real-world situations. The terms can include but are not limited to acute angle, adjacent angles, angle, area, bisect, borrow, carry, circle, circumference, convert, cubic, decimal, degree, denominator, diagonal, diameter, difference, digit, English ruler, equilateral triangle, equivalent fractions, formula, fraction, improper fraction, invert, isosceles triangle, long division, machinist's ruler, meter, metric ruler, mixed number, negative numbers, numerator, obtuse angle, opposite angles, percent, perimeter, pi, place value, positive numbers, radius, rectangle, remainder, right angle, right triangle, square, standard ruler, straight angle, sum, triangle, vertex, volume, and whole numbers.
- Display several objects that are appropriately measured with different units such as a paper clip, a pen top, a mug, a textbook, and the marker board. Have students discuss what measurement is most appropriate for determining the length of the object. Make a list of measurements, such as 40 cm, 2 m, 15 mm, 1 ft, and 6 in. Have students go on a scavenger hunt around the room with a tape measure to find objects as close to the given lengths as possible.
- Have students create their own ruler so they can understand how to read the measurements on the ruler. Give each student a piece of computer paper. Have students fold the paper in half lengthwise. Write 1/2 at the top of the fold. Then have the students fold the paper in half twice. Write 1/4 at the first fold, 2/4 underneath 1/2, and 3/4 at the third fold. Fold the paper in half three times, which has divided the paper into eighths. Write 1/8 at the first fold, 2/8 underneath 1/4, 3/8 at the third fold, 4/8 underneath 2/4 and 1/2, and so on. Fold the paper in half four times, which has divided the paper into 16ths, and write the appropriate 16th at each fold. Upon completion of the activity, students should notice that the 1/2 mark is the longest, the 1/4 and 3/4 marks are the next to the longest, and the 1/16, 3/16, and so forth marks are the shortest, just like the segments on the ruler between two consecutive whole numbers. Have students keep their homemade ruler out to help them distinguish between halves, fourths, eighths, and 16ths while they measure different objects in the room or segments on a handout.
- Have students estimate their own height and the height of a partner in centimeters. Then have them pair up and measure their heights with a tape measure to see how closely they estimated.

Make a list of several objects, such as arm span, wallet, textbook, and marker board. Have students guess the lengths of the objects in whatever unit you feel is appropriate. Then have them measure the object with a tape measure to see how closely they estimated.

- Have students search the Internet for a construction calculator. Have students use the writing process and technology tools to create a "quick reference" identifying the buttons on the construction calculator and their functions. Utilize a construction calculator to demonstrate how to convert decimals to fractions and fractions to decimals.[M1, M2, M4, M6, M7 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6]
- Model the various methods for understanding and reading the tape measure.[M7 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6]
- Give students the correct answers to problems, and ask at least one student who got the answers for whole numbers correct to write the problems on the chalkboard or a piece of chart paper. Have students who did not get the problems correct listen as the student at the board or paper works the problems. Do this procedure for fractions and percents as well, having students rotate through the skills until each student has spent time with each set of problems. Have a different student lead the discussion each time students rotate so that the students who are just learning how to work the problems have a chance to teach the other students.[M1, M2, M4, M6, M7 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6]
- Provide students with additional problems to apply the four basic math skills with whole numbers, fractions, decimals, and percents while working in small groups and then alone.[M1, M2, M4, M6, M7 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6]
- Have students solve word problems related to construction technology, such as the following: James/Joan was using a construction kit to make a window screen. He measured the height of the part of the window to be screened as 48 in. and followed the directions that said to subtract 1 3/4 in. from the height before cutting the side pieces of the frame. How long did he cut each side piece? After measuring and cutting the top and bottom pieces, he affixed all four brackets to the side pieces and tested the frame in the window. It was too short. When he went back and measured the brackets, he found that each had a height of 3/4 in. What mistake did the manufacturing company print in the instructions? Write a letter to the manufacturing company explaining the mistake and emphasizing the cost of the mistake, both in terms of time and money.[E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6, W1, W2, W3, W4, W5, M1, M2, M4, M6, M7 CS1,CS2,CS3,CS4,CS5 T1,T2,T3,T4,T5,T6]
- A student needs to measure the following lengths: $\frac{1}{2}+\frac{17}{4}, \frac{5}{4}+\frac{23}{8}, \frac{5}{2}+\frac{31}{16}$. Convert the sums to mixed numbers so that the student will know where to find them on the tape measure.[M1, M2, M4, M6, M7 CS1,CS2,CS3,CS4,CS5 T1,T2,T3,T4,T5,T6]
- Give each student a strip of paper that is his or her "unit." Have each student measure objects around the room using his or her unit. Discuss the need for naming parts of the unit to measure objects more accurately. Have students mark one end of the unit to be 0 and the other end to be 1. Fold the unit in half. Mark the fold to be 1/2. Label the ends of each unit (paper that the student is folding) below 1 and 0/2 and 2/2. Fold the unit again, this time in fourths. Label 0/4, 1/4, 2/4, 3/4, and 4/4. Fold the unit so that it is in eighths. Label 0/8, 1/8, 2/8, 3/8, 4/8, 5/8, 6/8, 7/8, and 8/8. Finally, fold the unit in 16ths. Label from 0/16 to 16/16. Students should notice that the unit looks like a magnified inch on a ruler. Have students measure an object to the nearest 16th of a unit.[M1, M2, M4, M6, M7 CS1,CS2,CS3,CS4,CS5 T1,T2,T3,T4,T5,T6]
- Have students use sample blueprints to calculate the square footage of a house plan. As an extension, have students work as a team to use measurement tools to determine the square

footage of the classroom, building, cafeteria, and so forth.

- Have students interview their industry mentors to determine the importance of mastering these basic mathematical skills. Have students summarize their knowledge by creating a product of choice, such as a flier, song, blog, newsletter, or wiki. Have students document the mastery of their application of the four basic math skills with whole numbers, fractions, decimals, and percents.
- Utilize Contren Connect for review and reinforcement.

Suggested Assessment Strategies

- Monitor group work as students perform calculations.
- Evaluate students on a posttest with whole number, fraction, and percent problems.
- Evaluate the measuring activity using teacher observation and an answer key.
- Evaluate the measuring activity using teacher observation.
- Utilize Contren written and performance assessments.
- Have students show mastery of this competency by posting documentation to their Blackboard electronic portfolios.

Competency 2: Use the metric system. (DOK 2) MAT, SGM4, PRA4

Suggested Objectives

a. Explain what the metric system is and its importance.
b. Use a standard and metric ruler to measure.
c. Recognize and use metric units of length, weight, volume, and temperature.

Suggested Teaching Strategies

- Have students visit a construction site. Have the students document the different types of shapes they can find at the construction site. Have students interview construction managers to determine how knowledge of the metric system is used in everyday procedures in the construction industry.
- Discuss the metric system and its importance. Illustrate the use of metric conversion charts. Divide students into groups, and have them design a small building project appropriate for the program, including dimensions in standard and metric measurements. E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6, W1, W2, W3, W4, W5, M1, M2, M4, M6, M7 CS1,CS2,CS3,CS4,CS5 T1,T2,T3,T4,T5,T6
- Have students use stiff paper (or materials in the shop) to build a simple model, measuring the pieces using both standard and metric rulers to ensure that the model is to proper scale with the design. M7 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6
- Distribute a variety of metric measuring tools for length, weight, volume, and temperature. Have students measure assigned materials using the appropriate tools and record the measurements. Have each student write or type (if technology resources are available) a paper comparing the use of the standard and metric systems and proposing why the United States should or should not use the metric system. W1, W2, W3, W4, W5 M7 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6
- Have students partner with the geometry students to create a presentation showing how concepts learned in the construction course and the geometry course are used in the construction industry.
- Utilize Contren Connect for review and reinforcement.

Suggested Assessment Strategies

- Compare design specifications to the constructed model to ensure that measurements are

correct.

- Evaluate each student's measurements for accuracy.
- Evaluate each student's paper using the **Written Report Rubric**.
- Evaluate each student's paper for content as well as grammar and organization.
- Utilize Contren written and performance assessments.
- Have students show mastery of this competency by posting documentation to their Blackboard electronic portfolios.

Standards

21st Century Skills Standards

CS1 Flexibility and Adaptability
CS2 Initiative and Self-Direction
CS3 Social and Cross-Cultural Skills
CS4 Productivity and Accountability
CS5 Leadership and Responsibility

Mississippi Academic Standards

SGM1 Apply concepts of rational numbers, and perform basic operations emphasizing the concepts of ratio, proportion, and percent with and without the use of calculators.
SGM4 Apply appropriate techniques, tools, and formulas to determine measurements with a focus on real-world problems. Recognize that formulas in mathematics are generalized statements about rules, equations, principles, or other logical mathematical relationships.
PRA1 Apply concepts and perform basic operations using real numbers in real-world contexts.
PRA4 Understand measurable attributes of objects, and apply various formulas in problem-solving situations.
TTA1 Understand relationships between numbers and their properties, and perform operations fluently.

ACT College Readiness Standards

E1 Topic Development in Terms of Purpose and Focus
E2 Organization, Unity, and Coherence
E3 Word Choice in Terms of Style, Tone, Clarity, and Economy
E4 Sentence Structure and Formation
E5 Conventions of Usage
E6 Conventions of Punctuation
M1 Basic Operations and Applications
M2 Probability, Statistics, and Data Analysis
M3 Numbers: Concepts and Properties
M4 Expressions, Equations, and Inequalities
M5 Graphical Representations
M6 Properties of Plane Figures
M7 Measurement
R1 Main Ideas and Author's Approach
R2 Supporting Details
R3 Sequential, Comparative, and Cause–Effect Relationships
R5 Meaning of Words
R6 Generalizations and Conclusions
W1 Expressing Judgments
W2 Focusing on the Topic
W3 Developing a Position

W4 Organizing Ideas
W5 Using Language

National Industry Standards

MAT - Introduction to Construction Math

National Educational Technology Standards

T1 Creativity and Innovation
T2 Communication and Collaboration
T3 Research and Information Fluency
T4 Critical Thinking, Problem Solving, and Decision Making
T5 Digital Citizenship
T6 Technology Operations and Concepts

Suggested References

Ball, J. (1980). *Practical problems in mathematics for masons*. Albany, NY: Delmar Learning.

Barrows, R., & Jones, B. (2002). *Fundamentals of math with career applications*. Upper Saddle River, NJ: Pearson Prentice Hall.

Boyce, J., Margolis, L., & Slade, S. (2000). *Mathematics for technical and vocational students*. Upper Saddle River, NJ: Prentice Hall.

Carman, R., & Saunders, H. (2005). *Mathematics for the trades: A guided approach*. Upper Saddle River, NJ: Pearson Prentice Hall.

Contren Connect. (n.d.). Retrieved January 14, 2008, from http://www.contrenconnect.com/

Cook, N. (2004). *Introductory mathematics.* Upper Saddle River, NJ: Pearson Prentice Hall.

Cook, N. (2004). *Mathematics for technical trades.* Upper Saddle River, NJ: Pearson Prentice Hall.

Huth, H., & Huth, M. (2001). *Practical problems in mathematics for carpenters* (7th ed.). Albany, NY: Delmar Learning.

Smith, L. (2008). *Mathematics for plumbers and pipefitters.* Clifton Park, NY: Delmar Learning.

Suggested Rubrics and Checklists

Written Report Rubric

NAME: DATE: PERIOD:

	Exemplary 4 Points	Accomplished 3 Points	Developing 2 Points	Beginning 1 Point	Score
Content	Clear thesis and focus that remain apparent	Thesis and focus that remain apparent	Addresses subject matter with minimal support	Does not focus on topic	
Grammar	Correct and effective use of grammar and mechanics	Occasional errors in use of grammar and mechanics	Problems in use of grammar and mechanics	Repeated errors in use of grammar and mechanics	
Organization	Ideas flow smoothly and logically with clarity and coherence.	Logical order and appropriate sequencing of ideas with adequate transition	Some evidence of an organizational plan or strategy	Lacks organization	
				Total	

Comments:

Competency 1: Demonstrate the use and maintenance of hand and power tools. (DOK 2) HTO, PTO

Suggested Objectives

a. Identify and discuss the use of common hand and power tools.
b. Discuss rules of safety.
c. Select and demonstrate the use of tools.
d. Explain the procedures for maintenance.

Suggested Teaching Strategies

- Have students define, illustrate, and give real-world examples of hand and power tool terms. Terms related to hand tools may include but are not limited to allen wrench, ball-peen hammer, bell-faced hammer, bevel, box-end wrench, carpenter's square, cat's paw, chisel, chisel bar, claw hammer, combination square, combination wrench, crescent wrench, dowel, fastener, flat bar, flats, foot-pounds, inch-pounds, joint, kerf, level, miter joint, nail puller, open-end wrench, peening, pipe wrench, planed, pliers, plumb, points, punch, rafter angle square, ripping bar, round off, spud wrench, square, striking (or slugging) wrench, strip, tang, tempered, tenon, torque, try square, vise, and weld. Terms related to power tools can include but are not limted to abrasive, AC (alternating current), auger, booster, carbide, chuck, chuck key, countersink DC (direct current) electric tools, ferromagnetic, grit, ground fault circuit interrupter (GFCI), ground fault protection, hazardous material, hydraulic tools, masonry, pneumatic tools, reciprocating, revolutions per minute (rpm), ring test, shank, and trigger lock. Have students create a quick reference guide describing and illustrating steps to use each piece of equipment properly.
- Identify basic hand and power tools (e.g., hammer, screwdriver, saw, wrench, pliers, and drill) used in the field (Contren Core Text Introduction to Hand Tools and Introduction to Power Tools Units, Level I Hand and Power Tools Unit, and Contren Connect Units) and how they have advanced through time. Have students use the Inspiration program to illustrate a timeline of the evolution of hand and power tools. R1, R2, R3, R4, R5, R6 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6
- Discuss safety factors, proper use, and maintenance. Describe accidents that can occur while using tools. Divide students into groups, and give each group a scenario or case study (written or on video) involving an accident. Have each group identify safety mistakes in each situation; determine correct procedures; and present the scenario, mistakes found, and procedures that should have been used. E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6, W1, W2, W3, W4, W5 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6
- Demonstrate the uses of various hand and power tools for the class. Provide each student with a description of a project to be completed. Have the student select the appropriate tool for the project and demonstrate its proper use to the class. R1, R2, R3, R4, R5, R6 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6
- Demonstrate the proper maintenance of commonly used hand and power tools. Assign each student a specific set of tools (i.e., hammers, power saws, wrenches, etc.). Have students use the Internet to research and type a report on the proper procedures for maintenance of the assigned set of tools. E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6, W1, W2, W3, W4, W5, CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6
- Given a scenario, students will choose the correct tool and explain why that tool is the correct one for the scenario. E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6
- Have students video each other properly using each hand and power tool discussed above. Have students upload the videos to their Blackboard electronic portfolios to document mastery of these concepts.

- Have students use the Internet, classroom resources, or information from industry mentors to research the importance of each hand and power tool to everyday activity on a construction site. Have students research the cost of each tool. Have students create a spreadsheet describing the tools and the cost of the tools they must have in order to perform a construction job effectively. Have students compare and contrast the benefit of working with a contractor or going into business for themselves.
- Utilize Contren Connect for review and reinforcement.

Suggested Assessment Strategies

- Have each student complete a test to identify specific tools.
- Use the **Case Study Presentation Rubric** to evaluate the presentations.
- Evaluate the selection of the proper tool for the assigned project and demonstration of its use.
- Utilize Contren written and performance assessments.
- Use the **Maintenance Written Report Rubric** to evaluate the report.
- Evaluate the scenario through teacher assessment of appropriateness.
- Have students show mastery of this competency by posting documentation to their Blackboard electronic portfolios.

Standards

21st Century Skills Standards

CS1 Flexibility and Adaptability
CS2 Initiative and Self-Direction
CS3 Social and Cross-Cultural Skills
CS4 Productivity and Accountability
CS5 Leadership and Responsibility

ACT College Readiness Standards

E1 Topic Development in Terms of Purpose and Focus
E2 Organization, Unity, and Coherence
E3 Word Choice in Terms of Style, Tone, Clarity, and Economy
E4 Sentence Structure and Formation
E5 Conventions of Usage
E6 Conventions of Punctuation
R1 Main Ideas and Author's Approach
R2 Supporting Details
R3 Sequential, Comparative, and Cause–Effect Relationships
R5 Meaning of Words
R6 Generalizations and Conclusions
W1 Expressing Judgments
W2 Focusing on the Topic
W3 Developing a Position
W4 Organizing Ideas
W5 Using Language

National Industry Standards

HTO - Introduction to Hand Tools
PTO - Introduction to Power Tools

National Educational Technology Standards

T2 Communication and Collaboration
T3 Research and Information Fluency
T4 Critical Thinking, Problem Solving, and Decision Making
T5 Digital Citizenship
T6 Technology Operations and Concepts

Suggested References

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Vogt, F. (2003). *Residential construction academy: Carpentry.* Clifton Park, NY: Delmar Learning.

Suggested Rubrics and Checklists

Case Study Presentation Rubric

NAME: DATE: PERIOD:

	Excellent 4 Points	Accomplished 3 Points	Needs Improvement 2 Points	Unsatisfactory 1 Point	Score
Comprehension	Shows complete understanding of the issues and grasps implications beyond the immediate issue	Asks for more details to clarify understanding of the issue	Shows partial understanding of the issue but does not ask for clarification	Resists attempts to get clarification	
Strategizing	Develops realistic strategies that provide a satisfactory conclusion	Chooses appropriate strategies that may satisfy	Shows evidence of strategy that may or may not satisfy	Needs assistance to choose a strategy	
Innovation	Devises more than one resolution to the problem	Offers a solution	Offers a solution with a limited point of view	Shows some understanding of the problem	
Communication	Convincingly communicates resolution	Explains solution so others can understand	Conveys an opinion	Unsure of how to explain	
				Total	

Comments:

Maintenance Written Report Rubric

NAME: DATE: PERIOD:

	Exemplary 4 Points	Accomplished 3 Points	Developing 2 Points	Beginning 1 Point	Score
Content	Clear thesis and focus that remain apparent	Thesis and focus that remain apparent	Addresses subject matter with minimal support	Does not focus on topic	
Grammar	Correct and effective use of grammar and mechanics	Occasional errors in use of grammar and mechanics	Problems in use of grammar and mechanics	Repeated errors in use of grammar and mechanics	
Organization	Ideas flow smoothly and logically with clarity and coherence	Logical order and appropriate sequencing of ideas with adequate transition	Some evidence of an organizational plan or strategy	Lacks organization	
				Total	

Comments:

Competency 1: Read, analyze, and understand basic components of a blueprint. (DOK 3) BLU, PRA3, PRA4, TTA2, TTA3, GEO1

Suggested Objectives

a. Identify terms and symbols commonly used on blueprints.
b. Interpret various symbols to locate various elements.
c. Interpret a plan to determine layout.
d. Interpret electrical drawings, including site plans, floor plans, and detail drawings.
e. Read an equipment schedule.
f. Explain the basic layout of a blueprint.
g. Describe the information in a title block.
h. Identify the lines used on blueprints.
i. Explain the architect's and engineer's scales.
j. Sketch a project to scale.
k. Construct a structure based on a sketch.

Suggested Teaching Strategies

- Using a blueprint, explain all terms, symbols, and abbreviations on the blueprint and how they are used to locate various elements. Terms may include but are not limited to architect, architect's scale, architectural plans, beam, blueprints, civil plans, computer aided drafting (CAD), contour lines, detail drawings, dimension line, dimensions, electrical plans, elevation (EL) drawing, engineer, engineer's scale, floor plan, foundation plan, HVAC (heating, ventilation, and air-conditioning), hidden line, isometric drawing, leader, legend, mechanical plans, metric scale, not to scale (NTS), piping and instrumentation drawing (P&IDs), plumbing, plumbing plans, request for information (RFI), roof plan, scale, schematic, section drawing, specifications, structural plans, symbol, and title block.
- Give each student a copy of the symbols and abbreviations (Contren Core Text Introduction to Blueprints Unit and Contren Connect). Discuss electrical specifications and drawings, equipment schedules, blueprint components, and architect's and engineer's scales. E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6
- Divide students into pairs, and have them quiz each other on the terms and symbols. Have the students sketch a simple project to scale. R1, R2, R3, R4, R5, R6 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6
- Have students contact a building store manager (may simulate a call) or review advertisements on the Internet to determine the procedure for purchase of the materials and the estimated cost. Have students include an estimated cost of material in the information sent to the client in the activity above. E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6, W1, W2, W3, W4, W5, M1, M2, M4, M6, M7 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6
- To determine the accuracy of the sketch, have students complete a project according to the sketch specifications (Contren Core Text Introduction to Blueprints Unit and Contren Connect). E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6, W1, W2, W3, W4, W5 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6
- Have students add a product indicating mastery of their ability to read, understand, and analyze basic components of a blueprint.
- Utilize Contren Connect for review and reinforcement.

Suggested Assessment Strategies

- Monitor group work as students quiz each other, and use a check sheet of symbols to monitor student success (Contren Core Text Introduction to Blueprints Unit and Contren Connect).
- Review the sketch for accuracy.
- Evaluate the equipment schedule and estimated cost of materials for cost-effectiveness.
- Evaluate the project according to the Contren Unit in text and online.
- Utilize Contren written and performance assessments.
- Have students show mastery of this competency by posting documentation to their Blackboard electronic portfolios.

Standards

21st Century Skills Standards

CS1 Flexibility and Adaptability
CS2 Initiative and Self-Direction
CS3 Social and Cross-Cultural Skills
CS4 Productivity and Accountability
CS5 Leadership and Responsibility

MS Academic Standards

PRA3 Identify and apply geometric principles to polygons, angles, and two- and three-dimensional figures.
PRA4 Understand measurable attributes of objects, and apply various formulas in problem-solving situations.
TTA2 Understand, represent, and analyze patterns, relations, and functions.
TTA3 Understand geometric principles of polygons, angles, and figures.
GEO1 Compute and determine the reasonableness of a result in mathematical and real-world situations with and without technology.

ACT College Readiness Standards

E1 Topic Development in Terms of Purpose and Focus
E2 Organization, Unity, and Coherence
E3 Word Choice in Terms of Style, Tone, Clarity, and Economy
E4 Sentence Structure and Formation
E5 Conventions of Usage
E6 Conventions of Punctuation
M1 Basic Operations and Applications
M2 Probability, Statistics, and Data Analysis
M4 Expressions, Equations, and Inequalities
M6 Properties of Plane Figures
M7 Measurement
M8 Functions
R1 Main Ideas and Author's Approach
R2 Supporting Details
R3 Sequential, Comparative, and Cause–Effect Relationships
R5 Meaning of Words
R6 Generalizations and Conclusions
W1 Expressing Judgments
W2 Focusing on the Topic
W3 Developing a Position
W4 Organizing Ideas
W5 Using Language

National Industry Standards

BLU - Introduction to Blueprints

National Educational Technology Standards

T1 Creativity and Innovation
T2 Communication and Collaboration
T3 Research and Information Fluency
T4 Critical Thinking, Problem Solving, and Decision Making
T5 Digital Citizenship
T6 Technology Operations and Concepts

Suggested References

Brown, W., & Dorfmueller, D. (2005). *Print reading for construction*. Tinley Park, IL: Goodheart-Willcox.

Contren Connect. (n.d.). Retrieved January 14, 2008, from http://www.contrenconnect.com/

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Meridian Education Corporation. (n.d.). *Blueprints: Planning a building* [Videotape]. (Available from Meridian Education Corporation, 236 E. Front St., Bloomington, IL 61701)

National Joint Apprenticeship Training Committee. (2008). *Blueprint reading for electricians.* Clifton Park, NY: Delmar Learning.

Proctor, T., & Toenjes, L. (2005). *Print reading for residential and light commercial construction.* Homewood, IL: American Technical.

Competency 1: Explain the fundamentals of the carpentry trade. (DOK 1) [OTT, BFM]

Suggested Objectives

a. Define terms related to the carpentry trade.
b. Discuss the history of the carpentry trade.
c. Describe modern carpentry.
d. Describe career ladders, stages of progress, and advancement possibilities in carpentry work.
e. Exhibit the skills, attitudes, abilities, personal responsibilities, and responsibilities a person needs to work as a successful carpenter.
f. Recognize materials used and the importance of safety in the carpentry industry.

Suggested Teaching Strategies

- Have students define and illustrate terms realted to the carpentry trade. Terms may include but are not limited to building codes, finish carpentry, rough carpentry, and take off.
- Using the Contren Carpentry Level I Orientation to the Trade Unit in text and online, discuss the fundamentals of carpentry to include a review of history, modern materials and methods, career opportunities, and workplace skills. Using the Internet, have students work in teams/groups to complete a written report contrasting the history of carpentry with modern carpentry to include materials and methods. Have students present the report to the class. [E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6, W1, W2, W3, W4, W5 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6]
- Have students interview an industry mentor or a contractor to explore the opportunities for advancement in the construction field. Opportunities should include the identification and exploration of industry certifications, apprenticeship programs, postsecondary programs, training programs, and so forth. Also, using the Career Center, have students investigate career opportunities in the carpentry field to include occupational outlook, wages, and working conditions. Have students write a report on the field. Have a guest speaker present career possibilities in carpentry. Have students develop a list of the most common employee problems. Have students document their research using a product of choice, such as but not limited to a podcast, wiki, blog, report, newsletter, or written report. Have students share their products with their industry mentors for input. Additionally, have students peer evaluate the products of choice and revise the product. Have students post the products to their Blackboard electronic portfolios. [E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6, W1, W2, W3, W4, W5 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6]
- Using the Contren Carpentry Level I Orientation to the Trade Unit in text and online resources, provide students with a list of terms, types, and definitions relating to carpentry. Discuss the terms that apply to wood and lumber. Divide the students into groups to quiz each other on the terms provided. Provide handouts identifying various types of lumber and the effects of imperfections. Have the students research the uses of the types of lumber and the effects of imperfections and present the results of the research. [E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6, W1, W2, W3, W4, W5, CS1,CS2,CS3,CS4,CS5 T1,T2,T3,T4,T5,T6]
- Give students a scenario such as the following:

  You have been contracted with the local contract construction firm to create a construction worker recruitment video. This video will be posted to the contract construction firm's Web site. It will also be used at local WIN job centers to recruit construction workers. The video

must include information related to the following topics:
  - Formal construction training (including secondary, postsecondary, and apprenticeship programs)
  - Benefits of beginning a career in the industry
  - Responsibilities of the employee
  - Professionalism
  - Honesty
  - Loyalty
  - Willingness to learn
  - Willingness to take responsibility
  - Willingness to cooperate
  - Rules and regulations
  - Tardiness and absenteeism
  - Human relations
  - Attitude (maintaining a positive attitude)

  Work as a group to research, write, produce, edit, and present the recruitment video to the contract construction firm (made up of industry representatives, preferably members of a real contract construction firm). Revisit and revise the video based on input from the contract construction firm. Have students post the videos to their Blackboard electronic portfolios.
- Demonstrate the proper methods for sorting and stacking building materials. Have students perform the proper methods. Explain the procedures for calculating lumber and building materials for a given job. Provide the students with a scenario, and have them perform the calculation. Schedule an actual or virtual field trip to a lumber company, building supply, or other related industry. Have the students write a report about the field trip.[E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6, W1, W2, W3, W4, W5, M1, M2, M4, M6, M7 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6]
- Utilize Contren Connect for review and reinforcement.

