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Architecture and Drafting

Mississippi Department of Education



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Direct inquiries to

Doug Ferguson
Instructional Design Specialist
Research and Curriculum Unit
Mississippi State University
P.O. Drawer DX
Mississippi State, MS 39762
662.325.2510
E-mail: doug.ferguson@rcu.msstate.edu

Kendra Taylor
Program Coordinator
Office of Career and Technical Education
Mississippi Department of Education
P.O. Box 771
Jackson, MS 39205
601.359.3461
E-mail: ktaylor@mde.k12.ms.us

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Research and Curriculum Unit
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Betsey Smith, Curriculum Manager
Jolanda Harris, Educational Technologist
Kristen Dechert, Editor

The Research and Curriculum Unit (RCU), located in Starkville, MS, 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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Standards

Standards are superscripted in each unit and are referenced in the appendices. Standards in the *Architecture Curriculum Framework and Supporting Materials* are based on the following:

Industry Standard: American Design Drafting Association

The American Design Drafting Association is an international nonprofit, professional membership and educational organization born in Bartlesville, Oklahoma in 1948. **Copyright 2006.**

Common Core State Standards Initiative

The Common Core State Standards provide a consistent, clear understanding of what students are expected to learn, so teachers and parents know what they need to do to help them. The standards are designed to be robust and relevant to the real world, reflecting the knowledge and skills that our young people need for success in college and careers. With American students fully prepared for the future, our communities will be best positioned to compete successfully in the global economy. **Copyright 2010.**

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National Educational Technology Standards for Students

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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.

Preface

Secondary career and 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).

Architecture and Drafting Executive Summary

Pathway Description

Architecture and Drafting is a pathway in the Architecture and Construction career cluster. Study in this program allows students to produce workable drawings on the drawing board and with the computer. Upon successful completion of the program, the student will be qualified for an entry-level drafting or related position or may pursue postsecondary education. Skills developed through the course of study assist students in meeting requirements for the ADDA certification. Students are provided the opportunity to participate in career and technical student organizations, including SkillsUSA.

Architectural Design and Drafting I is the entry-level course of the secondary Architecture and Drafting program. Students will gain foundation competencies related to orientation, safety, leadership and personal development, and drafting and CAD skills. Students receive 2-2.5 Carnegie units, depending upon time spent in the course.

Architectural Design and Drafting II is the exit level course of the secondary Architecture and Drafting program. Students will gain foundation competencies related to orientation, safety, advanced leadership and personal development, architectural drafting, and CAD skills. The architectural drafting section includes floor plans, elevations, foundations, and sections. Students receive 2-2.5 Carnegie units, depending upon time spent in the course.

Industry Certification

An industry-recognized certification is available through the American Design Drafting Association and the American Digital Design Association.

Assessment

Students will be assessed using the Architecture and Drafting MS-CPAS2 test. The MS-CPAS2 blueprint can be found at the Research and Curriculum Unit's Web site (www.rcu.msstate.edu). All students will test after Year 1 of the Architecture and Drafting program. A second test covering the second year material in Architecture and Drafting will be administered to students upon completion of their program. If there are questions regarding assessment of this program, please contact the Architecture and Construction Instructional Design Specialist at the Research and Curriculum Unit at 662.325.2510.

Student Prerequisites

In order for students to be successful in the Architecture and Drafting 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

Applied Academic Credit (if applicable)

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 Carnegie unit of Applied Math credit that can be used for graduation requirements.

If there are questions regarding applied academic credit, please contact the program supervisor listed on the front page of this document.

Licensure Requirements

986 Career Pathway: Architecture and Drafting

This endorsement licenses a person to teach the following secondary courses:

- 994300 2-Carnegie unit Architectural Design and Drafting I
- 994301 2-Carnegie unit Architectural Design and Drafting II
- 994302 1-Carnegie unit Concepts of Drafting
- 994303 1-Carnegie unit Drafting Design
- 994304 1-Carnegie unit Architectural Drafting
- 994305 1-Carnegie unit Architectural Drafting Application

Minimum Requirements for this Endorsement:

1. Education

- Hold a 2-year college degree (associate degree) or higher from an accredited institution of higher education.

2. Occupational Experience and Related Assessment of that Experience

- Applicants with an associate 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.
- Applicants 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.

This endorsement requires the following assessment(s) of occupational expertise:

American Design Drafting Association Certification: ADDA Certified Drafter

OR

Other teacher occupational competency assessment approved by the Mississippi Department of Education Office of Career and Technical Education.

3. Technology Literacy and Related Assessment of that Competency

- Applicant must validate technology competency by attaining the established minimum score or higher on an assessment approved by the Mississippi Department of Education (MDE). The assessment must be directly related to technology competency required by the grade level and subject matter being taught. Approved assessments for this license are IC3, Propulse, or other specific assessment created by third-party vendors, authorized by the Local Education Agency and approved by the MDE.

4. Teacher Education Preparation and Related Assessment(s) of that Education

- Applicant must enroll immediately in the Vocational Instructor Preparation (VIP) program.
- Applicant must complete the individualized professional development plan requirements of the VIP program prior to the expiration date of the 3-year vocational license.
- Applicant must successfully complete a certification for online learning workshop, module, or course that is approved by the MDE.
- Applicant must successfully complete the Architecture and Drafting 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 986 endorsement—a 5-year license. If the applicant does not meet all requirements, the applicant may 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

Option 1—Four 1-Carnegie-Unit Courses

Architecture and Drafting is an instructional program designed to teach students to produce workable drawings on the drawing board and with the computer. Upon successful completion of the program, the student will be qualified for an entry level drafting or related position or may pursue postsecondary education.

The content of this curriculum framework is based on national standards as developed by the **American Design Drafting Association**.

This curriculum consists of four one-credit courses, which should be completed in the following sequence:

1. Concepts of Drafting (Course Code: 994302)
2. Drafting Design (Course Code: 994303)
3. Architectural Drafting (Course Code: 994304)
4. Architectural Drafting Application (Course Code: 994305)

Course Description: Concepts of Drafting (Course Code: 994302) includes an introduction to the field as well as fundamentals of safety, math, geometric construction, graphic projection, and computer aided drafting (CAD) applications. This is a one-Carnegie-unit course.

Course Description: Drafting and Design (Course Code: 994303) emphasizes an overview of safety and an in-depth study of the elements of drafting. This course gives student's real-world, hands-on practice in these areas. This one-Carnegie-unit course should only be taken after student successfully passes Concepts of Drafting.

Course Description: Architectural Drafting (Course Code: 994304) includes a study of mathematics used in drafting and residential and commercial drafting techniques. This course also reinforces safety related to the drafting and design industry. This one-Carnegie-unit course should only be taken after student successfully passes Drafting and Design.

Course Description: Architectural Drafting Application (Course Code: 994305) is a continued study of residential and commercial drafting techniques. This course also includes a study of the uses of drafting and design in today's global market place. This one-Carnegie-unit course should only be taken after student successfully passes Architectural Drafting.

Concepts of Drafting—Course Code: 994302

Unit Number	Unit Name	Hours
1	Orientation and Safety	14
2	Introduction to Drafting	15
3	Lettering	7
4	Geometric Construction	25
5	Computer Aided Drafting (CAD)	20
6	Orthographic Projection	30
Total		111

Drafting and Design—Course Code: 994303

Unit Number	Unit Name	Hours
1	Orientation and Safety	14
7	Dimensioning	8
8	Sectional Views	14
9	Auxiliary Views	10
10	Pictorial Views	15
11	Machine Drafting	40
Total		101

Architectural Drafting—Course Code: 994304

Unit Number	Unit Name	Hours
1	Orientation and Safety	14
12	Architectural Drafting Math	25
13	Residential Architectural Drafting I	70
Total		109

Architectural Drafting Application—Course Code: 994305

Unit Number	Unit Name	Hours
1	Orientation and Safety	14
14	Residential Architectural Drafting II	70
15	Field Applications of Architectural Drafting	25
Total		109

Option 2—Two 2-Carnegie-Unit Courses

Architecture and Drafting is an instructional program designed to teach students to produce workable drawings on the drawing board and with the computer. Upon successful completion of the program, the student will be qualified for an entry level drafting or related position or may pursue postsecondary education.

The content of this curriculum framework is based on national standards as developed by the American Design Drafting Association.

Course Description: Architectural Design and Drafting I (994300) is the entry level course of the secondary Architecture I & II program. Students will gain foundation competencies related to orientation, safety, leadership and personal development, and drafting and CAD skills. Students receive 2-2½ Carnegie units, depending upon time spent in the course.