Suggested Assessment Strategies

- Use the **Written Report Rubric** and the **Presentation Rubric** to evaluate the student's report and presentation.
- Evaluate the student-created list by teacher observation.
- Assess the activity by using the label or definitions answer key.
- Assess term identification with a written quiz.
- Assess student procedures using a **Performance Assessment Rubric**.
- Assess the scenario according to the correctness of the calculation.
- Evaluate the report using the **Written Report Rubric**.
- Utilize Contren written and performance assessments.
- Have students show mastery of this competency by posting documentation to their Blackboard electronic portfolios.

Competency 2: Demonstrate safety when working in carpentry and with carpentry tools. (DOK 2) [OTT]

Suggested Objectives

a. Demonstrate safe working procedures related to carpentry.
b. Identify hazards related to carpentry and how to avoid or minimize them in the workplace.

Suggested Teaching Strategies

- Using the Contren Carpentry Level I Orientation to the Trade Unit in text and online, discuss

safety factors regarding carpentry.[E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6]

- Have students create a safety blog describing safety precautions they implement throughout course projects completed in the course.
- Divide students into groups, and give each group a scenario/case study involving an accident. Have each group identify safety mistakes in each situation; determine the correct procedures; and present the scenario, mistakes found, and procedures that should have been used to correct the problem.[E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6]
- Utilize Contren Connect for review and reinforcement.

Suggested Assessment Strategies

- Evaluate the case study by using the **Case Study Presentation Rubric**.
- Utilize Contren written and performance assessments.
- Have students show mastery of this competency by posting documentation to their Blackboard electronic portfolios.

Standards

21st Century Skills Standards

CS1 Flexibility and Adaptability
CS2 Initiative and Self-Direction
CS3 Social and Cross-Cultural Skills
CS4 Productivity and Accountability
CS5 Leadership and Responsibility

ACT College Readiness Standards

E1 Topic Development in Terms of Purpose and Focus
E2 Organization, Unity, and Coherence
E3 Word Choice in Terms of Style, Tone, Clarity, and Economy
E4 Sentence Structure and Formation
E5 Conventions of Usage
E6 Conventions of Punctuation
M1 Basic Operations and Applications
M2 Probability, Statistics, and Data Analysis
M4 Expressions, Equations, and Inequalities
M6 Properties of Plane Figures
M7 Measurement
R1 Main Ideas and Author's Approach
R2 Supporting Details
R3 Sequential, Comparative, and Cause–Effect Relationships
R5 Meaning of Words
R6 Generalizations and Conclusions
W1 Expressing Judgments
W2 Focusing on the Topic
W3 Developing a Position
W4 Organizing Ideas
W5 Using Language

National Industry Standards

OTT - Orientation to the Trade
BMF - Building Materials, Fasteners, and Adhesives

National Educational Technology Standards

T2 Communication and Collaboration
T3 Research and Information Fluency
T4 Critical Thinking, Problem Solving, and Decision Making
T5 Digital Citizenship
T6 Technology Operations and Concepts

Suggested References

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Toenjes, L. P. (2006). *Building trades dictionary.* Homewood, IL: American Technical.

Vogt, F. (2003). *Residential construction academy: Carpentry.* Clifton Park, NY: Delmar Learning.

Suggested Rubrics and Checklists

Case Study Presentation Rubric

NAME: DATE: PERIOD:

	Excellent 4 Points	Accomplished 3 Points	Needs Improvement 2 Points	Unsatisfactory 1 Point	Score
Comprehension	Shows complete understanding of the issues and grasps implications beyond the immediate issue	Asks for more details to clarify understanding of the issue	Shows partial understanding of the issue but does not ask for clarification	Resists attempts to get clarification	
Strategizing	Develops realistic strategies that provide a satisfactory conclusion	Chooses appropriate strategies that may satisfy	Shows evidence of strategy that may or may not satisfy	Needs assistance to choose a strategy	
Innovation	Devises more than one resolution to the problem	Offers a solution	Offers a solution with a limited point of view	Shows some understanding of the problem	
Communication	Convincingly communicates resolution	Explains solution so others can understand	Conveys an opinion	Unsure of how to explain	
				Total	

Comments:

Performance Assessment Rubric

Student's Name _____

Date_____

Task to Be Performed_____

	Possible Points	Points Awarded
Safety Personal safety (glasses, clothing, etc.) Safe use of tool Safely perform the task	25	
Performance of the Task **Insert specific procedures for each performance activity.** Follow the task instructions Perform the task efficiently Perform the task satisfactorily	50	
Lab Maintenance Area cleanup (clean and tidy) Area organization (before, during, and after the task)	25	
Total	100	

Comments for deductions:

Instructor's Signature_____

Presentation Rubric

NAME: _____ DATE: _____ PERIOD: _____

	Exemplary 4 points	Accomplished 3 points	Developing 2 points	Beginning 1 point	Score
Content	Clear, appropriate, and correct	Mostly clear, appropriate, and correct	Somewhat confusing, incorrect, or flawed	Confusing, incorrect, or flawed	
Clarity	Logical, interesting sequence	Logical sequence	Unclear sequence	No sequence	
Presentation	Clear voice and precise pronunciation	Clear voice and mostly correct pronunciation	Low voice and incorrect pronunciation	Mumbling and incorrect pronunciation	
Visual Aids	Attractive, accurate, and grammatically correct	Adequate, mostly accurate, and few grammatical errors	Poorly planned, somewhat accurate, and some grammatical errors	Weak, inaccurate, and many grammatical errors	
Length	Appropriate length	Slightly too long or short	Moderately too long or short	Extremely too long or short	
Eye Contact	Maintains eye contact, seldom looking at notes	Maintains eye contact most of time but frequently returns to notes	Occasionally uses eye contact but reads most of information	No eye contact because reading information	
				TOTAL	

Comments:

Written Report Rubric

NAME: _____ DATE: _____ PERIOD: _____

	Exemplary 4 Points	Accomplished 3 Points	Developing 2 Points	Beginning 1 Point	Score
Content	Clear thesis and focus that remain apparent	Thesis and focus that remain apparent	Addresses subject matter with minimal support	Does not focus on topic	
Grammar	Correct and effective use of grammar and mechanics	Occasional errors in use of grammar and mechanics	Problems in use of grammar and mechanics	Repeated errors in use of grammar and mechanics	
Organization	Ideas flow smoothly and logically with clarity and coherence.	Logical order and appropriate sequencing of ideas with adequate transition	Some evidence of an organizational plan or strategy	Lacks organization	
				Total	

Comments:

Competency 1: Demonstrate safety in and around electrical circuits and equipment. (DOK 2) [ESF]

Suggested Objectives

a. Define terms related to electrical safety.
b. Demonstrate safe working procedures in a construction and shop/lab environment.
c. Explain the purpose of OSHA and how it promotes safety on the job.
d. Identify electrical hazards and how to avoid or minimize them in the workplace.
e. Explain safety issues concerning lock-out/tag-out procedures, personal protection using assured grounding and isolation programs, confined space entry, respiratory protection, and fall protection systems.

Suggested Teaching Strategies

- Have students define and illustrate terms related to electrical safety. Terms may include but are not limited to double-insulated/ungrounded tool, fibrillation, ground fault circuit interrupter (GFCI), and polychlorinated biphenyls (PCBs).
- Ask students, "Why is OSHA important to industry?" Have students watch a video about safety. Have students research, define, and illustrate OSHA electrical regulations. Have students create an OSHA safety podcast and upload to their Blackboard electronic portfolios. [E1, E2, E3, E4, E5, E6 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6]
- Have students research the electrical industry. Research can include information from traditional classroom resources, the Internet, and industry mentors. Invite a guest speaker to visit the class and discuss electrical safety issues and give an overview of the electrical industry.
- Have students create a Blackboard wiki that answers the following questions:
  - What is lock-out/tag-out?
  - What situations are likely to require lock-out/tag-out?
  - Who is responsible for performing the lock-out/tag-out?
  - When is more than one person responsible?
- Have students perform basic safety techniques. Observe student performance to ensure mastery of safety skills. If students are not performing to mastery, guide students through the proper procedure and have students perform the techniques again.
- Use Contren modules in text and online for basic and electrical safety. Have students simulate proper techniques for working around electrical equipment. [R1, R2, R3, R4, R5, R6 E1, E2, E3, E4, E5, E6 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6]
- Utilize Contren Connect for review and reinforcement.

Suggested Assessment Strategies

- Observe the student simulated experience, and provide verbal feedback. Have students continue to complete safety techniques until mastery.
- Utilize Contren written and performance assessments.
- Have students show mastery of this competency by posting documentation to their Blackboard electronic portfolios.

Competency 2: Describe/identify basic electrical theory. (DOK 2) [ETO, TTA4]

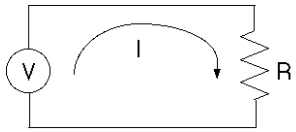
Suggested Objectives

a. Define terms related to electrical theory.
b. State how electrical power is generated and distributed.
c. Identify voltage, and identify the ways in which it can be produced.
d. Compare the difference between conductors and insulators.
e. Describe how voltage, current, resistance, and power are related.
f. Explain the different types of meters used to measure voltage, current, and resistance.
g. Use Ohm's law to calculate the current, voltage, and resistance in a circuit.
h. Calculate how much power is consumed by a circuit using the power formula.
i. Describe the differences between series and parallel circuits.
j. Calculate the amount of power used by a circuit using the power formula.

Suggested Teaching Strategies

- Have students define and illustrate terms related to electrical theory. Terms should include but are not limited to ammeter, ampere (A), atom, battery, circuit, conductor, coulomb, current, electron, insulator, joule (J), kilo, matter, mega, micro, neurons, nucleus, ohm, ohmmeter, Ohm's law, power, protons, resistance, resistor, schematic, series circuit, valence shell, voltage, voltage drop, voltmeter, and watt (W).
- Discuss the process of generating electrical power from origin to actual usage. Utilize a chart, diagram, or flowchart to trace the generation of power from the atom to the power plant to industrial buildings and residential areas. Have students trace this process by labeling an example of the process. Use Contren Construction Technology Volume I, Wiring: Commercial and Industrial Unit in text and online or other resources to define and discuss the terms related to electricity. Have students match terms with the definitions. E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6
- Using Contren Construction Technology Volume I, Wiring: Commercial and Industrial Unit in text and online, discuss and demonstrate the various types of meters and their uses. Have students give a specific reading and identify the correct meter and record the correct reading. Have students use various types of meters to identify the amount of current. E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6
- Show students the video *Resistance in Electrical Systems* or a video related to electrical systems technology from United Streaming (http://www.unitedstreaming.com). Before the video, ask students the following question:
    - Why does a wire get hot when current flows through it?
- After the video, use the following probes to facilitate discussion:
    - In what ways is resistance useful in an electrical system?
    - What is the formula for calculating resistance in an electrical system?
    - What causes resistance in an electrical system?
- Compose four to five charts that represent how resistance affects electrical systems with content material, pictorially or verbally. Charts can include photographs and explanations, direct quotes from classroom resources, or other means to convey one idea per chart. Post the charts around the classroom, and number each chart. Divide students into groups of three to four. Assign one group per chart as a starting point. Allow groups to spend 2 to 5 minutes at each assigned chart. Encourage students to take notes and discuss the ideas presented on each chart. When time is up, rotate the groups until all groups have taken notes and discussed information from each chart. When students return to their seats, lead a whole group discussion about the content learned from each chart.

- Use technology application tools or a graphing calculator (work with a math teacher to integrate this technology) and presentation equipment to enter data related to various voltages and currents. Graph the resulting resistances to demonstrate the relationship between them (Ohm's law).
- Have students use the Internet or classroom resources to gain a basic understanding of Ohm's law. Have students write the formula and sketch the drawing that represents the formula in their notebooks.
    - Ohm's law: V = I x R
      V = Voltage
      I = Current
      R = Resistance



- Allow students to work in small groups to solve the following problem:[M2, M4, M6, M7 CS1,CS2,CS3,CS4,CS5]
    - **Problem:** A 9-V battery supplies power to a cordless curling iron with a resistance of 18 Ω. How much current is flowing through the curling iron?
    - **Solution:** Visit http://www.grc.nasa.gov/WWW/K-12/Sample_Projects/Ohms_Law/ohmslaw.html for the solution and more problems for students to solve.
- Discuss "resistivity," and demonstrate the relationship of electrical resistance to Ohm's law. Use four wires and a multimeter. One wire should be the "standard" with a specific length, diameter, and material. Each of the other three wires has ONE parameter changed. Use this strategy to show the change in resistance of path of the three wires with respect to the standard wire.
- Have students use technology productivity tools to define and illustrate what they discovered by watching the demonstration explaining Ohm's law.
- Using technology productivity tools, groups of three to four students will use the Internet to research the differences between conductors, semiconductors, and insulators. Have students create a product such as a Web page, brochure, newspaper, or technical report to explain and illustrate conductors, semiconductors, and insulators.
- Have students practice calculating current, resistance, and voltage using the Ohm's law formula.[M1]
- Given the power equation, students will perform calculations to find the power consumed in a circuit or load.[M1, M2, M4, M6, M7 CS1,CS2,CS3,CS4,CS5]
- Using Contren Construction Technology Volume I, Wiring: Commercial and Industrial Unit in text and online, discuss the difference between a series circuit and a parallel circuit. The students should be able to draw a diagram of series and parallel circuits.[E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6, W1, W2, W3, W4, W5 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6]
- Have students demonstrate mastery of electrical theory concepts by posting a product of choice to their Blackboard electronic portfolios.
- Utilize Contren Connect for review and reinforcement.

Suggested Assessment Strategies

- Observe students while working in groups on resistance problems. Use the **Group Work Rubric** to assess students' group work.
- The labeling exercise will be assessed by using an answer key.
- The matching activity will be assessed with an answer key.
- Assessment of the activity will use an identification answer key and reading chart.
- The problems will be assessed with an answer key.

- The diagram will be assessed using an answer key.
- Have students show mastery of this competency by posting documentation to their Blackboard electronic portfolios.

Standards

21st Century Skills Standards

CS1 Flexibility and Adaptability
CS2 Initiative and Self-Direction
CS3 Social and Cross-Cultural Skills
CS4 Productivity and Accountability
CS5 Leadership and Responsibility

MS Academic Standards

TTA4 Demonstrate and apply various formulas in problem-solving situations.

ACT College Readiness Standards

E1 Topic Development in Terms of Purpose and Focus
E2 Organization, Unity, and Coherence
E3 Word Choice in Terms of Style, Tone, Clarity, and Economy
E4 Sentence Structure and Formation
E5 Conventions of Usage
E6 Conventions of Punctuation
M2 Probability, Statistics, and Data Analysis
M4 Expressions, Equations, and Inequalities
M6 Properties of Plane Figures
M7 Measurement
R1 Main Ideas and Author's Approach
R2 Supporting Details
R3 Sequential, Comparative, and Cause–Effect Relationships
R5 Meaning of Words
R6 Generalizations and Conclusions
W1 Expressing Judgments
W2 Focusing on the Topic
W3 Developing a Position
W4 Organizing Ideas
W5 Using Language

National Industry Standards

ESF - Electrical Safety
ETO - Electrical Theory One

National Educational Technology Standards

T2 Communication and Collaboration
T3 Research and Information Fluency
T4 Critical Thinking, Problem Solving, and Decision Making
T5 Digital Citizenship

T6 Technology Operations and Concepts

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Suggested Rubrics and Checklists

Group Work Rubric

NAME: DATE: PERIOD:

	Beginning 1 point	Developing 2 points	Accomplished 3 points	Exemplary 4 points	Score
Group Discussions	Rarely contributed to discussions of the group	Contributed good effort to discussions of the group	Contributed great effort to discussions of the group	Contributed exceptional effort to discussions of the group	
On-task Behavior	Exhibited on-task behavior inconsistently	Exhibited on-task behavior some of the time	Exhibited on-task behavior most of the time	Exhibited on-task behavior consistently	
Helping Others	Did not assist other group members	Seldom assisted other group members	Occasionally assisted other group members	Assisted other group members	
Listening	Ignored ideas of group members	Seldom listened to ideas of group members	Occasionally listened to ideas of group members	Always listened to ideas of group members	
				Total	

Comments:

Competency 1: Explain the fundamentals of the masonry trade. (DOK 1) [ITM]

Suggested Objectives

a. Review the history of masonry.
b. Explain modern masonry materials and methods.
c. Describe career ladders and advancement possibilities in masonry work.
d. Demonstrate the skills, attitudes, and abilities needed to work as a mason.

Suggested Teaching Strategies

- Discuss the fundamentals of masonry to include a review of history, modern materials and methods, career opportunities, and workplace skills. Have students illustrate the fundamentals of masonry using a concept map or the Inspiration software program. [E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6, CS1,CS2,CS3,CS4,CS5]
- Have a guest speaker present an overview of the masonry profession to the class. Using the Internet, have students work in teams/groups to complete a written report contrasting the history of masonry with modern masonry to include materials and methods. The report should include a timeline that depicts the evolution of the profession and tools. Additionally, the report should include information about emerging trends and issues related to the industry. Have students present the report to the class. Have students develop a list of common masonry obstacles. Have students ask the guest speaker about how he or she overcame those obstacles. [E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6, W1, W2, W3, W4, W5 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6]
- Using the Career Center, have students investigate career opportunities in the field of masonry to include occupational outlook, wages, and working conditions. Have students produce a product of choice describing pros and cons of perusing a career in the masonry field. Have students document their understanding of the field and career opportunities available to them by posting a product of choice to their Blackboard electronic portfolios. [E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6, W1, W2, W3, W4, W5 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6]
- Utilize Contren Connect for review and reinforcement.

Suggested Assessment Strategies

- Evaluate the student's report and presentation for content, organization, grammar, and spelling using the **Written Report Rubric** and the **Presentation Rubric**.
- Evaluate the report for participation, content, organization, grammar, and spelling using the **Group Report Rubric**.
- Use an answer key to evaluate the list.
- Have students show mastery of this competency by posting documentation to their Blackboard electronic portfolios.

Competency 2: Identify and discuss safety issues in and around the masonry work site. (DOK 1) [SAR]

Suggested Objectives

a. Identify hazards related to masonry and how to avoid or minimize them in the workplace.
b. Identify and describe the safe use of tools and equipment used in performing masonry tasks.
c. Demonstrate safe working procedures related to masonry.
d. Demonstrate the correct procedure for assembling and disassembling scaffolding according to federal safety regulations.
e. Perform safety and mechanical checks on a mechanical mixer.

Suggested Teaching Strategies

- Utilize the Contren Construction Technology Volume I Masonry Units and Installation Techniques Unit in text and online to discuss safety factors and hazards in the field of masonry. Divide students into groups, and give each group a scenario/case study involving an accident. Have each group identify safety mistakes in each situation; determine the correct procedures; and present the scenario, mistakes found, and procedures that should have been used to correct the problem. [E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6]
- Utilize the Contren Construction Technology Volume I Masonry Units and Installation Techniques Unit in text and online to demonstrate the uses of various hand and power tools for the class. Provide each student with a description of a project to be completed. Have the student select, demonstrate, discuss, and present the proper use of the appropriate tool to the entire class. [E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6 CS1,CS2,CS3,CS4,CS5]
- Utilize the Contren Construction Technology Volume I Masonry Units and Installation Techniques Unit in text and online to discuss and demonstrate the correct procedure for assembling and disassembling scaffolding. Include the federal safety regulations. Have students demonstrate the correct procedure for assembling and disassembling scaffolding according to federal safety regulations. [E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6 CS1,CS2,CS3,CS4,CS5]
- Utilize the Contren Construction Technology Volume I Masonry Units and Installation Techniques Unit in text and online to discuss and demonstrate safety and mechanical checks on a mixer. Have students demonstrate the safe use of a mixer. [E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6 CS1,CS2,CS3,CS4,CS5]
- Utilize Contren Connect for review and reinforcement.

Suggested Assessment Strategies

- Evaluate the group activities for participation and accuracy of content.
- Evaluate the demonstrations based on accuracy of procedures.
- Have students show mastery of this competency by posting documentation to their Blackboard electronic portfolios.

Competency 3: Explain and define terms and materials associated with masonry. (DOK 1) [MIT]

Suggested Objectives

a Name the different types of brick, block, and stone.
b. Label parts of a brick, block, and stone.
c. Identify the positions as they appear in a wall.
d. Identify the materials used in the masonry trade.

Suggested Teaching Strategies

- Have students define and illustrate terms related to the masonry trade. Terms may include but

are not limited to admixture, aggregate, adobe, alkaline, American Society for Testing and Materials International (ASTM), ashlar, butter, capital, concrete, cornice, course, cube, facing, footing, furrowing, grout, head joint, hygroscopic, joints, mason, masonry unit, mortar, nonstructural, parapet, pilaster, spread, stringing, structural, tuckpointing, weephole, and whythe.

- Utilize the Contren Construction Technology Volume I Masonry Units and Installation Techniques Unit in text and online to provide terms, definitions, and examples of brick, block, and stone. Discuss the terms and materials in class. E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6 CS1,CS2,CS3,CS4,CS5,T2,T3,T4,T5,T6
- Have the students research from text, Contren Connect online, handouts, and the Internet to identify types, parts, and positions of brick, block, and stone. Have students visit a local brick yard to identify and price different types of brick, block, and stone. Divide the students into groups, and have them develop working projects using actual materials. E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6
- Utilize Contren Connect for review and reinforcement.

Suggested Assessment Strategies

- Monitor student mastery by observing groups.
- Assess the project using the **Group Work Rubric** to judge the accuracy of the project.
- Have students show mastery of this competency by posting documentation to their Blackboard electronic portfolios.

Competency 4: Perform procedures used in masonry trades. (DOK 2) MIT, PRA4

Suggested Objectives

a. Identify the positions of masonry units as they appear in a wall.
b. Measure, mark, and cut brick and block to specifications.
c. Lay out a brick and/or block wall using the dry bond method.
d. Mix a batch of mortar.
e. Lay a wall between established leads.

Suggested Teaching Strategies

- Utilize the Contren Construction Technology Volume I Masonry Units and Installation Techniques Unit in text and online to identify and describe the positions of masonry units as they appear in a wall. Using a wall, have students describe and identify the positions. E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6
- Utilize the Contren Construction Technology Volume I Masonry Units and Installation Techniques Unit in text and online to discuss and demonstrate measuring, marking, and cutting brick and block to specification. Discuss the importance of accuracy as related to cost. Provide the students with specifications, and have them demonstrate measuring, marking, and cutting brick and block to specification. E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6, M1, M2, M4, M6, M7 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6
- Utilize the Contren Construction Technology Volume I Masonry Units and Installation Techniques Unit in text and online to discuss and demonstrate the procedures for laying out a brick or block wall using the dry bond method. Have the students identify the materials, tools, and equipment required to lay out a wall using the dry bond method. Have them lay the wall out. E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6
- Utilize the Contren Construction Technology Volume I Masonry Units and Installation

Techniques Unit in text and online to discuss and demonstrate procedures for mixing mortar. Have students mix a batch of mortar. E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6

- Utilize the Contren Construction Technology Volume I Masonry Units and Installation Techniques Unit in text and online to discuss and demonstrate the procedures for laying a wall between established leads. Have the students lay a wall between established leads. E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6, CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6

- Have students perform the following basic bricklaying procedures while using the proper safety procedures:
    - Mixing the mortar
    - Laying a mortar bed
    - Laying bricks

  Evaluate students for proper technique. Ensure students perform each task properly. If students do not perform the task properly, re-teach specific techniques. Have students video each other performing the proper bricklaying procedures at 100% accuracy. Have students document mastery of basic bricklaying procedures by adding the video to their Blackboard electronic portfolios.
- Utilize Contren Connect for review and reinforcement.

Suggested Assessment Strategies

- Evaluate students on positions of the wall by using a written test with a diagram of a wall.
- Evaluate student demonstrations for accuracy of procedures.
- Have students show mastery of this competency by posting documentation to their Blackboard electronic portfolios.

Standards

21st Century Skills Standards

CS1 Flexibility and Adaptability
CS2 Initiative and Self-Direction
CS3 Social and Cross-Cultural Skills
CS4 Productivity and Accountability
CS5 Leadership and Responsibility

MS Academic Standards

PRA4 Understand measurable attributes of objects, and apply various formulas in problem-solving situations.

ACT College Readiness Standards

E1 Topic Development in Terms of Purpose and Focus
E2 Organization, Unity, and Coherence
E3 Word Choice in Terms of Style, Tone, Clarity, and Economy
E4 Sentence Structure and Formation
E5 Conventions of Usage
E6 Conventions of Punctuation
R1 Main Ideas and Author's Approach
R2 Supporting Details
R3 Sequential, Comparative, and Cause–Effect Relationships
R5 Meaning of Words
R6 Generalizations and Conclusions
W1 Expressing Judgments
W2 Focusing on the Topic
W3 Developing a Position
W4 Organizing Ideas
W5 Using Language

National Industry Standards

ITM Introduction to Masonry
SAR Masonry Safety Requirements
MIT Masonry Units and Installation Techniques

National Educational Technology Standards

T2 Communication and Collaboration
T3 Research and Information Fluency
T4 Critical Thinking, Problem Solving, and Decision Making
T5 Digital Citizenship
T6 Technology Operations and Concepts

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Suggested Rubrics and Checklists

Group Work Rubric

NAME: DATE: PERIOD:

	Beginning 1 point	Developing 2 points	Accomplished 3 points	Exemplary 4 points	Score
Group Discussions	Rarely contributed to discussions of the group	Contributed good effort to discussions of the group	Contributed great effort to discussions of the group	Contributed exceptional effort to discussions of the group	
On-task Behavior	Exhibited on-task behavior inconsistently	Exhibited on-task behavior some of the time	Exhibited on-task behavior most of the time	Exhibited on-task behavior consistently	
Helping Others	Did not assist other group members	Seldom assisted other group members	Occasionally assisted other group members	Assisted other group members	
Listening	Ignored ideas of group members	Seldom listened to ideas of group members	Occasionally listened to ideas of group members	Always listened to ideas of group members	
				Total	

Comments:

Presentation Rubric

NAME: _____ DATE: _____ PERIOD: _____

	Exemplary 4 points	Accomplished 3 points	Developing 2 points	Beginning 1 point	Score
Content	Clear, appropriate, and correct	Mostly clear, appropriate, and correct	Somewhat confusing, incorrect, or flawed	Confusing, incorrect, or flawed	
Clarity	Logical, interesting sequence	Logical sequence	Unclear sequence	No sequence	
Presentation	Clear voice and precise pronunciation	Clear voice and mostly correct pronunciation	Low voice and incorrect pronunciation	Mumbling and incorrect pronunciation	
Visual Aids	Attractive, accurate, and grammatically correct	Adequate, mostly accurate, and few grammatical errors	Poorly planned, somewhat accurate, and some grammatical errors	Weak, inaccurate, and many grammatical errors	
Length	Appropriate length	Slightly too long or short	Moderately too long or short	Extremely too long or short	
Eye Contact	Maintains eye contact, seldom looking at notes	Maintains eye contact most of time but frequently returns to notes	Occasionally uses eye contact but reads most of information	No eye contact because reading information	
				TOTAL	

Comments:

Written Report Rubric

NAME: DATE: PERIOD:

	Exemplary 4 Points	Accomplished 3 Points	Developing 2 Points	Beginning 1 Point	Score
Content	Clear thesis and focus that remain apparent	Thesis and focus that remain apparent	Addresses subject matter with minimal support	Does not focus on topic	
Grammar	Correct and effective use of grammar and mechanics	Occasional errors in use of grammar and mechanics	Problems in use of grammar and mechanics	Repeated errors in use of grammar and mechanics	
Organization	Ideas flow smoothly and logically with clarity and coherence.	Logical order and appropriate sequencing of ideas with adequate transition	Some evidence of an organizational plan or strategy	Lacks organization	
				Total	

Comments:

Competency 1: Recognize the fundamentals and use appropriate materials of the plumbing trade. (DOK 2) IPP, PLT, DSM3

Suggested Objectives

a. Identify terms related to the plumbing trade.
b. Describe the historical development of the plumbing trade.
c. Describe the importance of plumbers in modern society and career opportunities available.
d. Explore leadership skills and personal development opportunities related to plumbing.
e. Describe the functions of water supply and sewage treatment systems.
f. Explain how the water supply and sewage treatment facilities function.
g. Relate the development of plumbing to improvement in public health.
h. Identify materials of the plumbing trade.
i. Utilize materials of the plumbing trade.