Course Description: Architectural Design and Drafting II (994301) is the exit level course of the secondary Architecture and Drafting program. Students will gain foundation competencies related to orientation, safety, advanced leadership and personal development, architectural drafting, and CAD skills. The architectural drafting section includes floor plans, elevations, foundations, and sections. Students receive 2-2½ Carnegie units, depending upon time spent in the course. This course should only be taken after the student successfully passes Architectural Design and Drafting I.

Architectural Design and Drafting I — Course Code: 994300

Unit Number	Unit Name	Hours
1	Orientation and Safety	28
2	Introduction to Drafting	15
3	Lettering	7
4	Geometric Construction	25
5	Computer Aided Drafting (CAD)	20
6	Orthographic Projection	30
7	Dimensioning	8
8	Sectional Views	14
9	Auxiliary Views	10
10	Pictorial Drawings	15
11	Machine Drafting	40
Total		212

Architectural Design and Drafting II — Course Code: 994301

Unit Number	Unit Name	Hours
1	Orientation and Safety (Review)	28
12	Architectural Drafting Math	25
13	Residential Architectural Drafting I	70
14	Residential Architectural Drafting II	70
15	Field Applications of Architectural Drafting	25
Total		218

Architecture Research Synopsis

Introduction

Architectural drafting is a method of documenting geometric dimensioning and characteristics, which include shape, size, color, and surface finish. Many companies across the globe use drafters to record the thoughts of engineers and scientists into written language through the use of shape and alphabet association. Without drafters to document processes, construction and manufacturing would suffer in production as well as quality. Architectural design allows people of many varying cultures and languages to communicate without barriers in the creation of today's greatest accomplishments.

Needs of the Future Workforce

There will be ample need of drafters in the future. Mississippi can expect to see a 14% increase in drafters and a 21% increase in survey technicians over the next 8 to 10 years.

Employment (with industry job data BLS/EMSI table)

Occupational title	Employment, 2011	Projected employment, 2020	Change 2011–2020		Mean annual wage (in dollars)
			Number	Percent	
Drafters	1,879	2,142	263	14%	\$41,540
Surveying and mapping technicians	749	903	154	21%	\$29,600

Source: EMSI Complete Employment - 2011.3

Perkins IV Requirements

Carl Perkins IV Requirements	Curriculum
Program of Study	Yes
Aligned to Careers	Yes
Standards and Content	Yes
Continuous Improvement	Yes
Alignment and Articulation	Yes
Accountability and Assessment	Yes

Architecture and Drafting is an instructional program that prepares students to enter the field of drafting. Study in the course allows an individual to prepare for employment and/or continued education in the drafting field.

Upon completion of the Architecture and Drafting program and high school graduation, students may enter the workforce, continue education at a postsecondary institution and then enter the workforce, continue education at a postsecondary institution and then continue at an institution of higher learning (IHL), or continue education at an institution of higher learning (IHL).

Curriculum Content

Summary of Standards

Standards in the Architecture and Drafting Curriculum are based on information from the following organizations:

American Design Drafting Association and the American Digital Design Association

Articulation from Secondary to Postsecondary Programs

Articulation credit from Secondary Architecture and Drafting to Postsecondary Drafting and Design will be awarded beginning with the fall semester of 2014. Secondary students must have completed the Secondary Architecture and Drafting program and scored at the 80th percentile or higher on the Mississippi Career Planning and Assessment System, Second Edition (MS-CPAS2). The Mississippi Community College Board will forward the scores for each district to the Director of Admissions/Registrar at each postsecondary institution. No grade will be given on the transcript; only hours granted will be transcribed (therefore making no changes to quality points). Twelve additional hours must be earned before credit is transcribed. No cost will be assessed on credit assigned to a student receiving articulated credit. MS-CPAS2 scores may be accepted for up to 12 months after they are published.

Best Practices

Innovative Instructional Technologies

Recognizing that today's students are digital learners, the classroom should be equipped with tools that will teach them in the way they need to learn. The Architecture and Drafting curriculum includes teaching strategies that incorporate current technology. Each classroom should incorporate one teacher desktop or laptop as well as student computers in a networked environment. Each classroom should be equipped with an interactive white board and projector, intensifying the interaction between students and teachers during class. Teachers are encouraged to make use of the latest online communication tools such as wikis, blogs, and podcasts. They are also encouraged to teach using the content-delivery system Blackboard, which introduces students to education in an online environment and places the responsibility of learning on the student.

Differentiated Instruction

Students learn in a variety of ways. Some are visual learners, needing only to read information and study it to succeed. Others are auditory learners, thriving best when information is read aloud to them. Still others are tactile learners, needing to participate actively in their learning experiences. Add the student's background, emotional health, and circumstances, and a very unique learner emerges. To combat this, the Architecture and Drafting curriculum is written to include several instructional methods by using the Understanding by Design (UbD) approach. This method of instruction design leads students to a deeper understanding of course material and provides multiple opportunities for students to succeed in different ways. Many activities are graded by rubrics that allow students to choose the type of product they will produce. By providing various teaching and assessment strategies, students with various learning styles can succeed.

Career and Technical Education Student Organizations

There are student organizations that are relevant to this curriculum. Teachers are encouraged to charter one of these organizations if one is not already available to students. The suggested organization for this course is SkillsUSA. Contact information for this and other related organizations is listed under "Professional Organizations" in this document.

Conclusions

Based on the previous information, the Architecture and Drafting curriculum will be filled with opportunities to develop workforce skills. Widely used teaching strategies, such as cooperative learning, problem-based learning, and demonstration, will also be included. These will help to prepare students for the hands-on instruction they will likely receive upon entering the workforce. Because many of the instructors make use of the rubrics and teaching and assessment strategies, they will continue to be

included in the curriculum document. The curriculum document will be updated regularly to reflect the needs of the Architecture and Drafting workforce.

Professional Organizations

ADDA International
105 East Main Street
Newbern, TN 38059
731.627.0802
FAX: 731.627.9321

SkillsUSA
14001 SkillsUSA Way
Leesburg, Virginia 20176
703.777.8810
FAX: 703.777.8999

Using this Document

Unit Number and Title

This information is given at the beginning of each unit of the curriculum.

Suggested Time on Task

This is the estimated number of clock hours of instruction that should be required to teach the competencies and objectives of the unit. A minimum of 140 hr 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 Performance Indicators

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 performance indicators 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 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 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.

Architectural Design and Drafting I

Unit 1: Orientation and Safety

Understandings and Goals

Enduring Understandings

In this unit, the student will:

- Investigate the history of architectural design
- Study the job availability for architectural design employees

Essential Questions

- Where can I find a job and what will I be doing with an architectural background?
- If I had experience in architecture, what would I be doing in a designer role?

Vocabulary

Identify and review the unit vocabulary.

Architecture
Drafting

Suggested Learning Experiences

Competency 1: Demonstrate understanding of local program requirements. <small>(DOK1, PDC)</small>		
Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
<p>a. Observe local student handbook and classroom requirements. <small>CS1, CS3, CS6, CS7, CS8, CS9, CS10, CS11, CS12, CS13, CS14, CS15, CS16, CCR1, CCR2, CCR3, CCR4, CCR5, CCR6, CCR7, CCR8, CCR10, CCW4, CCW5, CCW6, CCW7, CCW8, CCW9, CCW10, CCSL1, CCSL3, CCSL5, CCL1, CCL2, CCL3, T1, T2, T3, T5, T6</small></p>	<p>a. Present local program and vocational center policies and procedures.</p> <p>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 will include dress code, attendance, academic requirements, discipline, and transportation regulations.</p> <p>Pair students (a student with a higher reading ability may team up with a student with a lower reading ability), and have them type or write a report about what is expected in relation to school and program policies and procedures.</p> <p>Have students prepare posters to identify the name and functions of equipment in the school lab.</p>	<p>a. Evaluate the written report on rules and regulations for content as well as grammar and organization.</p> <p>Evaluate posters to identify names and functions of equipment in the school lab for content, neatness, and creativity.</p>

Competency 2: Explore leadership skills and personal development opportunities provided students by student organizations, including SkillsUSA. <small>(DOK 1, PDC)</small>		
Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
<p>a. Demonstrate effective teambuilding and leadership skills. <small>CS1, CS3, CS6, CS7, CS8, CS9, CS10, CS11, CS12, CS13, CS14, CS15, CS16, CCR1, CCR2, CCR3, CCR4, CCR5, CCR6, CCR7, CCR8, CCR10, CCW4, CCW5, CCW6, CCW7, CCW8, CCW9, CCW10, CCSL1, CCSL3, CCSL5, CCL1, CCL2, CCL3, T1, T2, T3, T5, T6</small></p>	<p>a. 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.</p> <p>Utilize the lessons from SkillsUSA, or other resources to provide additional training.</p>	<p>a. Assess role-play using a checklist for participation, presentation, and content.</p> <p>Assess lessons from other resources according to the recommended resource guide.</p>
<p>b. Practice appropriate work ethics. <small>CS1, CS3, CS6, CS7, CS8, CS9, CS10, CS11, CS12, CS13, CS14, CS15, CS16, CCR1, CCR2, CCR3, CCR4, CCR5, CCR6, CCR7, CCR8, CCR10, CCW4, CCW5, CCW6, CCW7, CCW8, CCW9, CCW10, CCSL1, CCSL3, CCSL5, CCL1, CCL2, CCL3, T1, T2, T3, T5, T6</small></p>	<p>b. Discuss appropriate work ethics standards. Have the students list what they believe to be the most common problems within the drafting and design profession.</p>	<p>b. Evaluate lists of work ethics for content.</p>