Suggested Teaching Strategies

- Have students define and illustrate terms realted to the plumbing trade. Terms may include but are not limited to aboveground rough-in, appurtenances, aqueduct, backflow, backflow preventer, chlorine, code, cross-connection, disinfection, drain, waste, and vent (SWV), ethics, finish, fixture, journey plumber, model code, on-the-job training (OJT), plumber, plumbing, plumburn, polyvinyl chloride (PVC), portable, softening, stack-out, thermoplastic, thermoset, top-out, trim finish, trim-out, and underground rough-in.
- Discuss the fundamentals and importance of plumbing to include a review of history, modern materials and methods, career opportunities, and workplace skills. Using the Internet, have students work in teams/groups to complete a written report contrasting the history of plumbing with modern plumbing to include materials and methods. Have students include the importance of plumbers in modern society. Have students present the report to the class. E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6, W1, W2, W3, W4, W5 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6
- Using the Career Center, have students investigate career opportunities in the field of plumbing to include occupational outlook, wages, and working conditions. Have students write a report on the field. E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6, W1, W2, W3, W4, W5, M1, M2, M4, M6, M7 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6
- Utilize the Contren Construction Technology Volume I Plumbing Level I Unit in text and online to discuss and describe the functions of water supply and sewage treatment systems and how these facilities work. Discuss public health as it relates to the water supply. E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6
- Take students on a field trip to the local water supply and sewage treatment facility. Have guest speakers on site to discuss the functions of the local facility and how water safety is protected. E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6, CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6
- Have the students research the following situation: When a new neighborhood is built, how are all of the houses connected to the water supply and sewage treatment so that the least amount of supplies is used? Have students explore the Mail Delivery Route problem as it relates to Euler paths and circuits and then sketch how a neighborhood layout can be connected to water supply using a Euler path, if possible. E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6, W1, W2, W3, W4, W5, M1, M2, M4, M6, M7 CS1,CS2,CS3,CS4,CS5 T1,T2,T3,T4,T5,T6
- Utilize the Contren Construction Technology Volume I Plumbing Level I Unit in text and online to

discuss the types and sizes of pipe and fittings, and relate each type to its specific application. Provide the students with a project specification. They will identify the pipe necessary to complete the project according to type, size, and fitting needed.[E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6, M1, M2, M4, M6, M7 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6]

- Utilize Contren Connect for review and reinforcement.

Suggested Assessment Strategies

- Evaluate the group report for participation, content, organization, grammar, and spelling using the **Written Report Rubric**.
- Evaluate using a teacher-made answer key.
- Utilize Contren written and performance assessments.
- Have students show mastery of this competency by posting documentation to their Blackboard electronic portfolios.

Competency 2: Identify tools and safety procedures used in plumbing trades, and perform basic plumbing operations using proper tools and safety procedures. (DOK 1) [PLT]

Suggested Objectives

a. Identify and describe how to handle unsafe acts and conditions that cause accidents.
b. Use and care for personal protective equipment.
c. Identify jobsite hazards specific to the plumbing industry.
d. Identify basic hand and power tools used in the plumbing trade.
e. Demonstrate how to use and maintain power tools safely.
f. Demonstrate proper selection of tools for various plumbing tasks.
g. Demonstrate how to prepare a surface for tool use.
h. Describe the safety requirements for using plumbing tools.
i. Explain how to work safely in and around a trench.

Suggested Teaching Strategies

- Appropriate terms related to plumbing may include but are not limited to apparatus, asbestos, benching, blanded tools, combustible, competent person, confined space, decibels (dB), electrically powered tools, energy-isolating device, energy source, gassy operations, guard, guy wires, Hazard Communication (HazCom) Standard Hypothermia, impact tools, liquid-fuel tools, lock-out, lock-out device, lock-out/tag-out procedure, material safety data sheet (MSDS), NFPA warning diamond, nonpermit-required confined space, OSHA, oxygen-deficient atmosphere, oxygen-enriched atmosphere, permit-required confined space, power tools, protective system, shield, storing, subsidence, and tag-out device. Appropriate terms related to plumbing tools may include but are not limited to amperage, bar stock, burr, diameter, electrical ground, ferrous, flux, joist, keel crayon, kerf, level, miter, nonferrous, offset, plumb, reaming, scribe, soapstone, solder, soldering, spirit level, straightedge, temper, tolerance, torque, tub stock, and voltage drop.
- Utilize the Contren Construction Technology Volume I Plumbing Level I Unit in text and guided demonstration/modeling to demonstrate the uses of various plumbing tools for the class. Have students practice using the different plumbing tools under instructor guidance. Provide each student with a description of a project to be completed. Have the student select the appropriate tool for the project and demonstrate its proper use to the class.[E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6]

- Utilize the Contren Construction Technology Volume I Plumbing Level I Unit in text and online to

discuss and demonstrate basic plumbing operations to include selecting materials (i.e., copper, PVC, and steel), preparing the materials (i.e., threading, reaming and cutting, and sweating), and performing a specified job. Provide the students with job specifications, and have them select the proper materials, prepare the materials and fittings, and simulate performing the job.[E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6, M1, M2, M4, M6, M7 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6]

- Have students show mastery of safety procedures used in the plumbing industry by posting a product of choice to their Blackboard electronic portfolios. Utilize Contren Connect for review and reinforcement.

Suggested Assessment Strategies

- Evaluate the selection of the proper tool for the assigned project and demonstration of its use.
- Utilize Contren written and performance assessments.
- Have students show mastery of this competency by posting documentation to their Blackboard electronic portfolios.

Standards

21st Century Skills Standards

CS1 Flexibility and Adaptability
CS2 Initiative and Self-Direction
CS3 Social and Cross-Cultural Skills
CS4 Productivity and Accountability
CS5 Leadership and Responsibility

MS Academic Standards

DSM3 Use geometric models to describe and analyze mathematical relationships, establish the validity of conjectures, and determine solutions to real applications.

ACT College Readiness Standards

E1 Topic Development in Terms of Purpose and Focus
E2 Organization, Unity, and Coherence
E3 Word Choice in Terms of Style, Tone, Clarity, and Economy
E4 Sentence Structure and Formation
E5 Conventions of Usage
E6 Conventions of Punctuation
M1 Basic Operations and Applications
M2 Probability, Statistics, and Data Analysis
M4 Expressions, Equations, and Inequalities
M6 Properties of Plane Figures
M7 Measurement
R1 Main Ideas and Author's Approach
R2 Supporting Details
R3 Sequential, Comparative, and Cause–Effect Relationships
R5 Meaning of Words
R6 Generalizations and Conclusions
W1 Expressing Judgments
W2 Focusing on the Topic
W3 Developing a Position
W4 Organizing Ideas
W5 Using Language

National Industry Standards

IPP - Introduction to the Plumbing Profession
PLT - Plumbing Tools

National Educational Technology Standards

T2 Communication and Collaboration

T3 Research and Information Fluency
T4 Critical Thinking, Problem Solving, and Decision Making
T5 Digital Citizenship
T6 Technology Operations and Concepts

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Suggested Rubrics and Checklists

Written Report Rubric

NAME: DATE: PERIOD:

	Exemplary 4 Points	Accomplished 3 Points	Developing 2 Points	Beginning 1 Point	Score
Content	Clear thesis and focus that remain apparent	Thesis and focus that remain apparent	Addresses subject matter with minimal support	Does not focus on topic	
Grammar	Correct and effective use of grammar and mechanics	Occasional errors in use of grammar and mechanics	Problems in use of grammar and mechanics	Repeated errors in use of grammar and mechanics	
Organization	Ideas flow smoothly and logically with clarity and coherence.	Logical order and appropriate sequencing of ideas with adequate transition	Some evidence of an organizational plan or strategy	Lacks organization	
				Total	

Comments:

Competency 1: Review local program and vocational center policies and procedures. (DOK 1) EMP

Suggested Objectives

a. Review local program and vocational center policies and procedures including dress code, attendance, technology acceptable use policy, academic requirements, discipline, shop/lab rules and regulations, and transportation regulations.
b. Give a brief overview of the course, and explain to students what Construction Technology II is, why it is important for students to know the content of the course, and how it will be delivered.
c. Preview the school handbook, the technology acceptable use policy, and all other safety procedures for the classroom and building level.
d. Preview course objectives, program policy, and the industry standards.

Suggested Teaching Strategies

- Use the classroom presentation station to present local program and vocational center policies and procedures. Have students divide components of the student handbook. Have the group use the jigsaw method to read the handbook to become aware of what is expected of them in relation to the policies and procedures of the school. This will include dress code, attendance, academic requirements, discipline, and transportation regulations. Have students work together in pairs. A student with a higher reading ability will partner with a student with a lower reading ability to get a better understanding of the school's program policies and procedures.
- Describe general policies and procedures for participating in the Construction: Carpentry Concentration II course. Share the electronic portfolio checklist and expectations with students. Discuss potential industry certifications in detail.
- Provide each student with a written list of safety rules for the classroom and laboratory. Have students and parents/guardians sign a contract agreeing to abide by these rules at all times.
- Provide students with an overview of the equipment, materials, and other resources in the Construction: Carpentry Concentration II lab.
- Discuss workplace skills related to team building. Have students participate in team-building activities and critique their roles and actions within the team.
- Have students create and role-play shop safety scenarios. R1, R2, R3, R4, R5, R6, CS1,CS2,CS3,CS4,CS5 T1,T2,T3,T4,T5,T6

  NOTE: Required written tests will follow each section of guidelines for shop/lab safety rules and procedures.

Suggested Assessment Strategies

- Have students and parents/guardians sign a contract agreeing to school policies and procedures.
- Assess the written report with the **Written Report Rubric** on rules and regulations.
- Assess student orientation knowledge through teacher observations and a written unit test. File the completed test to document student mastery of the school and program policies and procedures.
- Document mastery of safety skills and techniques by administering a written and performance safety test (100% accuracy required) and signed contracts.
- Observe role-playing activity and students' critiques. Continue to observe teamwork throughout the year and critique as needed.

- Have students show mastery of this competency by posting documentation to their Blackboard electronic portfolios.

  NOTE: Students are required to complete the written safety test with 100% accuracy before entering the shop for lab activities. This test will be documented in the student file.

Competency 2: Describe employment opportunities and responsibilities. (DOK 1) [EMP]

Suggested Objectives

a. Describe employment opportunities including potential earnings, employee benefits, job availability, working conditions, and educational requirements.
b. Describe basic employee responsibilities and appropriate work ethics of those working in the construction industry.
c. Classify stages of progress within the carpentry trade.

Suggested Teaching Strategies

- Use the Contren Series Core Text Basic Employability Skills Unit and Carpentry Level I Orientation to the Trade Unit in text and online to define trade terms related to basic employability skills. Discuss the chapter, and perform the related activities to promote awareness of employability skills. Have students use career software and Internet resources to measure their aptitudes and abilities for particular careers. Have students use the Internet to research a list of careers for which they will be qualified upon program completion. Encourage students to use available resources (college catalogs, college Web sites, etc.) to research information about postsecondary educational opportunities. Finally, have students select a career in the field and outline educational and skill requirements, expected job growth, and entry-level salaries. Utilize the Mississippi State University Experts service on the MSU Web site to conduct research on the chosen career. [E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6, W1, W2, W3, W4, W5, CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6]

- Have students use traditional and electronic resources to produce a product of choice that answers the following questions in detail:
  - What should employers expect from employees?
  - What should employees expect from employers?
  - What is an apprenticeship program? What should the trainee expect from the apprenticeship committee?
  - How do productivity, positive attitude, and safety impact the construction site?
  - What would you do if you found that a colleague was abusing drugs and alcohol at work?
- Discuss the parts of a resume, cover letter, and/or job application, and provide each student a written sample. Have each student use the Internet or newspapers to choose a job for which he or she is qualified and prepare a resume and cover letter that can be used to apply for the selected job. Have students upload this information to their Blackboard electronic portfolios. [E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6, W1, W2, W3, W4, W5, CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6]

- Utilize Contren Connect for review and reinforcement.

Suggested Assessment Strategies

- Assessment will be determined by a matching test for definitions and the level of success regarding the Contren activities. Lessons involving writing and math skills will be integrated with the appropriate department.
- Use the **Resume Rubric** and **Cover Letter Rubric** to evaluate the resume and cover letter.

- Use the **Presentation Rubric** to evaluate the presentation.
- Review career software printout to assess student aptitudes and abilities.
- Have students show mastery of this competency by posting documentation to their Blackboard electronic portfolios.

Competency 3: Explore leadership skills and personal development opportunities provided students by student organizations to include SkillsUSA. (DOK 2) [EMP]

Suggested Objectives

a. Demonstrate effective team-building and leadership skills.

Suggested Teaching Strategies

- Have a current or former member discuss the student organization. Have the students brainstorm community service ideas and organize a community service project. Have students research leaders in construction and prepare a written/oral presentation. Include leadership responsibilities, qualities, and so forth. Have students select specific contests in which they want to compete. Throughout the course, have students work toward regional, state, and national competions. [E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6, W1, W2, W3, W4, W5 CS1,CS2,CS3,CS4,CS5 T1,T2,T3,T4,T5,T6]
- Show students a SkillsUSA promotional video. Develop a construction crew for various projects. A crew leader will oversee the projects. [E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6, W1, W2, W3, W4, W5 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6]

Suggested Assessment Strategies

- Use a **Written Report Rubric** and a **Presentation Rubric** to assess the research project. Have students show mastery of this competency by posting documentation to their Blackboard electronic portfolios.

Competency 4: Demonstrate the ability to follow verbal and written instructions and communicate effectively in on-the-job situations. (DOK 2) [COM]

Suggested Objectives

a. Follow basic written and verbal instructions.
b. Effectively communicate in on-the-job situations.

Suggested Teaching Strategies

- Utilize the Contren module on communication skills to present concepts and ideas. Engage students in a game such as Simon Says to introduce the importance of following instructions. Give students a list of simple tasks that require action. Have students complete tasks according to written instructions only. Give students a list of verbal instructions that require action. Have students complete tasks according to verbal instructions only. Have students discuss the pros and cons of trying to follow written and verbal instructions and the importance of following instructions thoroughly. Have students follow the emergency drill procedures. [E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6]
- Guide students in a brainstorming session of different ways people communicate. Divide students into pairs to simulate an interview process. One student would be the potential employer and be supplied with questions generated by the instructor. The other student would be the applicant. The dialogue could be videotaped and shown to the class for discussion about strengths and weaknesses of the communication. [E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6 CS1,CS2,CS3,CS4,CS5]

T2,T3,T4,T5,T6

- Assign students to a group project that requires them to make class presentations in various formats such as Photo Story, PowerPoint, or Movie Maker. Assign different formats to each group, and discuss the strengths and weaknesses of each format after the presentation. E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6, W1, W2, W3, W4, W5 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6
- Utilize Contren Connect for review and reinforcement.

Suggested Assessment Strategies

- Utilize rubrics and checklists for following written and verbal instructions.
- Utilize the **Interview Rubric** for the interview process.
- Utilize the **Presentation Rubric** for group presentations.
- Have students show mastery of this competency by posting documentation to their Blackboard electronic portfolios.

Standards

21st Century Skills Standards

CS1 Flexibility and Adaptability
CS2 Initiative and Self-Direction
CS3 Social and Cross-Cultural Skills
CS4 Productivity and Accountability
CS5 Leadership and Responsibility

ACT College Readiness Standards

E1 Topic Development in Terms of Purpose and Focus
E2 Organization, Unity, and Coherence
E3 Word Choice in Terms of Style, Tone, Clarity, and Economy
E4 Sentence Structure and Formation
E5 Conventions of Usage
E6 Conventions of Punctuation
R1 Main Ideas and Author's Approach
R2 Supporting Details
R3 Sequential, Comparative, and Cause–Effect Relationships
R5 Meaning of Words
R6 Generalizations and Conclusions
W1 Expressing Judgments
W2 Focusing on the Topic
W3 Developing a Position
W4 Organizing Ideas
W5 Using Language

National Industry Standards

EMP - Employability Skills

OTT - Orientation to the Trade

National Educational Technology Standards

T1 Creativity and Innovation
T2 Communication and Collaboration
T3 Research and Information Fluency
T4 Critical Thinking, Problem Solving, and Decision Making
T5 Digital Citizenship
T6 Technology Operations and Concepts

Suggested References

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Suggested Rubrics and Checklists

Cover Letter Rubric

NAME: _____ DATE: _____ PERIOD: _____

	Excellent 4 Points	Proficient 3 Points	Needs Improvement 2 points	Unsatisfactory 1 Point	Score
Layout/Design	Creatively designed, easily read, excellent business letter	Attractive, easy to read, good business letter	Appears busy or boring, difficult to read, needs improvement	Unattractive or inappropriate, very difficult to read, not acceptable	
Information, Style, Audience, and Tone	Accurate and complete information; very well written and presented	Well written and interesting to read	Some information provided but is limited or inaccurate	Poorly written, inaccurate, or incomplete	
Accurate Parts	Complete with all required parts	Some elements missing	Most elements missing or out of place	Proper form for a letter not used	
Grammar, Punctuation, and Wording	Excellent presentation, style, grammar, and punctuation	Fair presentation, style, grammar, and punctuation	Missing information; inaccurate punctuation and/or grammar	Poor grammar, punctuation, and wording	
Following Directions and Guidelines	Always on task; always followed directions	Followed directions with some guidance	Required a good bit of extra guidance	Did not follow directions, and did not ask for extra help	
				Total	

Comments:

Interview Rubric

NAME: DATE: PERIOD:

	Excellent 4 Points	Good 3 Points	Needs Improvement 2 Points	Unacceptable 1 Point	Score
Body language Displays confidence					
Eye contact Maintains good eye contact with interviewer					
Introduction Provides a self-introduction					
Handshakes Extends hand and shakes firmly					
Dress Dressed appropriately for an interview; business attire					
Language Concise and grammatically correct					
Questions Asks appropriate questions; demonstrates a knowledge of the business					
Closure Responds appropriately					
				TOTAL	

Presentation Rubric

NAME: _____ DATE: _____ PERIOD: _____

	Exemplary 4 points	Accomplished 3 points	Developing 2 points	Beginning 1 point	Score
Content	Clear, appropriate, and correct	Mostly clear, appropriate, and correct	Somewhat confusing, incorrect, or flawed	Confusing, incorrect, or flawed	
Clarity	Logical, interesting sequence	Logical sequence	Unclear sequence	No sequence	
Presentation	Clear voice and precise pronunciation	Clear voice and mostly correct pronunciation	Low voice and incorrect pronunciation	Mumbling and incorrect pronunciation	
Visual Aids	Attractive, accurate, and grammatically correct	Adequate, mostly accurate, and few grammatical errors	Poorly planned, somewhat accurate, and some grammatical errors	Weak, inaccurate, and many grammatical errors	
Length	Appropriate length	Slightly too long or short	Moderately too long or short	Extremely too long or short	
Eye Contact	Maintains eye contact, seldom looking at notes	Maintains eye contact most of time but frequently returns to notes	Occasionally uses eye contact but reads most of information	No eye contact because reading information	
				TOTAL	

Comments:

Resume Rubric

NAME: DATE: PERIOD:

	Excellent 25 Points	Well Done 20 Points	Meets Standards 15 Points	Beginning 10 Points	No Evidence 0 Points	Score
Format	Resume contains name, address, objective, education, experience, and references. All words are spelled correctly.	Contains at least six of the criteria and no more than two spelling errors	Contains at least five of the criteria and no more than four spelling errors	Contains minimal information and more than four spelling errors	Assignment not submitted	
Education	Education includes all schools attended, graduation dates, diploma/degree awarded, and major field of study.	Education includes three of the criteria.	Education includes two of the criteria.	Education includes one of the criteria.	Assignment not submitted	
Experience	Experience includes internships, entry-level jobs, and current position.	Experience includes two of the criteria.	Experience includes one of the criteria.	Experience includes current position only.	Assignment not submitted	
Factual	Contains factual names and dates and is believable	Contains fairly believable resume with factual names or dates	Resume has unrealistic dates or names.	Resume is unrealistic and contains conflicting information.	Assignment not submitted	
					TOTAL	

Comments:

Written Report Rubric

NAME: DATE: PERIOD:

	Exemplary 4 Points	Accomplished 3 Points	Developing 2 Points	Beginning 1 Point	Score
Content	Clear thesis and focus that remain apparent	Thesis and focus that remain apparent	Addresses subject matter with minimal support	Does not focus on topic	
Grammar	Correct and effective use of grammar and mechanics	Occasional errors in use of grammar and mechanics	Problems in use of grammar and mechanics	Repeated errors in use of grammar and mechanics	
Organization	Ideas flow smoothly and logically with clarity and coherence.	Logical order and appropriate sequencing of ideas with adequate transition	Some evidence of an organizational plan or strategy	Lacks organization	
				Total	

Comments:

Note: Safety should be integrated throughout the entire Construction: Carpentry Concentration course. Content should not be taught in isolation; rather, it should be taught and reinforced throughout the entire program.

Competency 1: Describe general safety rules for working in a shop/lab and industry. (DOK 1) [SAF]

Suggested Objectives

a. Describe how to avoid on-site accidents.
b. Compare and contrast the relationship between housekeeping and safety.
c. Carry out all safety rules and company safety policies.
d. Summarize the importance of reporting all on-the-job injuries, accidents, and near misses.
e. Review the need for evacuation policies and the importance of following them.
f. Research employer's substances abuse policy and how it relates to safety.

Suggested Teaching Strategies

- Identify, discuss, and demonstrate terms, rules, and procedures related to shop/lab and industry safety. Use the Contren Core Text Basic Safety Unit and Level I Orientation to the Trade Unit and Contren Connect related units as a resource. Terms may include but are not limited to apparatus, arch, arc weld, combustible, competent person, concealed receptacle, confined space, cross-bracing, dross, electrical distribution panel, excavation, extension ladder, flammable, flash, flashback, flash burn, flash goggles, flash point, ground, guarded, hand line, hazard communication standard, lanyard, lock-out/tag-out, management system, material safety data sheet (MSDS), maximum intended load, mid-rail, Occupational Safety and Health Administration (OSHA), permit-required confined space, personal protective equipment, planked, proximity work, qualified person, respirator, scaffold, shoring, signaler, slag, stepladder, straight ladder, switch enclosure, toeboard, top rail, trench, trencher, welding shield, and wind stock (Contren Core Text and online Basic Safety Unit and Level I Orientation to the Trade Unit). Provide the students with a list of terms, and have them define, illustrate, and create an analogy or metaphor for each term. Provide the students with a list of terms, and have them define the terms. Pair the students to quiz each other on the definitions in preparation for a written exam. [E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6]
- Use the guidelines provided for personal safety (i.e., clothing, jewelry, hair, eyes, and ears). Divide the students into pairs, and assign each pair one of the guidelines. Each pair will demonstrate the "do's and don'ts" of the guideline. [E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6]
- Have an industry speaker present to the class the necessity of safety in the work environment. Have students write a summary of the presentation. Divide the students into teams, and have them develop scenarios of hazards and accidents using the Contren Series Core Text and online, Basic Safety Unit, publications, and the Internet. This will include tools; spills; working around welding; improper use of barriers, ladders, or scaffolds; use of material safety data sheet (MSDS) information; fires; and electrical situations. In a game type situation, one team will read a scenario and the other teams will compete to be the first to provide the proper safety measures that should have been used to prevent the hazardous situation or accident. Points will be awarded to the teams with the correct answers. [E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6 CS1,CS2,CS3,CS4,CS5]

T2,T3,T4,T5,T6

- Have students interview their industry mentors, conduct research online, or use traditional classroom resources to research employer substance abuse policies. Have students write a brief outline to explain the process of employer substance abuse policies and consequences of violating the policies. Have students illustrate their outline using word processing or Inspiration software. Have students summarize the importance of following the employee substance abuse policy by creating a podcast. Have students post the podcast to their electronic portfolios.
- Utilize Contren Connect for review and reinforcement.

Suggested Assessment Strategies

- Student participation will be monitored by the teacher, and the written exam will be utilized to test student knowledge.
- The "do's and don'ts" exercise will be critiqued with a peer review.
- The teams will be rewarded according to the points earned from the game. This could be extra points, classroom privileges, and so forth.
- Written exams will be utilized to test student knowledge.
- Use the **Podcast Rubric** to evaluate student podcasts.
- Have students show mastery of this competency by posting documentation to their Blackboard electronic portfolios.

Competency 2: Identify and apply safety around welding operations. (DOK 1) SAF

Suggested Objectives

a. Use proper safety practices when welding or working around welding operations.
b. Use proper safety practices when welding in or near trenches and excavations.
c. Explain the term "proximity work."

Suggested Teaching Strategies

- Show illustrations of injuries caused by failure to observe safety precautions in welding operations. Have a welding professional speak to the class concerning safety. Have students write a brief report on the speaker's message and content. E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6, W1, W2, W3, W4, W5 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6
- Have students observe a welding operation and see the firsthand dangers associated with welding. Model appropriate safety procedures when performing welding operations. Have students use technology to produce a flowchart describing the process of performing a welding operation and the safety precautions that should be taken throughout the process. CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6
- Utilize Contren Connect for review and reinforcement.