Competency 3: Research career opportunities, earnings, and educational requirements in the architecture industry. <small>(DOK1, PDC)</small>		
Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Describe earnings, educational requirements, career ladder, and organizations associated with the architecture industry. <small>CS1, CS3, CS6, CS7, CS8, CS9, CS10, CS11, CS12, CS13, CS14, CS15, CS16, CCR1, CCR2, CCR3, CCR4, CCR5, CCR6, CCR7, CCR8, CCR10, CCW4, CCW5, CCW6, CCW7, CCW8, CCW9, CCW10, CCL1, CCL3, CCL5, CCL1, CCL2, CCL3, T1, T2, T3, T5, T6</small>	a. Have students use the Internet and Choices to research a list of careers for which they will be qualified upon program completion. Have each student use the Internet, Choices, or newspapers to choose a job for which they are qualified and prepare a résumé and cover letter that can be used to apply for the selected job.	a. Use a checklist to evaluate the résumé and cover letter for completeness and neatness.

Performance Task

Performance Task Title

No Performance Task is needed for the Orientation Unit.

Attachments for Performance Task

NONE

Unit Resources

Construction jargon. Retrieved 12 March 2012, from <http://constructionjargon.com/>

National Center for Construction Education and Research. (2009). *Core curriculum.* Upper Saddle River, NJ: Pearson Prentice Hall.

National Center for Construction Education and Research. (2009). *Tools for success.* Upper Saddle River, NJ: Pearson Prentice Hall.

School Policy Manual (Local District).

XAP.(2012). *Choices planner.* Author.

Unit 2: Introduction to Drafting

Understandings and Goals

Enduring Understandings

In this unit, the student will:

- Understand the proper techniques for technical sketching
- Recognize and use the alphabet of lines
- Demonstrate the use and maintain proper usage of drafting tools and equipment
- Demonstrate and identify types of scales
- Identify the various sheet sizes used in drafting
- Calculate basic math operations related to fractions, decimals, and conversions

Essential Questions

- How does the alphabet of lines apply to drafting?
- How important is accuracy when relating to the scale and the math concepts?

Vocabulary

Identify and review the unit vocabulary.

Technical sketching
Border line
Construction Line
Visible line
Hidden line
Centerline
Dimension line
Section line
Cutting-Plane line
Phantom line
Short Break line
Long Break line
Architect's Scale
Triangle
Template
Compass
Protractor
Divider

T-Square
Mechanical pencil
Erasing shield
Lettering guide
French curve
Cleaning pad
Eraser
Dusting brush