Suggested Assessment Strategies

- Assess students' written work with the **Written Report Rubric**.
- Utilize Contren written and performance assessments.
- Have students show mastery of this competency by posting documentation to their Blackboard electronic portfolios.

Competency 3: Explain the appropriate safety precautions to take around common jobsite hazards. (DOK 1) SAF

Suggested Objectives

a. Perform safety requirements for working in confined areas.
b. Explain and practice lock-out/tag-out procedures.
c. Explain the different barriers and barricades and how they are used.

Suggested Teaching Strategies

- Provide color-coded illustrations of common safety barriers and barricades. Have students identify common safety colors to demonstrate awareness of coding. Have students illustrate and write in their own words an explanation about the color-coded illustrations of common safety barriers and barricades. Have students post this to their Blackboard electronic Web sites.[E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6]
- Demonstrate lock-out/tag-out procedures, and provide safety rules related to these procedures. Have students perform lock-out/tag-out on a piece of shop or lab equipment. Have students make a flowchart to show the critical stages of the procedure.[R1, R2, R3, R4, R5, R6 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6]
- Utilize Contren Connect for review and reinforcement.

Suggested Assessment Strategies

- Use the **Lock-out/Tag-out Checklist** to observe student understanding of the procedure.
- Utilize Contren written and performance assessments.
- Have students show mastery of this competency by posting documentation to their Blackboard electronic portfolios.

Competency 4: Demonstrate the appropriate use and care of personal protective equipment (PPE). (DOK 2) [SAF]

Suggested Objectives

a. Identify commonly used PPE items.
b. Understand proper use of PPE.
c. Demonstrate appropriate care for PPE.

Suggested Teaching Strategies

- Have an industry speaker present to the class the necessity of safety in the work environment. Have students take and display a collection of photographs displaying the importance of safety in the workplace. Have students write a descriptive paragraph summarizing the collection of photographs.[E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6, W1, W2, W3, W4, W5 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6]
- Provide examples of damaged or misused safety equipment, and allow students to identify defects. Have students create a poem, song, or rap that includes relevant information about using PPE.[E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6, W1, W2, W3, W4, W5 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6]
- Show students how to appropriately care for PPE. Have students demonstrate appropriate care for PPE.
- Utilize Contren Connect for review and reinforcement.

Suggested Assessment Strategies

- Utilize the established **Written Report Rubric** to evaluate the picture collection and summary.
- Observe student activity to evaluate concept retention.
- Evaluate student presentations according to the **Presentation Rubric**.
- Utilize Contren written and performance assessments.

- Have students show mastery of this competency by posting documentation to their Blackboard electronic portfolios.

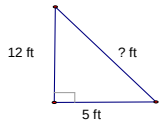
Competency 5: Explain lifting and the use of ladders and scaffolds. (DOK 1) SAF, ALGI4

Suggested Objectives

a. Identify and explain the procedures for lifting heavy objects.
b. Inspect and safely work with various ladders and scaffolds.

Suggested Teaching Strategies

- Have students design posters depicting the correct and incorrect ways to lift. Have students demonstrate safe lifting procedures. E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6, W1, W2, W3, W4, W5 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6
- Discuss ladder safety and OSHA and ANSI requirements related to ladder safety. Have students demonstrate proper ladder usage. E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6
- Have the students solve for the missing side of a right triangle using the Pythagorean theorem. For example, a construction worker needs a ladder to reach the top of a building that is 12 ft high. The ladder will safely rest on the ground 5 ft from the bottom of the building. How long should the worker let out the ladder? M1, M2, M4, M6, M7 CS1,CS2,CS3,CS4,CS5 T1,T2,T3,T4,T5,T6



- Utilize Contren Connect for review and reinforcement.

Suggested Assessment Strategies

- Utilize the **Poster Rubric** for assessing student work.
- Utilize the **Ladder Safety Checklist** to evaluate student performance.
- Utilize an answer key to evaluate the problem-solving situation.
- Utilize Contren written and performance assessments.
- Have students show mastery of this competency by posting documentation to their Blackboard electronic portfolios.

Competency 6: Explain the material safety data sheet (MSDS). (DOK 1) SAF

Suggested Objectives

a. Explain the function of the MSDS.
b. Interpret the requirements of the MSDS.

Suggested Teaching Strategies

- Provide students with examples of MSDS. Explain parts of MSDS. E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6, CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6
- Have students work in groups to locate information from MSDS. E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6, W1, W2, W3, W4, W5 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6
- Utilize Contren Connect for review and reinforcement.

Suggested Assessment Strategies

- Utilize the **Group Work Rubric** for evaluating student work.

- Utilize Contren written and performance assessments.
- Have students show mastery of this competency by posting documentation to their Blackboard electronic portfolios.

Competency 7: Explain fires and safety procedures related to fires. (DOK 1) [SAF]

Suggested Objectives

a. Explain the process by which fires start.
b. Explain fire prevention of various flammable liquids.
c. Explain the classes of fires and the types of extinguishers.

Suggested Teaching Strategies

- Have students illustrate the fire triangle (using Contren text and online, Internet resources, or PowerPoint presentations as a guide.) In the illustration, have students label the different components of the fire triangle and discuss the importance of each component. [R1, R2, R3, R4, R5, R6, W1, W2, W3, W4, W5 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6]
- Provide students with necessary terminology. Terminology may include but is not limited to flash point, fire prevention, fuel, oxygen, heat, flammable, combustibles, Class A, Class B, Class C, Class D, and fire extinguisher. Explain the classes of fires and the applicable fire extinguishers to put out these types of fires. [E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6]
- Bring in a local fire department representative to give a fire safety presentation and lead the class in a discussion about fires. [E1, E2, E3, E4, E5, E6 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6]
- Utilize Contren Connect for review and reinforcement.

Suggested Assessment Strategies

- Check terminology through a matching quiz or other type of objective assessment.
- Use the established **Group/Classroom Discussion Rubric** to evaluate student participation.
- Utilize Contren written and performance assessments. Have students show mastery of this competency by posting documentation to their Blackboard electronic portfolios.

Competency 8: Explain safety in and around electrical situations. (DOK 1) [SAF]

Suggested Objectives

a. Explain injuries that can result when electrical contact occurs.
b. Explain safety around electrical hazards.
c. Explain action to take when an electrical shock occurs.

Suggested Teaching Strategies

- Have students research electrical safety procedures. Have students use a diagram to illustrate the purpose of each safety procedure and the procedure as it relates to a particular electrical safety issue. Invite the physics or technology applications instructor to team teach an electrical safety unit.
- Have students brainstorm potential injuries from electrical shock to check prior knowledge. Use pictures and graphics to illustrate electrical injuries and hazards. [E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6, CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6]
- Utilize Allied Health students or other medical personnel to explain electrical injury first aid. [E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6]
- Provide students with electrical safety guides or checklists. [R1, R2, R3, R4, R5, R6 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6]

Suggested Assessment Strategies

- Use the established **Group/Classroom Discussion Rubric** to evaluate student participation.
- Observe student participation in discussions by outside presenters.
- Utilize Contren written and performance assessments.
- Have students show mastery of this competency by posting documentation to their Blackboard electronic portfolios.

Standards

21st Century Skills Standards

CS1 Flexibility and Adaptability
CS2 Initiative and Self-Direction
CS3 Social and Cross-Cultural Skills
CS4 Productivity and Accountability
CS5 Leadership and Responsibility

MS Academic Standards

ALGI 4 Demonstrate and apply various formulas in problem-solving situations.

ACT College Readiness Standards

E1 Topic Development in Terms of Purpose and Focus
E2 Organization, Unity, and Coherence
E3 Word Choice in Terms of Style, Tone, Clarity, and Economy
E4 Sentence Structure and Formation
E5 Conventions of Usage
E6 Conventions of Punctuation
R1 Main Ideas and Author's Approach
R2 Supporting Details
R3 Sequential, Comparative, and Cause–Effect Relationships
R5 Meaning of Words
R6 Generalizations and Conclusions
W1 Expressing Judgments
W2 Focusing on the Topic
W3 Developing a Position
W4 Organizing Ideas
W5 Using Language

National Industry Standards

SAF - Basic Safety

National Educational Technology Standards

T2 Communication and Collaboration
T3 Research and Information Fluency
T4 Critical Thinking, Problem Solving, and Decision Making
T5 Digital Citizenship
T6 Technology Operations and Concepts

Suggested References

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Goetsch, D. (2000). *The safety and health handbook.* Upper Saddle River, NJ: Pearson Prentice Hall.

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Mississippi Municipal Service Company. (n.d.). *Falls* [Videotape]. (Available from Mississippi Municipal Service Company, P.O. Box 2987, Jackson, MS 39207)

Mississippi Municipal Service Company. (n.d.). *Job safety analysis* [Videotape]. (Available from Mississippi Municipal Service Company, P.O. Box 2987, Jackson, MS 39207)

Mississippi Municipal Service Company. (n.d.). *Ladder safety* [Videotape]. (Available from Mississippi Municipal Service Company, P.O. Box 2987, Jackson, MS 39207)

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Mississippi Municipal Service Company. (n.d.). *Lockout–tagout guarding* [Videotape]. (Available from Mississippi Municipal Service Company, P.O. Box 2987, Jackson, MS 39207)

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National Electrical Contractors Association. (n.d.). Retrieved December 17, 2007, from http://www.necanet.org/

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Rosenberg, P. (2007). *DeWALT® construction safety/OSHA professional reference.* Clifton Park, NY: Delmar Learning.

VanCise, D., & VanCise, M. (2004). *Construction industry guide to OSHA for residential and light commercial construction.* Berne, NY: UHAI.

Suggested Rubrics and Checklists

Group/Classroom Discussion Rubric

NAME: _____ DATE: _____ PERIOD: _____

	Beginning 1 point	Developing 2 points	Accomplished 3 points	Exemplary 4 points	Score
Group Discussions	Rarely contributed to discussions of the group	Contributed good effort to discussions of the group	Contributed great effort to discussions of the group	Contributed exceptional effort to discussions of the group	
On-task Behavior	Exhibited on-task behavior inconsistently	Exhibited on-task behavior some of the time	Exhibited on-task behavior most of the time	Exhibited on-task behavior consistently	
Helping Others	Did not assist other group members	Seldom assisted other group members	Occasionally assisted other group members	Assisted other group members	
Listening	Ignored ideas of group members	Seldom listened to ideas of group members	Occasionally listened to ideas of group members	Always listened to ideas of group members	
				Total	

Comments:

Presentation Rubric

NAME: _____ DATE: _____ PERIOD: _____

	Exemplary 4 points	Accomplished 3 points	Developing 2 points	Beginning 1 point	Score
Content	Clear, appropriate, and correct	Mostly clear, appropriate, and correct	Somewhat confusing, incorrect, or flawed	Confusing, incorrect, or flawed	
Clarity	Logical, interesting sequence	Logical sequence	Unclear sequence	No sequence	
Presentation	Clear voice and precise pronunciation	Clear voice and mostly correct pronunciation	Low voice and incorrect pronunciation	Mumbling and incorrect pronunciation	
Visual Aids	Attractive, accurate, and grammatically correct	Adequate, mostly accurate, and few grammatical errors	Poorly planned, somewhat accurate, and some grammatical errors	Weak, inaccurate, and many grammatical errors	
Length	Appropriate length	Slightly too long or short	Moderately too long or short	Extremely too long or short	
Eye Contact	Maintains eye contact, seldom looking at notes	Maintains eye contact most of time but frequently returns to notes	Occasionally uses eye contact but reads most of information	No eye contact because reading information	
				TOTAL	

Comments:

Group Work Rubric

NAME: DATE: PERIOD:

	Beginning 1 point	Developing 2 points	Accomplished 3 points	Exemplary 4 points	Score
Group Discussions	Rarely contributed to discussions of the group	Contributed good effort to discussions of the group	Contributed great effort to discussions of the group	Contributed exceptional effort to discussions of the group	
On-task Behavior	Exhibited on-task behavior inconsistently	Exhibited on-task behavior some of the time	Exhibited on-task behavior most of the time	Exhibited on-task behavior consistently	
Helping Others	Did not assist other group members	Seldom assisted other group members	Occasionally assisted other group members	Assisted other group members	
Listening	Ignored ideas of group members	Seldom listened to ideas of group members	Occasionally listened to ideas of group members	Always listened to ideas of group members	
				Total	

Comments:

Poster Rubric

NAME: _____ DATE: _____ PERIOD: _____

	Exemplary 4 Points	Accomplished 3 Points	Developing 2 Points	Beginning 1 Point	Score
Required Content	The poster includes all required content elements as well as additional information.	All required content elements are included on the poster.	All but one of the required content elements are included on the poster.	Several required content elements are missing.	
Labels	All items of importance on the poster are clearly labeled with labels that are easy to read.	Almost all items of importance on the poster are clearly labeled with labels that are easy to read.	Many items of importance on the poster are clearly labeled with labels that are easy to read.	Labels are too small to read, or no important items are labeled.	
Attractiveness	The poster is exceptionally attractive in terms of design, layout, and neatness.	The poster is attractive in terms of design, layout, and neatness.	The poster is acceptably attractive though it may be a bit messy.	The poster is distractingly messy or very poorly designed.	
Grammar	There are no grammatical or mechanical mistakes on the poster.	There are one to two grammatical or mechanical mistakes on the poster.	There are three to four grammatical or mechanical mistakes on the poster.	There are more than four grammatical or mechanical mistakes on the poster.	
				Total	

Comments:

Ladder Safety Checklist

NAME: _____ DATE: _____ PERIOD: _____

_____ The ladder has been properly set up and is used in accordance with safety instructions and warnings.

_____ The body is centered on the ladder.

_____ Hold the ladder with one hand while working with the other.

_____ Move materials with extreme caution.

_____ Climb facing the ladder, and maintain a firm grip.

_____ Move one step at a time firmly setting one foot before moving the other.

_____ Haul materials up on a line.

Lock-out/Tag-out Checklist

NAME: _____ DATE: _____ PERIOD: _____

_____1. Identify all sources of electrical energy for the equipment or circuits in question.

_____2. Disable backup energy sources such as generators and batteries.

_____3. Identify all shut-offs for each energy source.

_____4. Notify all personnel that equipment and circuitry must be shut off, locked out, and tagged out. (Simply turning a switch off is NOT enough.)

_____5. Shut off energy sources, and lock switchgear in the **OFF** position. Each worker should apply his or her individual lock. Do not give your key to anyone.

_____6. Test equipment and circuitry to make sure they are de-energized. This must be done by a qualified person.

_____7. Deplete stored energy by bleeding, blocking, grounding, and so forth.

_____8. Apply a tag to alert other workers that an energy source or piece of equipment has been locked out.

_____9. Make sure everyone is safe and accounted for before equipment and circuits are unlocked and turned back on. Note that only a qualified person may determine when it is safe to re-energize circuits.

Source: National Institute for Occupational Safety and Health. (n.d.). Section 7: Safety model stage 3—controlling hazards: Safe work environment. In *Electrical safety: Safety and health for electrical trades student manual*. Retrieved January 10, 2008, from http://www.cdc.gov/niosh/docs/2002-123/2002-123d.html#

Podcast Rubric

When you listen to a podcast, or when you are making your own, think about these qualities of a well-done podcast. (N/A means not applicable—the question cannot be answered, or it does not pertain to the site you are viewing.)

Your name: _____ **Date:** _____

Title of podcast: _____

Feed URL (or URL):_____

Creator of podcast: _____

1. Did the podcast include content that was useful/relevant for your purpose?	YES	NO	N/A
2. Were the technical qualities (audio, slides, etc.) acceptable in the production?	YES	NO	N/A
3. Was a written transcript of the podcast available?	YES	NO	N/A
4. Was the podcast linked from a site that included subject tags?	YES	NO	N/A
5. Was the podcast linked from a site that included links to other resources?	YES	NO	N/A
6. Did the podcast adhere to the copyright guidelines in its use of music, pictures, and so forth?	YES	NO	N/A
7. Was the length of the podcast appropriate for its content (20 min. or less)?	YES	NO	N/A
8. Was the podcast part of a regularly scheduled series?	YES	NO	N/A
9. Did the subjects in the podcast have “personality” to keep you interested?	YES	NO	N/A
10. Did the podcast flow smoothly (introduction, content, and summary)?	YES	NO	N/A
11. Was it obvious how to add the podcast feed to your aggregator (RSS)?	YES	NO	N/A
12. If the item was an enhanced podcast, did the use of slides enhance the content?	YES	NO	N/A
13. If the item was an enhanced podcast, was it available in various file formats to allow viewing on various hardware devices?	YES	NO	N/A
In your own words, describe the podcast you listened to and its attributes.			

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Written Report Rubric

NAME: _____ DATE: _____ PERIOD: _____

	Exemplary 4 Points	Accomplished 3 Points	Developing 2 Points	Beginning 1 Point	Score
Content	Clear thesis and focus that remain apparent	Thesis and focus that remain apparent	Addresses subject matter with minimal support	Does not focus on topic	
Grammar	Correct and effective use of grammar and mechanics	Occasional errors in use of grammar and mechanics	Problems in use of grammar and mechanics	Repeated errors in use of grammar and mechanics	
Organization	Ideas flow smoothly and logically with clarity and coherence.	Logical order and appropriate sequencing of ideas with adequate transition	Some evidence of an organizational plan or strategy	Lacks organization	
				Total	

Comments:

NOTE: Construction Math should be integrated throughout the entire Construction: Carpentry Concentration course. Content should not be taught in isolation; rather, it should be taught and reinforced throughout the entire program.

Competency 1: Apply basic mathematics for carpentry. (DOK 2) MAT PRA2, PRA4, TTA3

Suggested Objectives

a. Solve basic algebraic equations.
b. Calculate area and volume of simple geometric figures.
c. Apply basic math to solve simple geometric figures and problems.

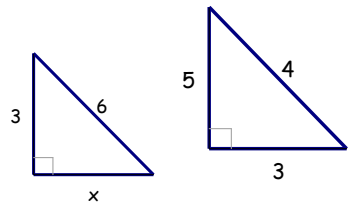
Suggested Teaching Strategies

- Discuss and demonstrate the mathematic applications in carpentry. Use an equation balance applet (found by searching the Internet) to help students understand solving equations. Have students apply the applications in solving real work-related problems using the Contren Carpentry Level I Roof Framing Unit text and online or other materials. M1, M2, M4, M6, M7 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6

- Use Power Solids to help students develop volume formulas, especially for students who have a difficult time memorizing formulas. For example, fill the Power Solid cone with water (or rice) and pour it into the Power Solid cylinder. Repeat this process until the cylinder is full. It will take three times to fill the cylinder because the volume of a cone is one third the volume of a cylinder that has equal radius and height. M1, M2, M4, M6, M7 CS1,CS2,CS3,CS4,CS5 T1,T2,T3,T4,T5,T6

- Have students analyze problems that have been worked to find errors. For example, Bob sets up the following equation to find the value of x: $3^2+6^2=x^2$. Is he correct? Why or why not?

  Is it possible for a right triangle to have the given side lengths? Why or why not? M1, M2, M4, M6, M7 CS1,CS2,CS3,CS4,CS5 T1, T2,T3,T4,T5,T6



- Utilize Contren Connect for review and reinforcement.

Suggested Assessment Strategies

- Assessment of the Power Solid cylinder activity will be teacher observation.
- Equation problems will be assessed with an answer key.
- Assessment of the problems will be Contren examinations and performance examinations.
- Have students show mastery of this competency by posting documentation to their Blackboard electronic portfolios.

Standards

21st Century Skills Standards

CS1 Flexibility and Adaptability
CS2 Initiative and Self-Direction
CS3 Social and Cross-Cultural Skills
CS4 Productivity and Accountability
CS5 Leadership and Responsibility

MS Academic Standards

PRA2 Apply properties to simplify algebraic expressions, solve linear equations, and inequalities and apply principles of graphing.

PRA4 Understand measurable attributes of objects, and apply various formulas in problem-solving situations.

TTA1 Understand relationships between numbers and their properties and perform operations fluently.

ACT College Readiness Standards

E1 Topic Development in Terms of Purpose and Focus
E2 Organization, Unity, and Coherence
E3 Word Choice in Terms of Style, Tone, Clarity, and Economy
E4 Sentence Structure and Formation
E5 Conventions of Usage
E6 Conventions of Punctuation
M1 Basic Operations and Applications
M2 Probability, Statistics, and Data Analysis
M4 Expressions, Equations, and Inequalities
M6 Properties of Plane Figures
M7 Measurement

National Industry Standards

MAT - Introduction to Construction Math

National Educational Technology Standards

T1 Creativity and Innovation
T2 Communication and Collaboration
T3 Research and Information Fluency
T4 Critical Thinking, Problem Solving, and Decision Making
T5 Digital Citizenship
T6 Technology Operations and Concepts

Suggested References

Barrows, R., & Jones, B. (2002). *Fundamentals of math with career applications*. Upper Saddle River, NJ: Pearson Prentice Hall.

Boyce, J., Margolis, L., & Slade, S. (2000). *Mathematics for technical and vocational students*. Upper Saddle River, NJ: Prentice Hall.

Carman, R., & Saunders, H. (2005). *Mathematics for the trades: A guided approach*. Upper Saddle River, NJ: Pearson Prentice Hall.

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Cook, N. (2004). *Mathematics for technical trades.* Upper Saddle River, NJ: Pearson Prentice Hall.

Huth, H., & Huth, M. (2001). *Practical problems in mathematics for carpenters* (7th ed.). Albany, NY: Delmar Learning.

NOTE: Materials Used in Construction should be integrated throughout the entire Construction: Carpentry Concentration course. Content should not be taught in isolation; rather, it should be taught and reinforced throughout the entire program.

Competency 1: Identify, use, and select appropriate wood building materials used in the construction industry. (DOK 3) [BMF]

Suggested Objectives

a. Identify the terms commonly used in discussing wood and lumber.
b. Review building materials discussed in Construction Technology I.
c. Explain how plywood is manufactured, graded, and used.
d. Identify various types of hardwoods and softwoods and the various types of imperfections that are found in the lumber.
e. Identify various types of building panels, and identify their uses.
f. Identify the uses and safety precautions associated with pressure-treated lumber.
g. Describe the proper method of caring for lumber and wood building materials at the jobsite.
h. State the uses of various types of engineered lumber.
i. Calculate the quantities of lumber and building materials using accepted standards. (See local building codes.)

Suggested Teaching Strategies

- Discuss the terms that apply to wood and lumber. Terms may include but are not limited to butt joint, cantilever, catalyst, galvanized, gypsum, header, jambs, japanned, joist, material safety data sheet (MSDS), millwork, nail set, pith, rafter, resins, sheathing, shiplap, sill plate, stringer, tongue-and-groove, and vaulted ceiling. Have students perform tasks related to these terms and take pictures illustrating the term. Have students create a pictorial dictionary that includes a picture and a description of each term. Divide the students into groups to quiz each other on the terms provided. [R1, R2, R3, R4, R5, R6, W1, W2, W3, W4, W5 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6]
- Provide a handout to describe how plywood is manufactured, graded, and used. Perform an activity to show examples of plywood, and have students explain the grading process (Contren Level I Wood Building Materials Fasteners and Adhesives Unit in text and online). Provide students with samples of panels, and have them identify and state their uses. [R1, R2, R3, R4, R5, R6, W1, W2, W3, W4 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6]
- Provide students with an MSDS related to safety precautions dealing with pressure-treated lumber. Have them use the MSDS to identify safety hazards associated with pressure-treated lumber. Demonstrate the proper methods for sorting and stacking building materials. Have students perform the proper methods. [R1, R2, R3, R4, R5, R6, W1, W2, W3, W4, W5 CS1,CS2,CS3,CS4,CS5,T2,T3,T4,T5,T6]
- Provide students with a handout, and have them identify the various types of engineered lumber and their applications (Contren Level I Wood Building Materials Fasteners and Adhesives Unit in text and online). [R1, R2, R3, R4, R5, R6, W1, W2, W3, W4, W5 CS1,CS2,CS3,CS4,CS5 T1,T2,T3,T4,T5,T6]
- Explain the procedures for calculating lumber and building materials for a given job. Provide the students with a scenario, and have them perform the calculation. [M1, M2, M4, M6, M7 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6]

- Schedule an actual or virtual field trip to a lumber company, building supply, or other related industry. Have the students write a journal entry about the field trip.[E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6, W1, W2, W3, W4, W5 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6]
- Utilize Contren Connect for review and reinforcement.

Suggested Assessment Strategies

- Assess term identification with a written quiz.
- Assess student procedures using a **Performance Assessment Rubric**.
- Assess students with an identification answer key.
- Assess the scenario according to the correctness of the calculation.
- Use the **Field Trip Checklist** and **Journal Rubric** to assess the field trip.
- Utilize Contren written and performance assessments.
- Have students show mastery of this competency by posting documentation to their Blackboard electronic portfolios.

Competency 2: Describe, use, and select the appropriate wood building fasteners and adhesives used in the construction industry. (DOK 3) [BMF]

Suggested Objectives

a. List the basic types of screws and their uses.
b. Identify the different types of anchors and their uses.
c. Describe the common types of adhesives used in construction work, and explain their uses.

Suggested Teaching Strategies

- Using the Contren Level I Wood Building Materials Fasteners and Adhesives Unit in text and online, discuss the various fasteners and adhesives, and have students perform the appropriate activities identifying the various fasteners and adhesives.[R1, R2, R3, R4, R5, R6, W1, W2, W3, W4, W5 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6]
- Have students compare and contrast different wood building fasteners and adhesives and list specific situations or scenarios in which the specific fasteners and adhesives could be used.
- Have students create a pictorial directory describing the names, types, and uses of different fasteners and adhesives. The pictorial directory can be created using a digital camera or a poster board and real nails that have been glued or taped to the poster board. The director should include the following:

  <u>Nails</u>
  - Common nails
  - Box nails
  - Finish nails
  - Casting nails
  - Duplex or scaffold (doublehead) nails
  - T-nails
  - Drywall (ratchet) nails
  - Cut nails
  - Masonry nails
  - Common roofing nails
  - Roofing panel nails

  <u>Staples</u>

- Chisel
- Crosscut chisel
- Outside chisel
- Inside chisel
- Spears
- Divergent
- Outside chisel divergent

Screws

- Wood screws
- Sheet metal screws
- Drywall screws
- Lag screws
- Machine screws
- Bolts

Anchors

- Masonry anchors
  - Wedge
  - Sleeve
  - Stud
  - Double expansion
  - Nail anchor
  - Drop-in anchor
  - Anchor bolt
- Hollow-wall /Anchor

Adhesives

- Toggle bolt
- Auger
- Plastic toggle
- Plastic insert
- Fiber insert

Glues

- Animal or hide glue
- Polyvinyl or white glue
- Casein glue
- Urea formaldehyde or plastic resin glue
- Resorcinol resin or waterproof glue
- Contact cement

Construction Adhesives

- Construction adhesives
- Neoprene adhesive
- Contact cement
- Drywall adhesive
- Instant-bond glue
- Epoxies

- Give students different scenarios related to fasteners and adhesives. Have students select the most appropriate fastener or adhesive for the given scenario. Have students document mastery

of this knowledge and post that documentation to their Blackboard electronic portfolios.
- Utilize Contren Connect for review and reinforcement.

Suggested Assessment Strategies

- Evaluate pictorial director for accuracy and neatness.
- Assess according to the materials provided in the Contren materials.
- Have students show mastery of this competency by posting documentation to their Blackboard electronic portfolios.

Standards

21st Century Skills Standards

CS1 Flexibility and Adaptability
CS2 Initiative and Self-Direction
CS3 Social and Cross-Cultural Skills
CS4 Productivity and Accountability
CS5 Leadership and Responsibility

ACT College Readiness Standards

R1 Main Ideas and Author's Approach
R2 Supporting Details
R3 Sequential, Comparative, and Cause–Effect Relationships
R5 Meaning of Words
R6 Generalizations and Conclusions
W1 Expressing Judgments
W2 Focusing on the Topic
W3 Developing a Position
W4 Organizing Ideas
W5 Using Language

National Industry Standards

BMF - Building Materials, Fasteners, and Adhesives

National Educational Technology Standards

T1 Creativity and Innovation
T2 Communication and Collaboration
T3 Research and Information Fluency
T4 Critical Thinking, Problem Solving, and Decision Making
T5 Digital Citizenship
T6 Technology Operations and Concepts

Suggested References

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Pratt, D. (2006). *Estimation for residential construction.* Clifton Park, NY: Delmar Learning.

Smith, H. (2008). *Modern carpentry*. Tinely Park, IL: Goodheart-Willcox.

Spence, W. P. (2007). *Construction materials, methods, and techniques.* Albany, NY: Delmar.

Taunton Press. (n.d.). *Fine homebuilding*. Retrieved August 10, 2006, from http://www.taunton.com/finehomebuilding/

Toenjes, L. P. (2000). *Building trades estimating.* Homewood, IL: American Technical.

Toenjes, L. P. (2006). *Building trades dictionary.* Homewood, IL: American Technical.

Vogt, F. (2003). *Residential construction academy: Carpentry.* Clifton Park, NY: Delmar Learning.

Suggested Rubrics and Checklists

Performance Assessment Rubric

Student's Name _____

Date_____

Task to Be Performed_____

	Possible Points	Points Awarded
Safety Personal safety (glasses, clothing, etc.) Safe use of tool Safely perform the task	25	
Performance of the Task **Insert specific procedures for each performance activity.** Follow the task instructions Perform the task efficiently Perform the task satisfactorily	50	
Lab Maintenance Area cleanup (clean and tidy) Area organization (before, during, and after the task)	25	
Total	100	

Comments for deductions:

Instructor's Signature_____

Journal Rubric

NAME: DATE: PERIOD:

CATEGORY	Excellent 4	Very Good 3	Satisfactory 2	Needs Work 1	Score
Writing Quality	There is a strong writing style and ability to express concepts learned. Excellent spelling, grammar, syntax, spelling, etc.	There is a good writing style and ability to express concepts learned. Very good grammar, syntax, spelling, etc.	There is a writing style that conveys meaning adequately. Some minor grammatical, syntax, and spelling errors	There is difficulty in expressing concepts. There is limited syntax. There are noticeable grammatical and spelling mistakes.	
Content	Clear and complete description of the activity is recorded. All major points are documented.	Very good description of the activity is recorded. Most major points are documented.	Good description of the activity is recorded. Some major points have been omitted.	Limited description of the activity is recorded. Very few major points are documented.	
Insight and Understanding	Definite insights into the implications of the activity are recorded. Awareness of complexity of issues and situations is present.	Some insight into the issue or situation is recorded. Some sense of complexity is present.	Insight is present from a more simplistic standpoint.	Only limited insight into the issue or situation is recorded.	
Application	Content of the activity is connected to the student's personal life and goals.	Content of the activity is connected to the field of construction.	Content of the activity is related to life in general.	Only limited connections are made between the content of the activity and the surrounding world.	
				Total	

Comments:

Competency 1: Identify, plan, and construct types of footing and foundations used in carpentry. (DOK 3)
ICR

Suggested Objectives

a. Set up a level or transit for determining grade or elevation prior to digging a foundation.
b. Calculate the amount of materials needed for a given foundation, including forms, concrete, moisture barrier, and reinforcement materials.
c. Set up batter boards to proper elevation.
d. Explain how building lines are established using batter boards.
e. Identify different types of concrete structures that require the construction of edge forms:
   - Slabs with or without a foundation
   - Parking lots
   - Driveways and streets
   - Sidewalks
   - Approaches
f. Demonstrate the ability to construct and dissemble edge forms for the following:
   - A slab-on-grade with the existing foundation
   - A slab-on-grade with an integral foundation
g. Explain the purpose of a screed, and identify the different types of screeds.
h. Demonstrate the ability to set screeds on grade.

Suggested Teaching Strategies

- Determine student prior knowledge through circle maps or direct questioning concerning foundations. Have students define and illustrate terms related to footing and/or foundations. Terms may include but are not limited to bulkhead, concrete form, construction joint, cross slope, flatwork, footing, foundation, frost line, monolithic clap (monolithic pour), pier, piles, plyform, screed, screeding, slab, slab-on-grade (slab-at-grade), subgrade, and walers.[E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6]

- Provide visual examples of foundation types (e.g., Internet, magazines, or photographs). Utilize construction drawings to illustrate foundation types. Provide students with a list of terms, types, and definitions relating to foundations. The students should be able to apply the terms by labeling and/or defining parts of a given foundation.[E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6, W1, W2, W3, W4, W5 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6]

- Have students brainstorm ideas of possible effects of poor foundations. Ask questions such as the following:
  - What effect does weak or unstable soil have on the foundation?
  - How does climate affect the foundation design?
  - Why do foundation building codes vary in different parts of the country?[E1, E2, E3, E4, E5, E6 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6]

- Demonstrate the proper setup and use of a builder's level or transit in the shop/lab or mock building site. Allow each student to practice setting up the transit with instructors' supervision in the shop/lab or mock building site.[E1, E2, E3, E4, E5, E6 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6]
- Discuss the process for preparing a footing and/or foundation. Have the students calculate the materials to complete the process for preparing a given foundation.[E1, E2, E3, E4, E5, E6, M1, M2, M4, M6, M7]

CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6

- Discuss the placement and installation of batter boards. Have students participate in the setup demonstration in a mock building site. Divide the students into groups, and have them set up batter boards according to given specifications in a mock building site. E1, E2, E3, E4, E5, E6, R1 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6

- Utilize Contren Connect for review and reinforcement.

Suggested Assessment Strategies

- Quiz students' understanding of terms.
- Assess the labeling activity with a definition checklist.
- The brainstorming activity will be assessed through teacher observation.
- Engage in dialogue with individual students as they set up the transit, and assess through teacher observation.
- The calculation activity will be assessed according to the correct calculation process.
- The demonstration will be assessed according to teacher observation.
- The setup of the batter board will be assessed according to a performance evaluation.
- Utilize Contren written and performance assessments.
- Have students show mastery of this competency by posting documentation to their Blackboard electronic portfolios.

Competency 2: Identify floor systems. (DOK 2) FSY, TTA3, TTA4

Suggested Objectives

a. Identify the different types of framing systems.
b. Describe floor system requirements from drawings and specifications.
c. Identify floor and sill framing support members.
d. Describe the methods used to fasten sills and floor framing systems to the foundation.
e. Select the correct girder/beam size using specific floor load and span data.
f. Describe different types of floor joists.
g. Identify different types of bridging.
h. Describe and explain different types of sub-flooring materials.
i. Estimate the amount of material needed to frame a floor assembly.

Suggested Teaching Strategies

- Using classroom lecture, inform students of the different types of floor framing systems (Contren Level 1 Floor Systems Unit in text and online). Allow students to research the history of different framing methods and report on strengths and weaknesses of each. Have students develop a timeline that illustrates the different history component. E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6, W1, W2, W3, W4, W5 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6

- Utilize construction videos to demonstrate floor framing techniques. Provide a span table to illustrate requirements for a floor system. Have students determine lumber size for a given spacing and span. R1, R2, R3, R4, R5, R6, M1, M2, M4, M6, M7 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6
- Describe the various floor and sill framing support members. Identify different methods used to fasten sills to a foundation. Demonstrate different methods used to fasten sills to a foundation. Have the students match the appropriate fasteners for floor framing with their purpose. E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6

- Have students select the correct girder/beam and joist size from a given blueprint and/or table (Contren Level 1 Floor Systems Unit in text and online). Have the students identify the different

types of floor joists and bridging by labeling a drawing. Demonstrate the installation of floor joists and bridging.[E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6]

- Have students identify sub-floor materials. Demonstrate installation of sub-floor materials.[E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6, CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6]
- Have the students estimate the materials needed for a floor assembly according to specifications provided.[M1, M2, M4, M6, M7 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6]
- Utilize Contren Connect for review and reinforcement.

Suggested Assessment Strategies

- Assess any reports using an established **Written Report Rubric**.
- Assess student understanding of interpreting tables by ensuring proper selection of materials using an answer key.
- Use a matching quiz to allow students to demonstrate understanding of appropriate fasteners.
- Labeling activities are to be assessed by using an answer key for the worksheet.
- Utilize Contren written and performance assessments.
- Estimates will be assessed using an answer key.
- Have students show mastery of this competency by posting documentation to their Blackboard electronic portfolios.

Competency 3: Plan and construct floor systems. (DOK 3) [FSY, TTA3, TTA4]

Suggested Objectives

a. Plan a floor system for construction to include a comprehensive material list and detailed plan of a floor system to scale.
b. Construct a floor system for a detailed plan.

Suggested Teaching Strategies

- Divide the students into groups. Explain the proper method of developing a material list. Provide an example material list for students to utilize. Have groups create a comprehensive material list for the plan created. Give students predetermined parameters, and have them draw a plan to scale.[R1, R2, R3, R4, R5, R6, W1, W2, W3, W4, W5 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6]
- Have groups construct an actual floor system based on a plan. Have students peer evaluate the work throughout the process. Have students document mastery of planning and constructing a floor system by posting documentation to their Blackboard electronic portfolios.[R1, R2, R3, R4, R5, R6, W1, W2, W3, W4, W5, CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6]
- Utilize Contren Connect for review and reinforcement.

Suggested Assessment Strategies

- The project will be assessed by teacher observation, a material list answer key, and comparison of the plan to an answer key.
- The construction project will be assessed with a **Performance Assessment Rubric**.
- Utilize Contren written and performance assessments.
- Have students show mastery of this competency by posting documentation to their Blackboard electronic portfolios.

Standards

21st Century Skills Standards

CS1 Flexibility and Adaptability
CS2 Initiative and Self-Direction
CS3 Social and Cross-Cultural Skills
CS4 Productivity and Accountability
CS5 Leadership and Responsibility

MS Academic Standards

TTA3 Understand geometric principles of polygons, angles, and figures.
TTA4 Demonstrate and apply various formulas in problem-solving situations.

ACT College Readiness Standards

E1 Topic Development in Terms of Purpose and Focus
E2 Organization, Unity, and Coherence
E3 Word Choice in Terms of Style, Tone, Clarity, and Economy
E4 Sentence Structure and Formation
E5 Conventions of Usage
E6 Conventions of Punctuation
M1 Basic Operations and Applications
M2 Probability, Statistics, and Data Analysis
M4 Expressions, Equations, and Inequalities
M6 Properties of Plane Figures
M7 Measurement
R1 Main Ideas and Author's Approach
R2 Supporting Details
R3 Sequential, Comparative, and Cause–Effect Relationships
R5 Meaning of Words
R6 Generalizations and Conclusions
W1 Expressing Judgments
W2 Focusing on the Topic
W3 Developing a Position
W4 Organizing Ideas
W5 Using Language

National Industry Standards

ICR - Introduction to Concrete, Reinforcing Materials, and Forms
FSY - Floor Systems

National Educational Technology Standards

T2 Communication and Collaboration
T3 Research and Information Fluency
T4 Critical Thinking, Problem Solving, and Decision Making
T5 Digital Citizenship
T6 Technology Operations and Concepts

Suggested References

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Vogt, F. (2003). *Residential construction academy: Carpentry.* Clifton Park, NY: Delmar Learning.

Suggested Rubrics and Checklists

Written Report Rubric

NAME: DATE: PERIOD:

	Exemplary 4 Points	Accomplished 3 Points	Developing 2 Points	Beginning 1 Point	Score
Content	Clear thesis and focus that remain apparent	Thesis and focus that remain apparent	Addresses subject matter with minimal support	Does not focus on topic	
Grammar	Correct and effective use of grammar and mechanics	Occasional errors in use of grammar and mechanics	Problems in use of grammar and mechanics	Repeated errors in use of grammar and mechanics	
Organization	Ideas flow smoothly and logically with clarity and coherence.	Logical order and appropriate sequencing of ideas with adequate transition	Some evidence of an organizational plan or strategy	Lacks organization	
				Total	

Comments:

Performance Assessment Rubric

Student's Name _____

Date_____

Task to Be Performed_____

	Possible Points	Points Awarded
Safety Personal safety (glasses, clothing, etc.) Safe use of tool Safely perform the task	25	
Performance of the Task **Insert specific procedures for each performance activity.** Follow the task instructions Perform the task efficiently Perform the task satisfactorily	50	
Lab Maintenance Area cleanup (clean and tidy) Area organization (before, during, and after the task)	25	
Total	100	

Comments for deductions:

Instructor's Signature_____

Competency 1: Research, lay out, and construct wall framing. (DOK 3) WCF, TTA3, TTA4

Suggested Objectives

a. Describe the different components of a wall layout.
b. Explain the procedures for layout and assembly of interior and exterior wall frames (laying out a wood frame wall, including plates, corner posts, door and window openings, partition T's, bracing, and firestops).
c. Perform the proper procedure for assembling and erecting an exterior wall.
d. Classify the appropriate materials and methods used for installing sheathing on walls.
e. Perform layout and assembly of a given size wall.
f. Calculate framing and sheathing materials needed for a wall assembly.

Suggested Teaching Strategies

- Have students identify the tools, materials, components, and terms related to wall layout. Demonstrate the procedures for laying out a wood frame wall, including plates, corner posts, door and window openings, partition T's, bracing, and fire stops. Use wall framing video to illustrate the proper procedures. Have students complete an exercise to determine door and window rough opening sizes from a blueprint schedule. E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6, M1, M2, M4, M6, M7 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6
- Demonstrate procedures for assembling and erecting an exterior wall. Describe the common materials and methods used for installing sheathing on walls. Demonstrate how to lay out, assemble, erect, and brace exterior walls for a frame building. Divide students into groups, and have the students lay out and assemble a wall according to specifications provided. E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6, CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6
- Have students estimate the materials required to frame walls as an individual exercise. M1, M2, M4, M6, M7 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6
- Utilize Contren Connect for review and reinforcement.

Suggested Assessment Strategies

- The door and window exercise will be assessed by instructor evaluation of the worksheet.
- The layout and assemble exercise will be assessed according to a performance evaluation.
- The estimation exercise will be assessed as correctly performed according to an answer key.
- Utilize Contren written and performance assessments.
- Have students show mastery of this competency by posting documentation to their Blackboard electronic portfolios.

Competency 2: Lay out and construct ceiling framing. (DOK 3) WCF, TTA3, TTA4

Suggested Objectives

a. Identify and describe the components needed to estimate and assemble a ceiling layout.
b. Construct a ceiling frame according to specified instructions or plans.

Suggested Teaching Strategies

- Discuss and have students identify tools and materials and terms related to labeling the components of a ceiling layout from a blank ceiling frame worksheet. Estimate the materials

required to frame ceilings.[E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6, W1, W2, W3, W4, W5, M1, M2, M4, M6, M7 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6]

- Demonstrate and have students perform the procedures for laying out a ceiling. Discuss the procedures for cutting and installing ceiling joists on a wood frame building. Have students utilize the procedures to cut and construct ceiling framing.[E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6, CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6]
- Utilize Contren Connect for review and reinforcement.

Suggested Assessment Strategies

- The labeling and estimating activities will be assessed with the corresponding answer key.
- The ceiling layout framing will be assessed using a performance evaluation.
- Utilize the Contren written and performance assessments for the unit.
- Have students show mastery of this competency by posting documentation to their Blackboard electronic portfolios.

Competency 3: Describe principles of roof framing. (DOK 2) [RFR, TTA3]

Suggested Objectives

a. Define roof framing members and terms.
b. Identify the basic roof styles.
c. Discuss methods used to calculate the length of a rafter.
d. Identify types of roof trusses.
e. Calculate the length of a rafter for a given size roof.
f. Identify various types of sheathing used in roof construction.
g Estimate materials needed to frame and sheathe a given size roof.
h. Frame a gable roof.
i. Sheathe and apply roofing felt on a gable roof.

Suggested Teaching Strategies

- Describe the various roof framing members and terms. Using handouts and/or text/online resources (Contren Level I Roof Framing Unit in text and online), describe the basic roof styles. Take students on a field trip or virtual field trip to see various roof styles.[E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6, CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6]
- Using text/online resources (Contren Level I Roof Framing Unit in text and online), an overhead projector, or handouts, describe the different types of roof trusses. Develop academic integration utilizing the geometry class to explain the mathematics involved in roof framing. Instruct the students on how to calculate the length of a rafter on a given size roof using a framing square or speed square. Students will perform calculations using provided specifications to calculate rafter lengths.[M1, M2, M4, M6, M7 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6]
- Display the various types of roof sheathing by using small pieces of sheathing as examples. Using the marker board, instruct students how to calculate materials needed to frame and sheathe a given size roof. Students will calculate the materials from given specifications.[W1, W2, W3, W4, W5, M1, M2, M4, M6, M7 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6]
- Demonstrate how to frame a gable roof properly by using a small scale roof in the lab or by using a small building. Demonstrate how to install sheathing properly on a given size gable roof. Students will be divided into groups and will perform the proper procedures for framing and sheathing a gable roof.[E1, E2, E3, E4, E5, E6 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6]
- Utilize Contren Connect for review and reinforcement.

Suggested Assessment Strategies

- Terms and styles activities will be assessed by the **Teacher Observation Rubric** and **Field Trip Checklist**.
- The specifications calculation activity will be assessed by checking the correct calculations.
- The material calculations will be assessed using an answer key.
- The framing and sheathing exercise will be assessed by the **Performance Assessment Rubric**.
- Have students show mastery of this competency by posting documentation to their Blackboard electronic portfolios.

Standards

21st Century Skills Standards

CS1 Flexibility and Adaptability
CS2 Initiative and Self-Direction
CS3 Social and Cross-Cultural Skills
CS4 Productivity and Accountability
CS5 Leadership and Responsibility

MS Academic Standards

TTA3 Understand geometric principles of polygons, angles, and figures.
TTA4 Demonstrate and apply various formulas in problem-solving situations.

ACT College Readiness Standards

E1 Topic Development in Terms of Purpose and Focus
E2 Organization, Unity, and Coherence
E3 Word Choice in Terms of Style, Tone, Clarity, and Economy
E4 Sentence Structure and Formation
E5 Conventions of Usage
E6 Conventions of Punctuation
M1 Basic Operations and Applications
M2 Probability, Statistics, and Data Analysis
M4 Expressions, Equations, and Inequalities
M6 Properties of Plane Figures
M7 Measurement
R1 Main Ideas and Author's Approach
R2 Supporting Details
R3 Sequential, Comparative, and Cause–Effect Relationships
R5 Meaning of Words
R6 Generalizations and Conclusions
W1 Expressing Judgments
W2 Focusing on the Topic
W3 Developing a Position
W4 Organizing Ideas
W5 Using Language

National Industry Standards

WCF - Wall and Ceiling Framing

RFR - Roof Framing

National Educational Technology Standards

T2 Communication and Collaboration
T3 Research and Information Fluency
T4 Critical Thinking, Problem Solving, and Decision Making

T5 Digital Citizenship
T6 Technology Operations and Concepts

Suggested References

Contren Connect. (n.d.). Retrieved January 14, 2008, from http://www.contrenconnect.com/

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Toenjes, L. P. (2000). *Building trades estimating.* Homewood, IL: American Technical.

Suggested Rubrics and Checklists

Performance Assessment Rubric

Student's Name _____

Date_____

Task to Be Performed_____

	Possible Points	Points Awarded
Safety Personal safety (glasses, clothing, etc.) Safe use of tool Safely perform the task	25	
Performance of the Task **Insert specific procedures for each performance activity.** Follow the task instructions Perform the task efficiently Perform the task satisfactorily	50	
Lab Maintenance Area cleanup (clean and tidy) Area organization (before, during, and after the task)	25	
Total	100	

Comments for deductions:

Instructor's Signature_____

Competency 1: Install windows and doors. (DOK 3) [WED]

Suggested Objectives

a. Describe the various types of windows commonly used in construction.
b. List the parts of a window.
c. State requirements for proper window installation.
d. Install a pre-hung window.
e. Identify various types of doors commonly used in construction.
f. Identify the parts of door construction.
g. Identify types of thresholds used with exterior doors.
h. Install pre-hung doors.
i. Identify and install various types of locksets used on doors.

Suggested Teaching Strategies

- Using text resources (Contren Level I Windows and Exterior Doors Unit in text and online) and/or an overhead projector and/or PowerPoint slides, describe the various types of windows used in construction. Describe the parts of a window. Have students label the parts of the various types of windows. Discuss the requirements for proper window installation. Demonstrate how to install a pre-hung window properly. Gather manufacturers' catalogs or photographs of local buildings containing examples of different types of windows and present them to the class. Have students install a pre-hung window.[E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6, W1, W2, W3, W4, W5 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6]

- Using text resources (Contren Level I Windows and Exterior Doors Unit in text and online) and/or an overhead projector and/or PowerPoint slides, describe the various types of interior and exterior doors used in construction. Discuss the requirements for proper door installation. Demonstrate how to install a pre-hung door properly. Have students install a pre-hung door.[E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6, W1, W2, W3, W4, W5, CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6]

- Have each student research various types of locksets. Have students demonstrate the use and purpose for these locks in an oral presentation.[E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6]

- Utilize Contren Connect for review and reinforcement.

Suggested Assessment Strategies

- The labeling exercise will be assessed using a correctly labeled drawing.
- Installation of pre-hung windows will be assessed using the performance evaluation.
- Installation of windows and pre-hung doors will be assessed with the performance evaluation.
- Evaluate the oral presentation with a rubric, including content and organization.
- Utilize Contren written and performance assessments.
- Have students show mastery of this competency by posting documentation to their Blackboard electronic portfolios.

Competency 2: Identify the types and parts of stairs. (DOK 1) [BSL]

Suggested Objectives

a. Classify stairs according to the type such as open, closed, winding, geometrical, and spiral.
b. Recognize common stair components such as tread, riser, stringer, skirt-board, and cleats.

Suggested Teaching Strategies

- Brainstorm and discuss types and parts of a stairwell. Allow students to attempt to identify the different types and parts of stairs according to their previous knowledge. Explain the proper terminology for stair styles and parts. Have students develop a poster illustrating different styles and parts of stairs. E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6, W1, W2, W3, W4, W5, CS1,CS2,CS3,CS4,CS5 T1,T2,T3,T4,T5,T6
- Utilize Contren Connect for review and reinforcement.

Suggested Assessment Strategies

- Use the established **Poster Rubric** for evaluation of student knowledge of stair styles and parts.
- Utilize Contren written and performance assessments.
- Have students show mastery of this competency by posting documentation to their Blackboard electronic portfolios.

Competency 3: Measure and calculate the rise, run, and stairwell openings. (DOK 2) BSL, TTA2

Suggested Objectives

a. Explain rise and run in relation to a given platform height.
b. Define rules for determining the rise and run for a given set of stairs.
c. Determine the number of treads and risers for a given platform height.
d. Identify codes and standards for determining rise, run, and stairwell openings.

Suggested Teaching Strategies

- Utilize stair construction videos for explanation of rise and run. Sketch illustrations on white board or handouts for students to see examples of rise and run. Bring in an advisory committee member skilled in the trade area to provide explanation of stair construction. E1, E2, E3, E4, E5, E6 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6
- Explain the use of a construction calculator in determining rise and run of stairs. Provide students with an exercise to determine total treads needed for a given overall rise and run. Have student groups research the Internet, code books, and texts for standards and codes related to stair construction. Students will report findings to the class and how these findings would affect the construction process. E1, E2, E3, E4, E5, E6, R1, R2, R3, R4, R5, R6, W1, W2, W3, W4, W5, M1, M2, M4, M6, M7 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6
- Utilize Contren Connect for review and reinforcement.

Suggested Assessment Strategies

- Use the **Guest Speaker Form** to assess the presentation.
- Assess student understanding of the construction calculator through teacher observation.
- Assess student activities with an exercise answer key.
- Use the **Group Report Rubric** to assess group presentations.
- Utilize Contren written and performance assessments.

Competency 4: Lay out and cut stair stringers. (DOK 3) BSL, TTA3

Suggested Objectives

a. Demonstrate ability in selecting appropriate material for stair stringers.
b. Understand and be familiar with the use of the framing square and stair gauges in marking stringer cuts.
c. Demonstrate ability in marking a stair stringer accurately.
d. Demonstrate ability to cut a stair stringer accurately.

Suggested Teaching Strategies

- Have student groups contact a local building supply to ask questions about appropriate lumber sizes for stair stringers.[E1, E2, E3, E4, E5, E6 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6]
- Demonstrate the use of a framing square by utilizing stair gauges to mark a stair stringer according to accepted practice. Assist students to set stair gauges and make practice marks on a stair stringer. Provide an opportunity for each student to lay out and cut a sample stair stringer to a specified rise and run.[R1, R2, R3, R4, R5, R6, M1, M2, M4, M6, M7 CS1,CS2,CS3,CS4,CS5 T2,T3,T4,T5,T6]
- Utilize Contren Connect for review and reinforcement.

Suggested Assessment Strategies

- The building supply activity will be evaluated by the **Group Work Rubric**.
- The teacher will observe students as they perform practice.
- Students' layout and cuts will be evaluated according to an established performance assessment.
- Utilize Contren written and performance assessments.
- Have students show mastery of this competency by posting documentation to their Blackboard electronic portfolios.

Standards

21st Century Skills Standards

CS1 Flexibility and Adaptability
CS2 Initiative and Self-Direction
CS3 Social and Cross-Cultural Skills
CS4 Productivity and Accountability
CS5 Leadership and Responsibility

MS Academic Standards

TTA2 Understand, represent, and analyze patterns, relations, and functions.
TTA3 Understand geometric principles of polygons, angles, and figures.

ACT College Readiness Standards

E1 Topic Development in Terms of Purpose and Focus
E2 Organization, Unity, and Coherence
E3 Word Choice in Terms of Style, Tone, Clarity, and Economy
E4 Sentence Structure and Formation
E5 Conventions of Usage
E6 Conventions of Punctuation
M1 Basic Operations and Applications
M2 Probability, Statistics, and Data Analysis
M4 Expressions, Equations, and Inequalities
M6 Properties of Plane Figures
M7 Measurement
R1 Main Ideas and Author's Approach
R2 Supporting Details
R3 Sequential, Comparative, and Cause–Effect Relationships
R5 Meaning of Words
R6 Generalizations and Conclusions
W1 Expressing Judgments
W2 Focusing on the Topic
W3 Developing a Position
W4 Organizing Ideas
W5 Using Language

National Industry Standards

WED - Windows and Exterior Doors
BSL - Basic Stair Layout

National Educational Technology Standards

T1 Creativity and Innovation
T2 Communication and Collaboration
T3 Research and Information Fluency
T4 Critical Thinking, Problem Solving, and Decision Making
T5 Digital Citizenship

T6 Technology Operations and Concepts

Suggested References

Contren Connect. (n.d.). Retrieved January 14, 2008, from http://www.contrenconnect.com/

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Vogt, F. (2003). *Residential construction academy: Carpentry.* Clifton Park, NY: Delmar Learning.

Suggested Rubrics and Checklists

Group Work Rubric

NAME: DATE: PERIOD:

	Beginning 1 point	Developing 2 points	Accomplished 3 points	Exemplary 4 points	Score
Group Discussions	Rarely contributed to discussions of the group	Contributed good effort to discussions of the group	Contributed great effort to discussions of the group	Contributed exceptional effort to discussions of the group	
On-task Behavior	Exhibited on-task behavior inconsistently	Exhibited on-task behavior some of the time	Exhibited on-task behavior most of the time	Exhibited on-task behavior consistently	
Helping Others	Did not assist other group members	Seldom assisted other group members	Occasionally assisted other group members	Assisted other group members	
Listening	Ignored ideas of group members	Seldom listened to ideas of group members	Occasionally listened to ideas of group members	Always listened to ideas of group members	
				Total	

Comments:

Poster Rubric

NAME: _____ DATE: _____ PERIOD: _____

	Exemplary 4 Points	Accomplished 3 Points	Developing 2 Points	Beginning 1 Point	Score
Required Content	The poster includes all required content elements as well as additional information.	All required content elements are included on the poster.	All but one of the required content elements are included on the poster.	Several required content elements are missing.	
Labels	All items of importance on the poster are clearly labeled with labels that are easy to read.	Almost all items of importance on the poster are clearly labeled with labels that are easy to read.	Many items of importance on the poster are clearly labeled with labels that are easy to read.	Labels are too small to read, or no important items are labeled.	
Attractiveness	The poster is exceptionally attractive in terms of design, layout, and neatness.	The poster is attractive in terms of design, layout, and neatness.	The poster is acceptably attractive though it may be a bit messy.	The poster is distractingly messy or very poorly designed.	
Grammar	There are no grammatical or mechanical mistakes on the poster.	There are one to two grammatical or mechanical mistakes on the poster.	There are three to four grammatical or mechanical mistakes on the poster.	There are more than four grammatical or mechanical mistakes on the poster.	
				Total	

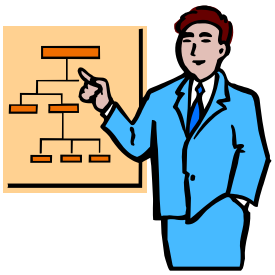
Comments:

Guest Speaker Form

Student's Name: _____

Date: _____

Name of Speaker: _____



1. List five main ideas expressed in the presentation.

   1. _____
   2. _____
   3. _____
   4. _____
   5. _____

2. Write a brief summary relating the topics of the presentation to your life.

_____
_____
_____
_____
_____
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_____
_____

Student Competency Profile
Construction: Carpentry Concentration

Student's Name: _____

This record is intended to serve as a method of noting student achievement of the competencies in each unit. It can be duplicated for each student and can serve as a cumulative record of competencies achieved in the course.

In the blank before each competency, place the date on which the student mastered the competency.

Unit 1: Introduction and Orientation

_____ 1 Describe local program and vocational center policies and procedures.

_____ 2 Describe employment opportunities and responsibilities.

_____ 3 Research, design, and conduct a project that will integrate the knowledge and skills learned in the Construction Pathway course in a real-world, unpredictable environment.

_____ 4 Demonstrate the ability to follow verbal and written instructions and communicate effectively in on-the-job situations.

Unit 2: Basic Safety

_____ 1 Describe, define, and illustrate general safety rules for working in a shop/lab and how they relate to the construction industry.

_____ 2 Identify and apply safety around welding operations.

_____ 3 Display appropriate safety precautions to take around common jobsite hazards.

_____ 4 Demonstrate the appropriate use and care of personal protective equipment.

_____ 5 Explain lifting and the use of ladders and scaffolds.

_____ 6 Explain the material safety data sheet (MSDS).

_____ 7 Display appropriate safety procedures related to fires.

_____ 8 Explain safety in and around electrical situations.

Unit 3: Basic Math

_____ 1 Apply the four basic math skills with whole numbers, fractions, decimals, and percents.

_____ 2 Use the metric system.

Unit 4: Hand and Power Tools

_____ 1 Demonstrate the use and maintenance of hand and power tools.

Unit 5: Introduction to Blueprints

_____ 1 Read, analyze, and understand basic components of a blueprint.

Unit 6: Introduction to Carpentry

_____ 1 Explain the fundamentals of the carpentry trade.

_____ 2 Demonstrate safety when working in carpentry and with carpentry tools.

Unit 7: Introduction to Electrical Wiring

_____ 1 Demonstrate safety in and around electrical circuits and equipment.

_____ 2 Describe/identify basic electrical theory.

Unit 8: Introduction to Masonry

_____ 1 Explain the fundamentals of the masonry trade.

_____ 2 Identify and discuss safety issues in and around the masonry work site.

_____ 3 Explain and define terms and materials associated with masonry.

_____ 4 Perform procedures used in masonry trades.

Unit 9: Introduction to Plumbing

_____ 1 Recognize the fundamentals and use appropriate materials of the plumbing trade.

_____ 2 Identify tools and safety procedures used in plumbing trades, and perform basic plumbing operations using proper tools and safety procedures.

Unit 10: Orientation (Review and Reinforcement)

_____ 1 Review local program and vocational center policies and procedures.

_____ 2 Describe employment opportunities and responsibilities.

_____ 3 Explore leadership skills and personal development opportunities provided students by student organizations to include SkillsUSA.

4 Demonstrate the ability to follow verbal and written instructions and communicate effectively in on-the-job situations.

Unit 11: Basic Safety (Review and Reinforcement)

_____ 1 Describe general safety rules for working in a shop/lab and industry.

_____ 2 Identify and apply safety around welding operations.

_____ 3 Explain the appropriate safety precautions to take around common jobsite hazards.

_____ 4 Demonstrate the appropriate use and care of personal protective equipment.

_____ 5 Explain lifting and the use of ladders and scaffolds.

_____ 6 Explain the material safety data sheet (MSDS).

_____ 7 Explain fires and safety procedures related to fires.

_____ 8 Explain safety in and around electrical situations.

Unit 12: Construction Math

_____ 1 Apply basic mathematics for carpentry.

Unit 13: Introduction to Materials Used in Construction

_____ 1 Identify, use, and select appropriate wood building materials used in the construction industry.

_____ 2 Describe, use, and select the appropriate wood building fasteners and adhesives used in the construction industry.

Unit 14: Footing, Foundation, and Floor Framing

_____ 1 Identify, plan, and contract types of footing and foundations used in carpentry.

_____ 2 Identify floor systems.

_____ 3 Plan and construct floor systems.

Unit 15: Wall, Ceiling, and Roof Framing

_____ 1 Research, layout, and construct wall framing.

_____ 2 Lay out and construct ceiling framing.

_____ 3 Describe principles of roof framing.

Unit 16: Windows, Doors, and Stairs

_____ 1 Install windows and doors.

_____ 2 Identify the types and parts of stairs.

_____ 3 Measure and calculate the rise, run, and stairwell openings.

_____ 4 Lay out and cut stair stringers.

Recommended Tools and Equipment

Capitalized Items

1. Air compressor (1)
2. Cabinet, flammable materials (1)
3. Computer w/operating software w/multimedia kit and software for blueprint reading and estimation in building trades (1)
4. Drill press (14 in. w/vise) (1)
5. Dust collection system for shop (1)
6. Eye protection and sterilization chest (w/20 pairs of safety glasses) (1)
7. Ladder, extension (32-ft fiberglass) (1)
8. Printer, (1 per program)
9. Saw, motorized miter (1)
10. Scaffold kit (1)
11. Table, workbench (4)
12. Table, metal shop (1)
13. Vise, pipe stand w/chain (1)

Non-capitalized Items

1. Awl, scratch (5)
2. Bar, flat (5)
3. Bar, ripping (2)
4. Bender, copper tubing (1)
5. Bender, conduit (2 in. to 3/4 in.) (1)
6. Bender, spring tube (1)
7. Bin, revolving (1)
8. Bit set, auger (3/8 in. to 1 in.) (2)
9. Bit, expansion (2)
10. Box, mortar (15 cu ft) (1)
11. Brush, masonry (6)
12. Brush, wire (1)
13. Clamp, hand screw (2)
14. Clamp, locking C (2)
15. Clamp, pipe (2)
16. Clamp, spring (1)
17. Clamp, web (1)
18. C-clamp, vise grip (4)
19. C-clamp, assorted sizes (4)
20. Chalk line (2)
21. Chisel, ripping (1)
22. Chisel set, wood (3/8 in. to 1 1/2 in.) (2)
23. Chisel set, cold (3/8 in. to 1 in.) (1)
24. Clamp, bar (4)

25. Compass (4)
26. Container, sealed metal (1)
27. Cutter, bolt (1)
28. Cutter, PVC pipe (2)
29. Cutter, pipe (1)
30. Cutter, copper tubing (2)
31. Darby (1)
32. Die set, threader ratchet type (1)
33. Drill, hammer (1)
34. Drill, portable (1/2 in.) (1)
35. Drill, cordless (3/8 in.)(1)
36. Drill set, spade (3/8 in. to 1 1/2 in.) (1)
37. Drill set, twist (1/16 in. to 1/2 in.) (1)
38. Edger, cement (2)
39. Extension cord (25-ft 12/3 conductor) (6)
40. Extinguisher, fire (ABC) (2)
41. Eyewash station (1)
42. File, curved tooth (1)
43. File, metal double-cut (3)
44. File, wood (flat, assorted sizes) (6)
45. File, wood rasp (half-round) (1)
46. Flaring tool, copper tubing (2)
47. Float, rubber (2)
48. Grinder, end (1)
49. Grinder, pedestal (1)
50. Groover, cement (2)
51. Hacksaw (5)
52. Half hatchet (1)
53. Hammer, straight claw (6)
54. Hammer, sledge (3)
55. Hammer, ball-peen (2)
56. Hammer, brick (4)
57. Hammer, curved claw (16 oz) (6)
58. Handsaw, rip (4)
59. Handsaw, crosscut (8)
60. Hardhat (10)
61. Hoe, mortar (2)
62. Hose, water (50 ft) (2)
63. Hose, air (50 ft) (2)
64. Joiner, sled block (6)
65. Jointer, rake bricklaying (6)
66. Jointer, concave bricklaying (6)
67. Knife, putty (4 in.) (2)
68. Knife, putty (6 in.) (2)
69. Knife, putty (2 in.) (2)
70. Knife, utility (2)
71. Ladder, straight (24 ft fiberglass) (1)
72. Ladder, step (4 ft fiberglass) (1)

73. Ladder, step (6 ft fiberglass) (1)
74. Ladder, step (8 ft fiberglass) (1)
75. Level, carpenter's aluminum (48 in.) (2)
76. Level, carpenter's aluminum (24 in.) (2)
77. Level, masonry (48 in.) (2)
78. Level, spirit (1)
79. Multimeter, VOM
80. Mallet, wood (2)
81. Mallet, rubber (1)
82. Mason, masher (1)
83. Nail puller (1)
84. Nailer, pneumatic framing (1)
85. Nut driver set (1)
86. Pliers, channel lock (12 in.) (2)
87. Pliers, diagonal (6)
88. Pliers, lineman's (side cutters) (8)
89. Pliers, needle-nose (8)
90. Pliers, joint (6)
91. Pliers, vise grip (2)
92. Plumb bob (2)
93. Pouch, electrician's tool (6)
94. Reamer, pipe (1)
95. Ripper, cable (6)
96. Router, w/bits (1)
97. Rule, folding (6 ft) (6)
98. Rule, folding (6 ft modular) (6)
99. Rule, spacer (1)
100. Safety kit (OSHA approved) (1)
101. Sander, belt (1)
102. Sander, random orbital (1)
103. Saw, back (2)
104. Saw, circular (7 1/4 in. portable) (3)
105. Saw, coping (2)
106. Saw, dove tail (1)
107. Saw, portable hand-held jigsaw (2)
108. Saw, keyhole (2)
109. Saw, saber (1)
110. Saw, reciprocating (1)
111. Saw, portable hand-held band (1)
112. Sawhorse (3 pair)
113. Screwdriver set (Phillips, assorted sizes) (10)
114. Screwdriver set (spiral w/bits) (2)
115. Screwdriver set (flat blade, assorted sizes) (10)
116. Set, nail (6)
117. Set, brick (2)
118. Shield safety (5)
119. Shovel, round point (2)
120. Shovel, square point (2)

121. Snips, aviation (2)
122. Snips, tin (2)
123. Solder gun (2)
124. Square, framing w/rafter chart (6)
125. Square, combination (6)
126. Square, speed and booklet (3)
127. Square, speed rafter (12 in.) (3)
128. Square, try (6)
129. Stripper, wire (8)
130. Stick, push (1)
131. T-bevel (2)
132. Tamper, hand (1)
133. Tape, steel (100 ft) (2)
134. Tape, steel (25 ft) (8)
135. Tong, brick (2)
136. Torch, propane (2)
137. Torch, striker (2)
138. Trowel, bricklaying (20)
139. Trowel, tuck point (1)
140. Trowel, cement finishing (2)
141. Vise, woodworking (5 in.) (8)
142. Wheelbarrow, (6 cu ft) (3)
143. Wrench, basin (1)
144. Wrench, pipe (8 in.) (2)
145. Wrench, pipe (10 in.) (2)
146. Wrench, pipe (12 in.) (2)
147. Wrench set, combination (SAE) (1)
148. Wrench, adjustable (12 in.) (1)
149. Wrench, adjustable (10 in.) (1)
150. Wrench, pipe (14 in.) (1)
151. Wrench, adjustable (8 in.) (1)
152. Wrench, hex set metric and standard (1)
153. Wrench, pipe (16 in.) (1)
154. Wrench, seat (1)
155. Wrench set, combination (metric) (1)
156. Wrench set, sockets w/ratchets and pull handles (SAE 3/8-in. and 1/2-in. drives) (2)
157. Wrench set, sockets w/ratchets and pull handles (metric 3/8-in. and 1/2-in. drives) (2)

Recommended Instructional Aids

It is recommended that instructors have access to the following items:

1. TV
2. Cart, AV (for TV–VCR/DVD)
3. VCR/DVD (1)
4. Data projector
5. Smart Board/Multimedia board
6. Digital camera
7. Laser printer
8. Teacher computer

Construction: Carpentry Concentration

Capitalized Items

1. Student computers in a networked environment with Internet access (10)
2. Networkable laser printer
3. Saw, sliding compound miter (2)
4. Saw, radial arm (1)
5. Saw, table (2)

Non-capitalized Items (for class size of 20)

1. Biscuit joiner/jointer (1)
2. Bit, expansion (2)
3. Level, laser with tripod and leveling rod (1)
4. Level, carpenter's aluminum (or wood) (48 in.) (2)
5. Level, carpenter's aluminum (or wood) (24 in.) (2)
6. Nailer, pneumatic finish (2)
7. Plane, electric block (2)
8. Pocket hole machine (1)
9. Saw, circular (6 1/2-in. portable, 24-V cordless) (1)
10. Saw, hole set (1 in. to 2 1/2 in. with arbor) (1)

Appendix A: 21st Century Skills Standards[1]

CLS1 Flexibility and Adaptability
CLS2 Initiative and Self-Direction
CLS3 Social and Cross-Cultural Skills
CLS4 Productivity and Accountability
CLS5 Leadership and Responsibility

Today's life and work environments require far more than thinking skills and content knowledge. The ability to navigate the complex life and work environments in the globally competitive information age requires students to pay rigorous attention to developing adequate life and career skills.

CS 1 Flexibility and Adaptability

- Adapting to varied roles and responsibilities
- Working effectively in a climate of ambiguity and changing priorities

CS 2 Initiative and Self-Direction

- Monitoring one's own understanding and learning needs
- Going beyond basic mastery of skills and/or curriculum to explore and expand one's own learning and opportunities to gain expertise
- Demonstrating initiative to advance skill levels toward a professional level
- Defining, prioritizing, and completing tasks without direct oversight
- Utilizing time efficiently and managing workload
- Demonstrating commitment to learning as a lifelong process

CS 3 Social and Cross-Cultural Skills

- Working appropriately and productively with others
- Leveraging the collective intelligence of groups when appropriate
- Bridging cultural differences and using differing perspectives to increase innovation and the quality of work

CS 4 Productivity and Accountability

- Setting and meeting high standards and goals for delivering quality work on time
- Demonstrating diligence and a positive work ethic (e.g., being punctual and reliable)

CS 5 Leadership and Responsibility

- Using interpersonal and problem-solving skills to influence and guide others toward a goal
- Leveraging strengths of others to accomplish a common goal
- Demonstrating integrity and ethical behavior
- Acting responsibly with the interests of the larger community in mind

[1] *21st century skills.* (n.d.). Washington, DC: Partnership for 21st Century Skills.

Appendix B: Mississippi Academic Standards

SEVENTH-GRADE MATH

SGM1. Apply concepts of rational numbers and perform basic operations emphasizing the concepts of ratio, proportion, and percent with and without the use of calculators.

a. Use the order of operations to simplify and/or evaluate whole numbers (including exponents and grouping symbols). (DOK 1)
b. Solve problems involving addition, subtraction, multiplication, and division of rational numbers. Express answers in simplest form. (DOK 2)
c. Convert among decimals, fractions, mixed numbers, and percents. (DOK 1)
d. Evaluate and estimate powers and square roots of real numbers. (DOK 2)
e. Explain the relationship between standard form and scientific notation. (DOK 1)
f. Multiply and divide numbers written in scientific notation. (DOK 1)
g. Solve real-life problems involving unit price, unit rate, sales price, sales tax, discount, simple interest, commission, and rates of commission. (DOK 1)
h. Solve contextual problems requiring the comparison, ordering, and application of integers. (DOK 2)
i. Develop a logical argument to demonstrate the 'denseness' of rational numbers. (DOK 3)

SGM2. Develop and apply the basic operations of rational numbers to algebraic and numerical tasks. Create and apply algebraic expressions and equations.

a. Recognize, describe, and state the rule of generalized numerical and geometric patterns using tables, graphs, words, and symbols. (DOK 2)
b. Solve equations that represent algebraic and real-world problems using multiple methods including the real number properties. (DOK 1)
c. Formulate algebraic expressions, equations, and inequalities to reflect a given situation and vice versa. (DOK 2)
d. Complete a function table based on a given rule and vice versa. (DOK 1)
e. Identify the following properties using variables, and apply them in solving problems: (DOK 1)
    - Zero property of multiplication
    - Inverse properties of addition/subtraction and multiplication/division
    - Commutative and associative properties of addition and multiplication
    - Identity properties of addition and multiplication
    - Distributive properties of multiplication over addition and subtraction
f. Predict the shape of a graph from a function table. (DOK 2)

SGM3. Apply geometric relationships of angles, two- and three-dimensional shapes, and transformations.

a. Classify and compare three-dimensional shapes using their properties. (DOK 1)
b. Construct two-dimensional representations of three-dimensional objects. (DOK 2)
c. Justify the congruency or symmetry of two figures. (DOK 2)
d. Perform transformations (rigid and non-rigid motions) on two-dimensional figures using the coordinate plane. (DOK 2)

e. Create an argument using the Pythagorean theorem principles to show that a triangle is a right triangle. (DOK 2)
f. Construct and classify angles. (DOK 2)

SGM4. Apply appropriate techniques, tools, and formulas to determine measurements with a focus on real-world problems. Recognize that formulas in mathematics are generalized statements about rules, equations, principles, or other logical mathematical relationships.

a. Convert from one unit to another, perform basic operations, and solve real-world problems using standard (English and metric) measurements within the same system. (DOK 2)
b. Use formulas and strategies, such as decomposition, to compute the perimeter and area of triangles, parallelograms, and trapezoids and the circumference and area of circles and to find the area of more complex shapes. (DOK 2)
c. Develop and justify geometric formulas for volume and surface area of cylinders, pyramids, and prisms. (DOK 3)
d. Solve problems involving scale factors using ratios and proportions. (DOK 2)

SGM5. Organize and interpret data. Analyze data to make predictions.

a. Use proportions, estimates, and percentages to construct, interpret, and make predictions about a population based on histograms or circle graph representations of data from a sample. (DOK 2)
b. Determine how outliers affect mean, median, mode, or range. (DOK 2)
c. Construct and interpret line graphs, frequency tables, circle graphs, box-and-whisker plots, and scatterplots to generalize trends from given data. (DOK 2)
d. Determine probabilities through experimentation, simulation, or calculation.
(Note: Make and test conjectures and predictions by calculating the probability of an event.)
(DOK 2)

PRE-ALGEBRA

PRA1. Apply concepts and perform basic operations using real numbers in real-world contexts.

a. Define, classify, and order rational and irrational numbers and their subsets. (DOK 1)
b. Formulate and solve standard and real-life problems involving addition, subtraction, multiplication, and division of rational numbers. (DOK 2)
c. Apply the concepts of greatest common factor (GCF) and least common multiple (LCM) to monomials with variables. (DOK 2)
d. Simplify and evaluate expressions using order of operations, and use real number properties to justify solutions. (DOK 2)
e. Explain the rules of exponents related to multiplication and division of terms with exponents. (DOK 2)
f. Recognize and appropriately use exponential and scientific notation. (DOK 1)
g. Explain and use the inverse relationship between square roots and squares. (DOK 2)

PRA2. Apply properties to simplify algebraic expressions, solve linear equations and inequalities, and apply principles of graphing.

a. Simplify and evaluate numerical and algebraic expressions. (DOK 1)
b. Apply properties of real numbers with an emphasis on the distributive properties of multiplication over addition and subtraction. (DOK 1)

c. Solve and check equations and inequalities using one variable. (DOK 2)
d. Model inequalities (and their solutions) on a number line. (DOK 1)
e. Graph linear equations and non-linear equations ($y = x^2$) using multiple methods including t-tables and slope–intercept. (DOK 2)
f. Given a linear graph, identify its slope as positive, negative, undefined, or zero, and interpret slope as rate of change. (DOK 2)
g. Determine slope, x-intercept, and y-intercept from a graph and/or equation in slope-intercept or standard form. (DOK 1)
h. Add, subtract, and multiply monomials and binomials. (DOK 1)
i. Predict characteristics of a graph given an equation or t-table. (DOK 2)

PRA3. Identify and apply geometric principles to polygons, angles, and two- and three-dimensional figures.

a. Locate and identify angles formed by parallel lines cut by a transversal(s) (e.g., adjacent, vertical, complementary, supplementary, corresponding, alternate interior, and alternate exterior). (DOK 1)
b. Find missing angle measurements for parallel lines cut by a transversal(s) and for a vertex of a polygon. (DOK 1)
c. Explain the Pythagorean theorem, and apply it to solve routine and non-routine problems. (DOK 3)
d. Solve real-world and non-routine problems involving congruent and similar figures. (DOK 3)
e. Use two-dimensional representations (nets) of three-dimensional objects to describe objects from various perspectives. (DOK 2)

PRA4. Understand measurable attributes of objects, and apply various formulas in problem-solving situations.

a. Solve real-world application problems that include length, area, perimeter, and circumference using standard measurements. (DOK 2)
b. Develop, analyze, and explain methods for solving problems involving proportions, such as scaling and finding equivalent ratios. (DOK 3)
c. Use formulas and/or appropriate measuring tools to find length and angle measures (to appropriate levels of precision), perimeter, area, volume, and surface area of polygons, circles, spheres, cones, pyramids, and composite or irregular figures. (DOK 1)

PRA5. Interpret, organize, and make predictions about a variety of data using concepts of probability.

a. Use a given mean, mode, median, and range to summarize and compare data sets including investigation of the different effects that changes in data values have on these measures. (DOK 2)
b. Select the appropriate measures of central tendency for a particular purpose. (DOK 2)
c. Make and list conjectures by calculating probability for experimental or simulated contexts. (DOK 3)
d. Construct and interpret scatterplots to generalize trends from given data sets. (DOK 3)

TRANSITION TO ALGEBRA

TTA1. Understand relationships between numbers and their properties, and perform operations fluently.

a. Compare and contrast the subsets of real numbers. (DOK 1)
b. Simplify and evaluate expressions using order of operations, and use real number properties to justify solutions. (DOK 2)
c. Express, interpret, and compute numbers using scientific notation in meaningful contexts. (DOK 1)
d. Apply the concept of greatest common factor (GCF) and least common multiple (LCM) to monomials with variables. (DOK 2)
e. Use the inverse relationship to develop the concept of roots and perfect squares. (DOK 2)

TTA2. Understand, represent, and analyze patterns, relations, and functions.

a. Given a literal equation, solve for a specified variable of degree one. (DOK 1)
b. Explain and illustrate how changes in one variable may result in a change in another variable. (DOK 2)
c. Solve and check multistep equations and inequalities, including distributive property, variables on both sides, and rational coefficients. (DOK 2)
d. Use real-world data to express slope as a rate of change. (DOK 2)
e. Graph solutions to linear inequalities. (DOK 2)
f. Write linear equations given slope and y-intercept or two points. (DOK 2)
g. Identify domain, range, slope, and intercepts of functions. (DOK 1)
h. Develop generalizations to characterize the behaviors of graphs (linear, quadratic, and absolute value). (DOK 2)
i. Classify and determine degree of a polynomial and arrange polynomials in ascending or descending order of a variable. (DOK 1)
j. Apply ratios and use proportional reasoning to solve real-world algebraic problems. (DOK 2)
k. Add, subtract, multiply, and divide polynomial expressions. (DOK 1)
l. Analyze the relationship between *x* and *y* values, and determine whether a relation is a function. (DOK 2)

TTA3. Understand geometric principles of polygons, angles, and figures.

a. Apply the Pythagorean theorem to solve problems. (DOK 2)
b. Apply proportional reasoning to determine similar figures and find unknown measures. (DOK 2)

TTA4. Demonstrate and apply various formulas in problem-solving situations.

a. Solve real-world problems involving measurements (i.e., circumference, perimeter, area, volume, distance, temperature, etc.). (DOK 2)
b. Explain and apply the appropriate formula to determine length, midpoint, and slope of a segment in a coordinate plane (i.e., distance formula and Pythagorean theorem). (DOK 2)

TTA5. Interpret data.

a. Construct graphs, make predictions, and draw conclusions from tables, line graphs, and scatterplots. (DOK 3)

b. Use a given mean, mode, median, and range to summarize and compare data sets including investigation of the different effects that changes in data have on these measures of central tendency, and select the appropriate measures of central tendency for a given purpose. (DOK 2)
c. Calculate basic probability of experiments and simulations to make and test conjectures about results. (DOK 3)

ALGEBRA I

ALG1-1. Understand relationships between numbers and their properties, and perform operations fluently.

a. Apply properties of real numbers to simplify algebraic expressions, including polynomials. (DOK 1)
b. Use matrices to solve mathematical situations and contextual problems. (DOK 2)

ALG1-2. Understand, represent, and analyze patterns, relations, and functions.

a. Solve, check, and graph multistep linear equations and inequalities in one variable, including rational coefficients in mathematical and real-world situations. (DOK 2)
b. Solve and graph absolute value equations and inequalities in one variable. (DOK 2)
c. Analyze the relationship between *x* and *y* values, determine whether a relation is a function, and identify domain and range. (DOK 2)
d. Explain and illustrate how a change in one variable may result in a change in another variable and apply to the relationships between independent and dependent variables. (DOK 2)
e. Graph and analyze linear functions. (DOK 2)
f. Use algebraic and graphical methods to solve systems of linear equations and inequalities in mathematical and real-world situations. (DOK 2)
g. Add, subtract, multiply, and divide polynomial expressions. (DOK 1)
h. Factor polynomials by using greatest common factor (GCF), and factor quadratics that have only rational roots. (DOK 1)
i. Determine the solutions to quadratic equations by using graphing, tables, completing the square, the quadratic formula, and factoring. (DOK 1)
j. Justify why some polynomials are prime over the rational number system. (DOK 2)
k. Graph and analyze absolute value and quadratic functions. (DOK 2)
l. Write, graph, and analyze inequalities in two variables. (DOK 2)

ALG1-3. Understand how algebra and geometric representations interconnect and build on one another.

a. Apply the concept of slope to determine if lines in a plane are parallel or perpendicular. (DOK 2)
b. Solve problems that involve interpreting slope as a rate of change. (DOK 2)

ALG1-4. Demonstrate and apply various formulas in problem-solving situations.

a. Solve real-world problems involving formulas for perimeter, area, distance, and rate. (DOK 2)
b. Explain and apply the appropriate formula to determine length, midpoint, and slope of a segment in a coordinate plane. (i.e., distance formula and Pythagorean theorem). (DOK 2)
c. Represent polynomial operations with area models. (DOK 2)

ALG1-5. Represent, analyze, and make inferences based on data with and without the use of technology.

a. Draw conclusions and make predictions from scatterplots. (DOK 3)
b. Use linear regression to find the line-of-best fit from a given set of data. (DOK 3)

DISCRETE MATHEMATICS

DSM1. Explore relationships among number systems.

a. Use matrices to model and solve problems. (DOK 2)
b. Model relationships and solve problems using graph theory. (DOK 2)

DSM2. Use algebraic methods to represent simple and complex relationships among statements. Use models to represent patterns and operations.

a. Define sentence (proposition), and use logic to determine if the sentence is true or false. (DOK 2)
b. Define simple compound statements: negation, conjunction, disjunction, contradiction, and tautology using truth tables. (DOK 2)
c. Define a conditional statement using truth tables. (DOK 2)
d. Apply the principles of logic to determine the validity of arguments. (DOK 3)
e. Define a sequence recursively and explicitly. (DOK 2)
f. Find the explicit formula for a recursively defined sequence using iteration. (DOK 2)
g. Use mathematical induction to verify explicit formulas for arithmetic, geometric, and other sequences and/or series. (DOK 2)
h. Add, subtract, multiply, and divide sets, and find unions, intersections, differences, and complements of sets. (DOK 2)

DSM3. Use geometric models to describe and analyze mathematical relationships, establish the validity of conjectures, and determine solutions to real applications.

a. Construct a logic circuit from a Boolean expression to determine output. (DOK 2)
b. Construct a Boolean expression given a logic circuit. (DOK 2)
c. Construct a logic circuit and Boolean expression given an input/output table. (DOK 2)
d. Use Venn diagrams to represent basic operations on sets. (DOK 1)
e. Determine the number of vertices and edges as well as walks, paths, and circuits in a graph. (DOK 2)
f. Construct walks, paths, and circuits given an edge/vertex string. (DOK 2)
g. Determine whether Euler and Hamiltonial (Hamiltonian) circuits exist in a given graph. (DOK 2)
h. Construct a graph given the adjacency matrix of the graph and vice versa. (DOK 1)
i. Determine connectivity of a graph using an adjacency matrix. (DOK 1)
j. Determine the number of walks between two vertices using powers of the adjacency matrix. (DOK 2)
k. Explain why a graph is a tree. (DOK 2)
l. Determine the level, parent, siblings, ancestors, and descendants of a given node. Determine the height of a rooted tree. (DOK 1)
m. Determine the shortest route in a spanning tree. (DOK 2)

DSM4. Investigate and explain strategies for solving simple games.

a. Determine the characteristics that result in a fair game. (DOK 2)

b. Identify winning strategies for basic games. (DOK 3)
c. Create and use simulations for probability models. (DOK 3)
d. Solve problems using discrete random variables. (DOK 2)

Appendix C: ACT College Readiness Standards

English

E1 Topic Development in Terms of Purpose and Focus

- Identify the basic purpose or role of a specified phrase or sentence.
- Delete a clause or sentence because it is obviously irrelevant to the essay.
- Identify the central idea or main topic of a straightforward piece of writing.
- Determine relevancy when presented with a variety of sentence-level details.
- Identify the focus of a simple essay, applying that knowledge to add a sentence that sharpens the focus or to determine if an essay has met a specified goal.
- Delete material primarily because it disturbs the flow and development of the paragraph.
- Add a sentence to accomplish a fairly straightforward purpose such as illustrating a given statement.
- Apply an awareness of the focus and purpose of a fairly involved essay to determine the rhetorical effect and suitability of an existing phrase or sentence or to determine the need to delete plausible but irrelevant material.
- Add a sentence to accomplish a subtle rhetorical purpose such as to emphasize, to add supporting detail, or to express meaning through connotation.
- Determine whether a complex essay has accomplished a specific purpose.
- Add a phrase or sentence to accomplish a complex purpose, often expressed in terms of the main focus of the essay.

E2 Organization, Unity, and Coherence

- Use conjunctive adverbs or phrases to show time relationship in simple narrative essays (e.g., then, this time, etc.).
- Select the most logical place to add a sentence in a paragraph.
- Use conjunctive adverbs or phrases to express straightforward logical relationships (e.g., first, afterward, and in response).
- Decide the most logical place to add a sentence in an essay.
- Add a sentence that introduces a simple paragraph.
- Determine the need for conjunctive adverbs or phrases to create subtle logical connections between sentences (e.g., therefore, however, and in addition).
- Rearrange the sentences in a fairly uncomplicated paragraph for the sake of logic.
- Add a sentence to introduce or conclude the essay or to provide a transition between paragraphs when the essay is fairly straightforward.
- Make sophisticated distinctions concerning the logical use of conjunctive adverbs or phrases, particularly when signaling a shift between paragraphs.
- Rearrange sentences to improve the logic and coherence of a complex paragraph.
- Add a sentence to introduce or conclude a fairly complex paragraph.
- Consider the need for introductory sentences or transitions, basing decisions on a thorough understanding of both the logic and rhetorical effect of the paragraph and essay.

E3 Word Choice in Terms of Style, Tone, Clarity, and Economy

- Revise sentences to correct awkward and confusing arrangements of sentence elements.
- Revise vague nouns and pronouns that create obvious logic problems.
- Delete obviously synonymous and wordy material in a sentence.
- Revise expressions that deviate from the style of an essay.
- Delete redundant material when information is repeated in different parts of speech (e.g., alarmingly startled).
- Use the word or phrase most consistent with the style and tone of a fairly straightforward essay.
- Determine the clearest and most logical conjunction to link clauses.
- Revise a phrase that is redundant in terms of the meaning and logic of the entire sentence.
- Identify and correct ambiguous pronoun references.
- Use the word or phrase most appropriate in terms of the content of the sentence and tone of the essay.
- Correct redundant material that involves sophisticated vocabulary and sounds acceptable as conversational English (e.g., “an aesthetic viewpoint” versus “the outlook of an aesthetic viewpoint”).
- Correct vague and wordy or clumsy and confusing writing containing sophisticated language.
- Delete redundant material that involves subtle concepts or that is redundant in terms of the paragraph as a whole.

E4 Sentence Structure and Formation

- Use conjunctions or punctuation to join simple clauses.
- Revise shifts in verb tense between simple clauses in a sentence or between simple adjoining sentences.
- Determine the need for punctuation and conjunctions to avoid awkward-sounding sentence fragments and fused sentences.
- Decide the appropriate verb tense and voice by considering the meaning of the entire sentence.
- Recognize and correct marked disturbances of sentence flow and structure (e.g., participial phrase fragments, missing or incorrect relative pronouns, or dangling or misplaced modifiers).
- Revise to avoid faulty placement of phrases and faulty coordination and subordination of clauses in sentences with subtle structural problems.
- Maintain consistent verb tense and pronoun person on the basis of the preceding clause or sentence.
- Use sentence-combining techniques, effectively avoiding problematic comma splices, run-on sentences, and sentence fragments, especially in sentences containing compound subjects or verbs.
- Maintain a consistent and logical use of verb tense and pronoun person on the basis of information in the paragraph or essay as a whole.
- Work comfortably with long sentences and complex clausal relationships within sentences, avoiding weak conjunctions between independent clauses and maintaining parallel structure between clauses.

E5 Conventions of Usage

- Solve such basic grammatical problems as how to form the past and past participle of irregular but commonly used verbs and how to form comparative and superlative adjectives.
- Solve such grammatical problems as whether to use an adverb or adjective form, how to ensure straightforward subject–verb and pronoun–antecedent agreement, and which preposition to use in simple contexts.
- Recognize and use the appropriate word in frequently confused pairs such as there and their, past and passed, and led and lead.
- Use idiomatically appropriate prepositions, especially in combination with verbs (e.g., long for and appeal to).
- Ensure that a verb agrees with its subject when there is some text between the two.
- Ensure that a pronoun agrees with its antecedent when the two occur in separate clauses or sentences.
- Identify the correct past and past participle forms of irregular and infrequently used verbs, and form present-perfect verbs by using "have" rather than "of."
- Correctly use reflexive pronouns, the possessive pronouns "its" and "your," and the relative pronouns "who" and "whom."
- Ensure that a verb agrees with its subject in unusual situations (e.g., when the subject–verb order is inverted or when the subject is an indefinite pronoun).
- Provide idiomatically and contextually appropriate prepositions following verbs in situations involving sophisticated language or ideas.
- Ensure that a verb agrees with its subject when a phrase or clause between the two suggests a different number for the verb.

E6 Conventions of Punctuation

- Delete commas that create basic sense problems (e.g., between verb and direct object).
- Provide appropriate punctuation in straightforward situations (e.g., items in a series).
- Delete commas that disturb the sentence flow (e.g., between modifier and modified element).
- Use commas to set off simple parenthetical phrases.
- Delete unnecessary commas when an incorrect reading of the sentence suggests a pause that should be punctuated (e.g., between verb and direct object clause).
- Use punctuation to set off complex parenthetical phrases.
- Recognize and delete unnecessary commas based on a careful reading of a complicated sentence (e.g., between the elements of a compound subject or compound verb joined by "and").
- Use apostrophes to indicate simple possessive nouns.
- Recognize inappropriate uses of colons and semicolons.
- Use commas to set off a nonessential/nonrestrictive appositive or clause.
- Deal with multiple punctuation problems (e.g., compound sentences containing unnecessary commas and phrases that may or may not be parenthetical).
- Use an apostrophe to show possession, especially with irregular plural nouns.
- Use a semicolon to indicate a relationship between closely related independent clauses.
- Use a colon to introduce an example or an elaboration.

Math

M1 Basic Operations and Applications

- Perform one-operation computation with whole numbers and decimals.
- Solve problems in one or two steps using whole numbers.
- Perform common conversions (e.g., inches to feet or hours to minutes).
- Solve routine one-step arithmetic problems (using whole numbers, fractions, and decimals) such as single-step percent.
- Solve some routine two-step arithmetic problems.
- Solve routine two-step or three-step arithmetic problems involving concepts such as rate and proportion, tax added, percentage off, and computing with a given average.
- Solve multi-step arithmetic problems that involve planning or converting units of measure (e.g., feet per second to miles per hour).
- Solve word problems containing several rates, proportions, or percentages.
- Solve complex arithmetic problems involving percent of increase or decrease and problems requiring integration of several concepts from pre-algebra and/or pre-geometry (e.g., comparing percentages or averages, using several ratios, and finding ratios in geometry settings).

M2 Probability, Statistics, and Data Analysis

- Calculate the average of a list of positive whole numbers.
- Perform a single computation using information from a table or chart.
- Calculate the average of a list of numbers.
- Calculate the average, given the number of data values and the sum of the data values.
- Read tables and graphs.
- Perform computations on data from tables and graphs.
- Use the relationship between the probability of an event and the probability of its complement.
- Calculate the missing data value, given the average and all data values but one.
- Translate from one representation of data to another (e.g., a bar graph to a circle graph).
- Determine the probability of a simple event.
- Exhibit knowledge of simple counting techniques.*
- Calculate the average, given the frequency counts of all the data values.
- Manipulate data from tables and graphs.
- Compute straightforward probabilities for common situations.
- Use Venn diagrams in counting.*
- Calculate or use a weighted average.
- Interpret and use information from figures, tables, and graphs.
- Apply counting techniques.
- Compute a probability when the event and/or sample space is not given or obvious.
- Distinguish between mean, median, and mode for a list of numbers.
- Analyze and draw conclusions based on information from figures, tables, and graphs.
- Exhibit knowledge of conditional and joint probability.

M3 Numbers: Concepts and Properties

- Recognize equivalent fractions and fractions in lowest terms.
- Recognize one-digit factors of a number.

- Identify a digit's place value.
- Exhibit knowledge of elementary number concepts including rounding, the ordering of decimals, pattern identification, absolute value, primes, and greatest common factor.
- Find and use the least common multiple.
- Order fractions.
- Work with numerical factors.
- Work with scientific notation.
- Work with squares and square roots of numbers.
- Work problems involving positive integer exponents.*
- Work with cubes and cube roots of numbers.*
- Determine when an expression is undefined.*
- Exhibit some knowledge of the complex numbers.†
- Apply number properties involving prime factorization.
- Apply number properties involving even/odd numbers and factors/multiples.
- Apply number properties involving positive/negative numbers.
- Apply rules of exponents.
- Multiply two complex numbers.†
- Draw conclusions based on number concepts, algebraic properties, and/or relationships between expressions and numbers.
- Exhibit knowledge of logarithms and geometric sequences.
- Apply properties of complex numbers.

M4 Expressions, Equations, and Inequalities

- Exhibit knowledge of basic expressions (e.g., identify an expression for a total as b + g).
- Solve equations in the form x + a = b, where a and b are whole numbers or decimals.
- Substitute whole numbers for unknown quantities to evaluate expressions.
- Solve one-step equations having integer or decimal answers.
- Combine like terms (e.g., 2x + 5x).
- Evaluate algebraic expressions by substituting integers for unknown quantities.
- Add and subtract simple algebraic expressions.
- Solve routine first-degree equations.
- Perform straightforward word-to-symbol translations.
- Multiply two binomials.*
- Solve real-world problems using first-degree equations.
- Write expressions, equations, or inequalities with a single variable for common pre-algebra settings (e.g., rate and distance problems and problems that can be solved by using proportions).
- Identify solutions to simple quadratic equations.
- Add, subtract, and multiply polynomials.*
- Factor simple quadratics (e.g., the difference of squares and perfect square trinomials).*
- Solve first-degree inequalities that do not require reversing the inequality sign.*
- Manipulate expressions and equations.
- Write expressions, equations, and inequalities for common algebra settings.
- Solve linear inequalities that require reversing the inequality sign.
- Solve absolute value equations.
- Solve quadratic equations.

- Find solutions to systems of linear equations.
- Write expressions that require planning and/or manipulating to model a situation accurately.
- Write equations and inequalities that require planning, manipulating, and/or solving.
- Solve simple absolute value inequalities.

M5 Graphical Representations

- Identify the location of a point with a positive coordinate on the number line.
- Locate points on the number line and in the first quadrant.
- Locate points in the coordinate plane.
- Comprehend the concept of length on the number line.*
- Exhibit knowledge of slope.*
- Identify the graph of a linear inequality on the number line.*
- Determine the slope of a line from points or equations.*
- Match linear graphs with their equations.*
- Find the midpoint of a line segment.*
- Interpret and use information from graphs in the coordinate plane.
- Match number line graphs with solution sets of linear inequalities.
- Use the distance formula.
- Use properties of parallel and perpendicular lines to determine an equation of a line or coordinates of a point.
- Recognize special characteristics of parabolas and circles (e.g., the vertex of a parabola and the center or radius of a circle).†
- Match number line graphs with solution sets of simple quadratic inequalities.
- Identify characteristics of graphs based on a set of conditions or on a general equation such as y = ax2 + c.
- Solve problems integrating multiple algebraic and/or geometric concepts.
- Analyze and draw conclusions based on information from graphs in the coordinate plane.

M6 Properties of Plane Figures

- Exhibit some knowledge of the angles associated with parallel lines.
- Find the measure of an angle using properties of parallel lines.
- Exhibit knowledge of basic angle properties and special sums of angle measures (e.g., 90°, 180°, and 360°).
- Use several angle properties to find an unknown angle measure.
- Recognize Pythagorean triples.*
- Use properties of isosceles triangles.*
- Apply properties of 30°-60°-90°, 45°-45°-90°, similar, and congruent triangles.
- Use the Pythagorean theorem.
- Draw conclusions based on a set of conditions.
- Solve multi-step geometry problems that involve integrating concepts, planning, visualization, and/or making connections with other content areas.
- Use relationships among angles, arcs, and distances in a circle.

M7 Measurement

- Estimate or calculate the length of a line segment based on other lengths given on a geometric figure.
- Compute the perimeter of polygons when all side lengths are given.
- Compute the area of rectangles when whole number dimensions are given.
- Compute the area and perimeter of triangles and rectangles in simple problems.
- Use geometric formulas when all necessary information is given.
- Compute the area of triangles and rectangles when one or more additional simple steps are required.
- Compute the area and circumference of circles after identifying necessary information.
- Compute the perimeter of simple composite geometric figures with unknown side lengths.*
- Use relationships involving area, perimeter, and volume of geometric figures to compute another measure.
- Use scale factors to determine the magnitude of a size change.
- Compute the area of composite geometric figures when planning or visualization is required.

M8 Functions

- Evaluate quadratic functions, expressed in function notation, at integer values.
- Evaluate polynomial functions, expressed in function notation, at integer values.†
- Express the sine, cosine, and tangent of an angle in a right triangle as a ratio of given side lengths.†
- Evaluate composite functions at integer values.†
- Apply basic trigonometric ratios to solve right-triangle problems.†
- Write an expression for the composite of two simple functions.†
- Use trigonometric concepts and basic identities to solve problems.†
- Exhibit knowledge of unit circle trigonometry.†
- Match graphs of basic trigonometric functions with their equations.

Notes

- Students who score in the 1–12 range are most likely beginning to develop the knowledge and skills assessed in the other ranges.
- Standards followed by an asterisk (*) apply to the PLAN and ACT mathematics tests only.
- Standards followed by a dagger (†) apply to the ACT mathematics test only.

Reading

R1 Main Ideas and Author's Approach

- Recognize a clear intent of an author or narrator in uncomplicated literary narratives.
- Identify a clear main idea or purpose of straightforward paragraphs in uncomplicated literary narratives.
- Infer the main idea or purpose of straightforward paragraphs in uncomplicated literary narratives.
- Understand the overall approach taken by an author or narrator (e.g., point of view and kinds of evidence used) in uncomplicated passages.

- Identify a clear main idea or purpose of any paragraph or paragraphs in uncomplicated passages.
- Infer the main idea or purpose of straightforward paragraphs in more challenging passages.
- Summarize basic events and ideas in more challenging passages.
- Understand the overall approach taken by an author or narrator (e.g., point of view and kinds of evidence used) in more challenging passages.
- Infer the main idea or purpose of more challenging passages or their paragraphs.
- Summarize events and ideas in virtually any passage.
- Understand the overall approach taken by an author or narrator (e.g., point of view and kinds of evidence used) in virtually any passage.
- Identify clear main ideas or purposes of complex passages or their paragraphs.

R2 Supporting Details

- Locate basic facts (e.g., names, dates, and events) clearly stated in a passage.
- Locate simple details at the sentence and paragraph level in uncomplicated passages.
- Recognize a clear function of a part of an uncomplicated passage.
- Locate important details in uncomplicated passages.
- Make simple inferences about how details are used in passages.
- Locate important details in more challenging passages.
- Locate and interpret minor or subtly stated details in uncomplicated passages.
- Discern which details, though they may appear in different sections throughout a passage, support important points in more challenging passages.
- Locate and interpret minor or subtly stated details in more challenging passages.
- Use details from different sections of some complex informational passages to support a specific point or argument.
- Locate and interpret details in complex passages.
- Understand the function of a part of a passage when the function is subtle or complex.

R3 Sequential, Comparative, and Cause–Effect Relationships

- Determine when (e.g., first, last, before, or after) or if an event occurred in uncomplicated passages.
- Recognize clear cause–effect relationships described within a single sentence in a passage.
- Identify relationships between main characters in uncomplicated literary narratives.
- Recognize clear cause–effect relationships within a single paragraph in uncomplicated literary narratives.
- Order simple sequences of events in uncomplicated literary narratives.
- Identify clear relationships between people, ideas, and so forth in uncomplicated passages.
- Identify clear cause–effect relationships in uncomplicated passages.
- Order sequences of events in uncomplicated passages.
- Understand relationships between people, ideas, and so forth in uncomplicated passages.
- Identify clear relationships between characters, ideas, and so forth in more challenging literary narratives.
- Understand implied or subtly stated cause–effect relationships in uncomplicated passages.
- Identify clear cause–effect relationships in more challenging passages.
- Order sequences of events in more challenging passages.
- Understand the dynamics between people, ideas, and so forth in more challenging passages.

- Understand implied or subtly stated cause–effect relationships in more challenging passages.
- Order sequences of events in complex passages.
- Understand the subtleties in relationships between people, ideas, and so forth in virtually any passage.
- Understand implied, subtle, or complex cause–effect relationships in virtually any passage.

R4 Meaning of Words

- Understand the implication of a familiar word or phrase and of simple descriptive language.
- Use context to understand basic figurative language.
- Use context to determine the appropriate meaning of some figurative and nonfigurative words, phrases, and statements in uncomplicated passages.
- Use context to determine the appropriate meaning of virtually any word, phrase, or statement in uncomplicated passages.
- Use context to determine the appropriate meaning of some figurative and nonfigurative words, phrases, and statements in more challenging passages.
- Determine the appropriate meaning of words, phrases, or statements from figurative or somewhat technical contexts.
- Determine, even when the language is richly figurative and the vocabulary is difficult, the appropriate meaning of context-dependent words, phrases, or statements in virtually any passage.

R5 Generalizations and Conclusions

- Draw simple generalizations and conclusions about the main characters in uncomplicated literary narratives.
- Draw simple generalizations and conclusions about people, ideas, and so forth in uncomplicated passages.
- Draw generalizations and conclusions about people, ideas, and so forth in uncomplicated passages.
- Draw simple generalizations and conclusions using details that support the main points of more challenging passages.
- Draw subtle generalizations and conclusions about characters, ideas, and so forth in uncomplicated literary narratives.
- Draw generalizations and conclusions about people, ideas, and so forth in more challenging passages.
- Use information from one or more sections of a more challenging passage to draw generalizations and conclusions about people, ideas, and so forth.
- Draw complex or subtle generalizations and conclusions about people, ideas, and so forth, often by synthesizing information from different portions of the passage.
- Understand and generalize about portions of a complex literary narrative.

Science

S1 Interpretation of Data

- Select a single piece of data (numerical or non-numerical) from a simple data presentation (e.g., a table or graph with two or three variables or a food web diagram).
- Identify basic features of a table, graph, or diagram (e.g., headings, units of measurement, or axis labels).

- Select two or more pieces of data from a simple data presentation.
- Understand basic scientific terminology.
- Find basic information in a brief body of text.
- Determine how the value of one variable changes as the value of another variable changes in a simple data presentation.
- Select data from a complex data presentation (e.g., a table or graph with more than three variables or a phase diagram).
- Compare or combine data from a simple data presentation (e.g., order or sum data from a table).
- Translate information into a table, graph, or diagram.
- Compare or combine data from two or more simple data presentations (e.g., categorize data from a table using a scale from another table).
- Compare or combine data from a complex data presentation.
- Interpolate between data points in a table or graph.
- Determine how the value of one variable changes as the value of another variable changes in a complex data presentation.
- Identify and/or use a simple (e.g., linear) mathematical relationship between data.
- Analyze given information when presented with new, simple information.
- Compare or combine data from a simple data presentation with data from a complex data presentation.
- Identify and/or use a complex (e.g., nonlinear) mathematical relationship between data.
- Extrapolate from data points in a table or graph.
- Compare or combine data from two or more complex data presentations.
- Analyze given information when presented with new, complex information.

S2 Scientific Investigation

- Understand the methods and tools used in a simple experiment.
- Understand the methods and tools used in a moderately complex experiment.
- Understand a simple experimental design.
- Identify a control in an experiment.
- Identify similarities and differences between experiments.
- Understand the methods and tools used in a complex experiment.
- Understand a complex experimental design.
- Predict the results of an additional trial or measurement in an experiment.
- Determine the experimental conditions that would produce specified results.
- Determine the hypothesis for an experiment.
- Identify an alternate method for testing a hypothesis.
- Understand precision and accuracy issues.
- Predict how modifying the design or methods of an experiment will affect results.
- Identify an additional trial or experiment that could be performed to enhance or evaluate experimental results.

S3 Evaluation of Models, Inferences, and Experimental Results

- Select a simple hypothesis, prediction, or conclusion that is supported by a data presentation or a model.
- Identify key issues or assumptions in a model.

- Select a simple hypothesis, prediction, or conclusion that is supported by two or more data presentations or models.
- Determine whether given information supports or contradicts a simple hypothesis or conclusion and why.
- Identify strengths and weaknesses in one or more models.
- Identify similarities and differences between models.
- Determine which model(s) is/are supported or weakened by new information.
- Select a data presentation or a model that supports or contradicts a hypothesis, prediction, or conclusion.
- Select a complex hypothesis, prediction, or conclusion that is supported by a data presentation or model.
- Determine whether new information supports or weakens a model and why.
- Use new information to make a prediction based on a model.
- Select a complex hypothesis, prediction, or conclusion that is supported by two or more data presentations or models.
- Determine whether given information supports or contradicts a complex hypothesis or conclusion and why.

Writing

W1 Expressing Judgments

- Show a little understanding of the persuasive purpose of the task, but neglect to take or to maintain a position on the issue in the prompt.
- Show limited recognition of the complexity of the issue in the prompt.
- Show a basic understanding of the persuasive purpose of the task by taking a position on the issue in the prompt, but do not maintain that position.
- Show a little recognition of the complexity of the issue in the prompt by acknowledging, but only briefly describing, a counterargument to the writer's position.
- Show understanding of the persuasive purpose of the task by taking a position on the issue in the prompt.
- Show some recognition of the complexity of the issue in the prompt by doing the following:
    - Acknowledging counterarguments to the writer's position
    - Providing some response to counterarguments to the writer's position
- Show clear understanding of the persuasive purpose of the task by taking a position on the specific issue in the prompt and offering a broad context for discussion.
- Show recognition of the complexity of the issue in the prompt by doing the following:
    - Partially evaluating implications and/or complications of the issue
    - Posing and partially responding to counterarguments to the writer's position
- Show clear understanding of the persuasive purpose of the task by taking a position on the specific issue in the prompt and offering a critical context for discussion.
- Show understanding of the complexity of the issue in the prompt by doing the following:
    - Examining different perspectives
    - Evaluating implications or complications of the issue
    - Posing and fully discussing counterarguments to the writer's position

W2 Focusing on the Topic

- Maintain a focus on the general topic in the prompt through most of the essay.

- Maintain a focus on the general topic in the prompt throughout the essay.
- Maintain a focus on the general topic in the prompt throughout the essay, and attempt a focus on the specific issue in the prompt.
- Present a thesis that establishes focus on the topic.
- Maintain a focus on discussion of the specific topic and issue in the prompt throughout the essay.
- Present a thesis that establishes a focus on the writer's position on the issue.
- Maintain a clear focus on discussion of the specific topic and issue in the prompt throughout the essay.
- Present a critical thesis that clearly establishes the focus on the writer's position on the issue.

W3 Developing a Position

- Offer a little development, with one or two ideas; if examples are given, they are general and may not be clearly relevant; resort often to merely repeating ideas.
- Show little or no movement between general and specific ideas and examples.
- Offer limited development of ideas using a few general examples; resort sometimes to merely repeating ideas.
- Show little movement between general and specific ideas and examples.
- Develop ideas by using some specific reasons, details, and examples.
- Show some movement between general and specific ideas and examples.
- Develop most ideas fully, using some specific and relevant reasons, details, and examples.
- Show clear movement between general and specific ideas and examples.
- Develop several ideas fully, using specific and relevant reasons, details, and examples.
- Show effective movement between general and specific ideas and examples.

W4 Organizing Ideas

- Provide a discernible organization with some logical grouping of ideas in parts of the essay.
- Use a few simple and obvious transitions.
- Present a discernible, though minimally developed, introduction and conclusion.
- Provide a simple organization with logical grouping of ideas in parts of the essay.
- Use some simple and obvious transitional words, though they may at times be inappropriate or misleading.
- Present a discernible, though underdeveloped, introduction and conclusion.
- Provide an adequate but simple organization with logical grouping of ideas in parts of the essay but with little evidence of logical progression of ideas.
- Use some simple and obvious, but appropriate, transitional words and phrases.
- Present a discernible introduction and conclusion with little development.
- Provide unity and coherence throughout the essay, sometimes with a logical progression of ideas.
- Use relevant, though at times simple and obvious, transitional words and phrases to convey logical relationships between ideas.
- Present a somewhat developed introduction and conclusion.
- Provide unity and coherence throughout the essay, often with a logical progression of ideas.
- Use relevant transitional words, phrases, and sentences to convey logical relationships between ideas.
- Present a well-developed introduction and conclusion.

W5 Using Language

- Show limited control of language by doing the following:
    - Correctly employing some of the conventions of standard English grammar, usage, and mechanics but with distracting errors that sometimes significantly impede understanding
    - Using simple vocabulary
    - Using simple sentence structure
    - Correctly employing some of the conventions of standard English grammar, usage, and mechanics but with distracting errors that sometimes impede understanding
    - Using simple but appropriate vocabulary
    - Using a little sentence variety, though most sentences are simple in structure
    - Correctly employing many of the conventions of standard English grammar, usage, and mechanics but with some distracting errors that may occasionally impede understanding
    - Using appropriate vocabulary
    - Using some varied kinds of sentence structures to vary pace
    - Correctly employing most conventions of standard English grammar, usage, and mechanics, with a few distracting errors but none that impede understanding
    - Using some precise and varied vocabulary
    - Using several kinds of sentence structures to vary pace and to support meaning
    - Correctly employing most conventions of standard English grammar, usage, and mechanics, with just a few, if any, errors
    - Using precise and varied vocabulary
    - Using a variety of sentence structures to vary pace and to support meaning

Appendix D: National Industry Standards

Construction Technology Standards

Contren Core

SAF - BASIC SAFETY

- Identify the responsibilities and personal characteristics of a professional craftsperson.
- Explain the role that safety plays in the construction crafts.
- Describe what jobsite safety means.
- Explain the appropriate safety precautions around common jobsite hazards.
- Demonstrate the use and care of appropriate personal protective equipment.
- Follow safe procedures for lifting heavy objects.
- Describe safe behavior on and around ladders and scaffolds.
- Explain the importance of the HazCom (Hazard Communication Standard) requirement and MSDSs (material safety data sheets).
- Describe fire prevention and firefighting techniques.
- Define safe work procedures around electrical hazards.

MAT - INTRODUCTION TO CONSTRUCTION MATH

- Add, subtract, multiply, and divide whole numbers, with and without a calculator.
- Use a standard ruler and a metric ruler to measure.
- Add, subtract, multiply, and divide fractions.
- Add, subtract, multiply, and divide decimals, with and without a calculator.
- Convert decimals to percents and percents to decimals.
- Convert fractions to decimals and decimals to fractions.
- Explain what the metric system is and how it is important in the construction trade.
- Recognize and use metric units of length, weight, volume, and temperature.
- Recognize some of the basic shapes used in the construction industry, and apply basic geometry to measure them.

HTO - INTRODUCTION TO HAND TOOLS

- Recognize and identify some of the basic hand tools used in the construction trade.
- Use these tools safely.
- Describe the basic procedures for taking care of these tools.

PTO - INTRODUCTION TO POWER TOOLS

- Identify commonly used power tools of the construction trade.
- Use power tools safely.
- Explain how to maintain power tools properly.

BLU - INTRODUCTION TO BLUEPRINTS

- Recognize and identify basic blueprint terms, components, and symbols.
- Relate information on blueprints to actual locations on the print.
- Recognize different classifications of drawings.
- Interpret and use drawing dimensions.

COM - COMMUNICATION SKILLS

- Demonstrate the ability to understand information and instructions that are presented in both written and verbal form.
- Demonstrate the ability to communicate effectively in on-the-job situations using written and verbal skills.

EMP - EMPLOYABILITY SKILLS

- Explain the construction industry, the role of the companies that make up the industry, and the role of individual professionals in the industry.
- Demonstrate critical-thinking skills and the ability to solve problems using those skills.
- Demonstrate knowledge of computer systems, and explain common uses for computers in the construction industry.
- Demonstrate effective relationship skills with teammates and supervisors, exhibit the ability to work on a team, and demonstrate appropriate leadership skills.
- Be aware of workplace issues such as sexual harassment, stress, and substance abuse.

Carpentry—Level One

OTT - ORIENTATION TO THE TRADE

- Describe the history of the carpentry trade.
- Identify the aptitudes, behaviors, and skills needed to be a successful carpenter.
- Identify the training opportunities within the carpentry trade.
- Identify the career and entrepreneurial opportunities within the carpentry trade.
- Identify the responsibilities of a person working in the construction industry.
- State the personal characteristics of a professional.
- Explain the importance of safety in the construction industry.

BMF - BUILDING MATERIALS, FASTENERS, AND ADHESIVES

- Identify various types of building materials and their uses.
- State the uses of various types of hardwoods and softwoods.
- Identify the different grades and markings of wood building materials.
- Identify the safety precautions associated with building materials.
- Describe the proper method of storing and handling building materials.
- State the uses of various types of engineered lumber.
- Calculate the quantities of lumber and wood products using industry-standard methods.
- Describe the fasteners, anchors, and adhesives used in construction work, and explain their uses.

HPT - HAND AND POWER TOOLS

- Identify the hand tools commonly used by carpenters, and describe their uses.
- Use hand tools in a safe and appropriate manner.
- State the general safety rules for operating all power tools, regardless of type.
- State the general rules for properly maintaining all power tools, regardless of type.
- Identify the portable power tools commonly used by carpenters, and describe their uses.
- Use portable power tools in a safe and appropriate manner.

RPE - READING PLANS AND ELEVATIONS

- Describe the types of drawings usually included in a set of plans, and list the information found on each type.
- Identify the different types of lines used on construction drawings.
- Identify selected architectural symbols commonly used to represent materials on plans.
- Identify selected electrical, mechanical, and plumbing symbols commonly used on plans.
- Identify selected abbreviations commonly used on plans.
- Read and interpret plans, elevations, schedules, sections, and details contained in basic construction drawings.
- State the purpose of written specifications.
- Identify and describe the parts of a specification.
- Demonstrate or describe how to perform a quantity takeoff for materials.

FSY - FLOOR SYSTEMS

- Identify the different types of framing systems.
- Read and interpret drawings and specifications to determine floor system requirements.
- Identify floor and sill framing and support members.
- Name the methods used to fasten sills to the foundation.
- Given specific floor load and span data, select the proper girder/beam size from a list of available girders/beams.
- List and recognize different types of floor joists.
- Given specific floor load and span data, select the proper joist size from a list of available joists.
- List and recognize different types of bridging.
- List and recognize different types of flooring materials.
- Explain the purposes of subflooring and underlayment.
- Match selected fasteners used in floor framing to their correct uses.
- Estimate the amount of material needed to frame a floor assembly.
- Demonstrate the ability to do the following:
  - Lay out and construct a floor assembly
  - Install bridging
  - Install joists for a cantilever floor
  - Install a subfloor using butt-joint plywood/OSB panels
  - Install a single floor system using tongue-and-groove plywood/OSB panels

WCF - WALL AND CEILING FRAMING

- Identify the components of a wall and ceiling layout.
- Describe the procedure for laying out a wood frame wall, including plates, corner posts, door and window openings, partition Ts, bracing, and firestops.
- Describe the correct procedure for assembling and erecting an exterior wall.
- Identify the common materials and methods used for installing sheathing on walls.
- Lay out, assemble, erect, and brace exterior walls for a frame building.
- Describe wall framing techniques used in masonry construction.
- Explain the use of metal studs in wall framing.
- Describe the correct procedure for laying out ceiling joists.
- Cut and install ceiling joists on a wood frame building.
- Estimate the materials required to frame walls and ceilings.

RFR - ROOF FRAMING

- Understand the terms associated with roof framing.
- Identify the roof framing members used in gable and hip roofs.
- Identify the methods used to calculate the length of a rafter.
- Identify the various types of trusses used in roof framing.
- Use a rafter framing square, speed square, and calculator in laying out a roof.
- Identify various types of sheathing used in roof construction.
- Frame a gable roof with vent openings.
- Frame a roof opening.
- Erect a gable roof using trusses.
- Estimate the materials used in framing and sheathing a roof.

ICR - INTRODUCTION TO CONCRETE, REINFORCING MATERIALS, AND FORMS

- Identify the properties of cement.
- Describe the composition of concrete.
- Perform volume estimates for concrete quantity requirements.
- Identify types of concrete reinforcement materials, and describe their uses.
- Identify various types of footings, and explain their uses.
- Identify the parts of various types of forms.
- Explain the safety procedures associated with the construction and use of concrete forms.
- Erect, plumb, and brace a simple concrete form with reinforcement.

WED - WINDOWS AND EXTERIOR DOORS

- Identify various types of fixed, sliding, and swinging windows.
- Identify the parts of a window installation.
- State the requirements for a proper window installation.
- Install a pre-hung window.
- Identify the common types of exterior doors, and explain how they are constructed.
- Identify the parts of a door installation.
- Identify the types of thresholds used with exterior doors.
- Install a pre-hung exterior door.
- Identify the various types of locksets used on exterior doors, and explain how they are installed.

- Install a lockset.

BSL - BASIC STAIR LAYOUT

- Identify the various types of stairs.
- Identify the various parts of stairs.
- Identify the materials used in the construction of stairs.
- Interpret construction drawings of stairs.
- Calculate the total rise, number and size of risers, and number and size of treads required for a stairway.
- Lay out and cut stringers, risers, and treads.
- Build a small stair unit with a temporary handrail.

Electrical—Level One

ESF - ELECTRICAL SAFETY

- Demonstrate safe working procedures in a construction environment.
- Explain the purpose of OSHA and how it promotes safety on the job.
- Identify electrical hazards and how to avoid or minimize them in the workplace.
- Explain safety issues concerning lock-out/tag-out procedures, personal protection using assured grounding and isolation programs, confined space entry, respiratory protection, and fall protection systems.

HBD - HAND BENDING

- Identify the methods of hand bending conduit.
- Identify the various methods used to install conduit.
- Use math formulas to determine conduit bends.
- Make 90° bends, back-to-back bends, offsets, kicks, and saddle bends using a hand bender.
- Cut, ream, and thread conduit.

FAA - FASTENERS AND ANCHORS

- Identify and explain the use of threaded fasteners.
- Identify and explain the use of non-threaded fasteners.
- Identify and explain the use of anchors.
- Demonstrate the correct applications for fasteners and anchors.
- Install fasteners and anchors.

ETO - ELECTRICAL THEORY ONE

- Recognize what atoms are and how they are constructed.
- Define voltage, and identify the ways in which it can be produced.
- Explain the difference between conductors and insulators.
- Define the units of measurement that are used to measure the properties of electricity.
- Explain how voltage, current, and resistance are related to each other.
- Using the formula for Ohm’s law, calculate an unknown value.
- Explain the different types of meters used to measure voltage, current, and resistance.

- Using the power formula, calculate the amount of power used by a circuit.

ETT - ELECTRICAL THEORY TWO

- Explain the basic characteristics of a series circuit.
- Explain the basic characteristics of a parallel circuit.
- Explain the basic characteristics of a series–parallel circuit.
- Calculate, using Kirchhoff's voltage law, the voltage drop in series, parallel, and series–parallel circuits.
- Calculate, using Kirchhoff's current law, the total current in parallel and series–parallel circuits.
- Find the total amount of resistance in a series circuit.
- Find the total amount of resistance in a parallel circuit.
- Find the total amount of resistance in a series–parallel circuit.

ETE - ELECTRICAL TEST EQUIPMENT

- Explain the operation of and describe the following pieces of test equipment:
  - Ammeter • Voltmeter
  - Ohmmeter • Volt-ohm-milliammeter (VOM)
  - Wattmeter • Mega ohmmeter
  - Frequency meter • Power factor meter
  - Continuity tester • Voltage tester
  - Recording instruments • Cable-length meters
- Explain how to read and convert from one scale to another using the above test equipment.
- Explain the importance of proper meter polarity.
- Define frequency, and explain the use of a frequency meter.
- Explain the difference between digital and analog meters.

NEC - INTRODUCTION TO THE NATIONAL ELECTRICAL CODE

- Explain the purpose and history of the National Electrical Code (NEC).
- Describe the layout of the NEC.
- Explain how to navigate the NEC.
- Describe the purpose of the National Electrical Manufacturers Association (NEMA) and the National Fire Protection Association (NFPA).
- Explain the role of testing laboratories.

RBF - RACEWAYS, BOXES, AND FITTINGS

- Describe various types of cable trays and raceways.
- Identify and select various types and sizes of raceways.
- Identify and select various types and sizes of cable trays.
- Identify and select various types of raceway fittings.
- Identify various methods used to install raceways.
- Demonstrate knowledge of NEC raceway requirements.
- Describe procedures for installing raceways and boxes on masonry surfaces.
- Describe procedures for installing raceways and boxes on concrete surfaces.
- Describe procedures for installing raceways and boxes in a metal stud environment.

- Describe procedures for installing raceways and boxes in a wood frame environment.
- Describe procedures for installing raceways and boxes on drywall surfaces.
- Recognize safety precautions that must be followed when working with boxes and raceways.

CON - CONDUCTORS

- Explain the various sizes and gauges of wire in accordance with American Wire Gauge standards.
- Identify insulation and jacket types according to conditions and applications.
- Describe voltage ratings of conductors and cables.
- Read and identify markings on conductors and cables.
- Use the tables in the NEC to determine the ampacity of a conductor.
- State the purpose of stranded wire.
- State the purpose of compressed conductors.
- Describe the different materials from which conductors are made.
- Describe the different types of conductor insulation.
- Describe the color coding of insulation.
- Describe instrumentation control wiring.
- Describe the equipment required for pulling wire through conduit.
- Describe the procedure for pulling wire through conduit.
- Install conductors in conduit.
- Pull conductors in a conduit system.

IEB - INTRODUCTION TO ELECTRICAL BLUEPRINTS

- Explain the basic layout of a blueprint.
- Describe the information included in the title block of a blueprint.
- Identify the types of lines used on blueprints.
- Identify common symbols used on blueprints.
- Understand the use of architect's and engineer's scales.
- Interpret electrical drawings, including site plans, floor plans, and detail drawings.
- Read equipment schedules found on electrical blueprints.
- Describe the type of information included in electrical specifications.

WCI - WIRING: COMMERCIAL AND INDUSTRIAL

- Identify and state the functions and ratings of single-pole, double-pole, three-way, four-way, dimmer, special, and safety switches.
- Explain NEMA classifications as they relate to switches and enclosures.
- Explain the NEC requirements concerning wiring devices.
- Identify and state the functions and ratings of straight blade, twist lock, and pin and sleeve receptacles.
- Identify and define receptacle terminals and disconnects.
- Identify and define ground fault circuit interrupters.
- Explain the box mounting requirements in the NEC.
- Use a wire stripper to strip insulation from a wire.
- Use a solderless connector to splice wires together.
- Identify and state the functions of limit switches and relays.
- Identify and state the function of switchgear.

WRE - WIRING: RESIDENTIAL

- Describe how to determine electric service requirements for dwellings.
- Explain the grounding requirements of a residential electric service.
- Calculate and select service entrance equipment.
- Select the proper wiring methods for various types of residences.
- Explain the role of the NEC in residential wiring.
- Compute branch circuit loads, and explain their installation requirements.
- Explain the types and purposes of equipment grounding conductors.
- Explain the purpose of ground fault circuit interrupters, and tell where they must be installed.
- Size outlet boxes, and select the proper type for different wiring methods.
- Describe rules for installing electric space heating and HVAC equipment.
- Describe the installation rules for electrical systems around swimming pools, spas, and hot tubs.
- Explain how wiring devices are selected and installed.
- Describe the installation and control of lighting fixtures.

Plumbing—Level One

IPP - INTRODUCTION TO THE PLUMBING PROFESSION

- Describe the history of the plumbing profession.
- Identify the responsibilities of a person working in the construction industry.
- State the personal characteristics of a professional.
- Identify the stages of progress within the plumbing profession and its positive impact on society.

PLS - PLUMBING SAFETY

- Describe the common unsafe acts and unsafe conditions that cause accidents.
- Describe how to handle unsafe acts and unsafe conditions.
- Explain how the cost of accidents and illnesses affects everyone on site.
- Demonstrate the use and care of appropriate personal protective equipment.
- Identify jobsite hazardous work specific to plumbers.
- Demonstrate the proper use of ladders.
- Demonstrate how to maintain power tools safely.
- Explain how to work safely in and around a trench.
- Describe and demonstrate the lock-out/tag-out process.

PLT - PLUMBING TOOLS

- Identify the basic hand and power tools used in the plumbing trade.
- Demonstrate the proper use of plumbing tools.
- Demonstrate the ability to know when and how to select the proper tool(s) for tasks.
- Demonstrate the proper maintenance for caring for hand and power tools.
- Demonstrate how to prepare a surface for tool use.
- Describe the safety requirements for using plumbing tools.

IPM - INTRODUCTION TO PLUMBING MATH

- Add, subtract, multiply, and divide whole numbers.
- Add, subtract, multiply, and divide fractions.
- Add, subtract, multiply, and divide decimals.
- Convert decimals to percentages and percentages to decimals.
- Convert fractions to decimals and decimals to fractions.
- Explain what the metric system is and how it is important in the plumbing trade.
- Square various numbers, and take square roots of numbers, with and without a calculator.
- Identify the parts of a fitting, and use common pipe-measuring techniques.
- Use fitting dimension tables to determine fitting allowances and thread makeup.
- Calculate end-to-end measurements using fitting allowances and thread makeup.

IPD - INTRODUCTION TO PLUMBING DRAWINGS

- Identify pictorial (isometric and oblique), schematic, and orthographic drawings, and discuss how different views are used to depict information about objects.
- Identify the basic symbols used in schematic drawings of pipe assemblies.
- Explain the types of drawings that may be included in a set of plumbing drawings and the relationship among the different drawings.
- Interpret plumbing-related information from a set of plumbing drawings.
- Sketch orthographic and schematic drawings.
- Use an architect's scale to draw lines to scale and to measure lines drawn to scale.
- Discuss how code requirements apply to certain drawings.

PPF - PLASTIC PIPE AND FITTINGS

- Identify types of materials and schedules of plastic piping.
- Identify proper and improper applications of plastic piping.
- Identify types of fittings and valves used with plastic piping.
- Identify and determine the kinds of hangers and supports needed for plastic piping.
- Identify the various techniques used in hanging and supporting plastic piping.
- Properly measure, cut, and join plastic piping.
- Explain proper procedures for the handling, storage, and protection of plastic pipes.

CPF - COPPER PIPE AND FITTINGS

- Identify the types of materials and schedules used with copper piping.
- Identify the material properties, storage, and handling requirements of copper piping.
- Identify the types of fittings and valves used with copper piping.
- Identify the techniques used in hanging and supporting copper piping.
- Properly measure, ream, cut, and join copper piping.
- Identify the hazards and safety precautions associated with copper piping.

CIF - CAST-IRON PIPE AND FITTINGS

- Recognize proper and improper applications of cast-iron piping.
- Identify the material properties, storage, and handling requirements of carbon steel piping.
- Identify the types of materials and schedules used in cast-iron piping.
- Identify the types of fittings used with cast-iron piping.
- Identify the various techniques used in handling and supporting cast-iron piping.
- Properly measure, cut, and join cast-iron piping.
- Identify the hazards and safety precautions associated with cast-iron piping.

CSF - CARBON STEEL PIPE AND FITTINGS

- Recognize proper applications of carbon steel piping.
- Identify the material properties, storage, and handling requirements of carbon steel piping.
- Identify the various techniques used in hanging and supporting carbon steel piping.
- Properly measure, cut, groove, thread, and join carbon steel piping.

CST - CORRUGATED STAINLESS STEEL TUBING

- Identify the common manufacturers of corrugated stainless steel tubing.
- Recognize proper and improper applications of corrugated stainless steel tubing.
- Identify the various techniques used in hanging and supporting corrugated stainless steel tubing.
- Explain how to properly measure, cut, join, and groove corrugated stainless steel tubing.
- Identify the material properties, storage, and handling requirements of corrugated stainless steel tubing.

FXF - FIXTURES AND FAUCETS

- Identify the basic types of materials used in the manufacture of plumbing fixtures.
- Discuss common types of sinks, lavatories, and faucets.
- Identify and discuss common types of bathtubs, bath–shower modules, shower stalls, and shower baths.
- Discuss common types of toilets, urinals, and bidets.
- Identify and describe common types of drinking fountains and water coolers.
- Discuss common types of garbage disposals and domestic dishwashers.

DWV - INTRODUCTION TO DRAIN, WASTE, AND VENT (DWV) SYSTEMS

- Explain how waste moves from a fixture through the drain system to the environment.
- Identify the major components of a drainage system, and describe their functions.
- Identify the different types of traps and their components, explain the importance of traps, and identify the ways that traps can lose their seals.
- Identify the various types of drain, waste, and vent (DWV) fittings, and describe their applications.

- Identify significant code and health issues, violations, and consequences related to DWV systems.

WDS - INTRODUCTION TO WATER DISTRIBUTION SYSTEMS

- Describe the process by which water is distributed in municipal, residential, and private water systems.
- Identify the major components of a water distribution system, and describe the function of each component.
- Explain the relationships between components of a water distribution system.

Appendix E: National Educational Technology Standards for Students[2]

T1 Creativity and Innovation
T2 Communication and Collaboration
T3 Research and Information Fluency
T4 Critical Thinking, Problem Solving, and Decision Making
T5 Digital Citizenship
T6 Technology Operations and Concepts

T1 Creativity and Innovation

Students demonstrate creative thinking, construct knowledge, and develop innovative products and processes using technology. Students do the following:

a. Apply existing knowledge to generate new ideas, products, or processes
b. Create original works as a means of personal or group expression
c. Use models and simulations to explore complex systems and issues
d. Identify trends and forecast possibilities

T2 Communication and Collaboration

Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others. Students do the following:

a. Interact, collaborate, and publish with peers, experts, or others employing a variety of digital environments and media
b. Communicate information and ideas effectively to multiple audiences using a variety of media and formats
c. Develop cultural understanding and global awareness by engaging with learners of other cultures
d. Contribute to project teams to produce original works or solve problems

T3 Research and Information Fluency

Students apply digital tools to gather, evaluate, and use information. Students do the following:

a. Plan strategies to guide inquiry
b. Locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media
c. Evaluate and select information sources and digital tools based on the appropriateness to specific tasks
d. Process data and report results

[2] International Society for Technology in Education. (2000). *National educational technology standards for students (NETS).* Retrieved February 27, 2008, from http://www.iste.org/

T4 Critical Thinking, Problem Solving, and Decision Making

Students use critical-thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources. Students do the following:

a. Identify and define authentic problems and significant questions for investigation
b. Plan and manage activities to develop a solution or complete a project
c. Collect and analyze data to identify solutions and/or make informed decisions
d. Use multiple processes and diverse perspectives to explore alternative solutions

T5 Digital Citizenship

Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior. Students do the following:

a. Advocate and practice safe, legal, and responsible use of information and technology
b. Exhibit a positive attitude toward using technology that supports collaboration, learning, and productivity
c. Demonstrate personal responsibility for lifelong learning
d. Exhibit leadership for digital citizenship

T6 Technology Operations and Concepts

Students demonstrate a sound understanding of technology concepts, systems, and operations. Students do the following:

a. Understand and use technology systems
b. Select and use applications effectively and productively
c. Troubleshoot systems and applications
d. Transfer current knowledge to learning of new technologies