Suggested Learning Experiences

Competency 1: Explain the purpose of technical drawing and freehand technical sketches. ^(DOK2, ASO, LLT)		
Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Identify appropriate techniques for technical drawing and freehand technical sketches. ^{CS7, CS8, CS9, CS10, CS11, CS12, CS13, CS14, CS15, CS16, CCR1, CCR2, CCR3, CCR4, CCR7, CCSL1, CCSL2, CCSL3, CCL3, CCL6, T1, T2, T3, T4, T5, T6}	a. Differentiate between technical drawing and freehand technical sketches. Have students participate in a class discussion relating to the differences between the two and where each would be more effectively used and applied in industry.	a. Assess this activity for class participation by teacher observation.
Competency 2: Create freehand technical sketches. ^(DOK2, ASO, LLT)		
Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Identify appropriate techniques for freehand sketches. ^{CS7, CS8, CS9, CS10, CS11, CS12, CS13, CS14, CS15, CS16, CCR1, CCR2, CCR3, CCR4, CCR7, CCSL1, CCSL2, CCSL3, CCL3, CCL6, T1, T2, T3, T4, T5, T6}	a. Discuss and demonstrate the appropriate techniques used in freehand sketches.	a. Assess the technique exercise for accuracy using a checklist.
b. Construct a freehand technical sketch. ^{CS7, CS8, CS9, CS10, CS11, CS12, CS13, CS14, CS15, CS16, CCR1, CCR2, CCR3, CCR4, CCR7, CCSL1, CCSL2, CCSL3, CCL3, CCL6, T1, T2, T3, T4, T5, T6}	b. Give students technique exercises to construct the freehand sketches.	b. Assess the sketching exercise for accuracy using a checklist.
c. Recognize the alphabet of lines. ^{CS7, CS8, CS9, CS10, CS11, CS12, CS13, CS14, CS15, CS16, CCR1, CCR2, CCR3, CCR4, CCR7, CCSL1, CCSL2, CCSL3, CCL3, CCL6, T1, T2, T3, T4, T5, T6}	c. Identify and discuss the alphabet of lines. Have students sketch various lines.	c. Assess the sketching exercise for accuracy using a checklist.
Competency 3: Identify and demonstrate drafting tools and media. ^(DOK2, DEM, INM)		
Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Identify drafting tools. ^{CS7, CS8, CS9, CS10, CS11, CS12, CS13, CS14, CS15, CS16, CCR1, CCR2, CCR3, CCR4, CCR7, CCSL1, CCSL2, CCSL3, CCL3, CCL6, T1, T2, T3, T4, T5, T6}	a. Identify the various tools used in drafting. Relate the tools with their uses. Have the students participate in a tool matching activity.	a. Assess the matching activity for accuracy using a matching key.

<p>b. Examine media and various sheet sizes. ^{CS7,} CS8, CS9, CS10, CS11, CS12, CS13, CS14, CS15, CS16, CCR1, CCR2, CCR3, CCR4, CCR7, CCSL1, CCSL2, CCSL3, CCL3, CCL6, CCM1, CCM2, CCM3, CCM4,CCM5, CCM6, T1, T2, T3, T4, T5, T6</p>	<p>b. Provide examples of different types of media and sheet sizes. Have the students distinguish between the various media and sheet sizes.</p>	<p>b. Assess the media and sheet size activity for accuracy by teacher observation.</p>
<p>c. Interpret architect, engineering, and metric scale units. ^{CS7, CS8, CS9, CS10,} CS11, CS12, CS13, CS14, CS15, CS16, CCR1, CCR2, CCR3, CCR4, CCR7, CCSL1, CCSL2, CCSL3, CCL3, CCL6, CCM1, CCM2, CCM3, CCM4,CCM5, CCM6, T1, T2, T3, T4, T5, T6</p>	<p>c. Demonstrate various linear techniques for measuring. Have students measure lines using various scales and have students perform various measuring exercises.</p>	<p>c. Assess the measuring activities for accuracy using a key.</p>

Competency 4: THIS COMPETENCY WILL BE ONGOING THROUGHOUT THE YEAR Demonstrate skills in mathematical concepts related to drafting technology. ^(DOK2, MAG)		
Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
<p>a. Use mathematical concepts to solve problems of measurement. ^{CS7, CS8, CS9,} CS10, CS11, CS12, CS13, CS14, CS15, CS16, CCR1, CCR2, CCR3, CCR4, CCR7, CCSL1, CCSL2, CCSL3, CCL3, CCL6, CCM1, CCM2, CCM3, CCM4,CCM5, CCM6, CCM10, CCM15, CCM16, CCM17, CCM18, CCM19, T1, T2, T3, T4, T5, T6</p>	<p>a. Explain basic fraction operations, reading fractional scales and measuring tools, conversions of fractional/decimal units of measurements, and conversions of English/metric measurements. Have students complete mathematical exercises.</p>	<p>a. The exercises will be assessed using mathematical keys.</p>

Performance Task

Performance Task Title

Sketch and Draw

You are an entry-level drafter working at a fabrication company. A problem has arisen when installing a platform in the field. You will need to meet the supervisor at the jobsite and create a freehand sketch of a bracket that is needed to fix the problem. After returning to the office, you will produce a mechanical drawing on the board so that the part can be manufactured in the shop. You will demonstrate freehand sketching techniques and the use of the drafting tools along with applying the use of the alphabet of lines on this activity. The sketch will be approved by the site supervisor, and the mechanical drawing will be approved by the checker before release for fabrication.

Your sketch and drawing will be evaluated on sketching techniques, accuracy, neatness, time management, and correctness. (See Appendix A.)

Attachments for Performance Task

Unit Resources

French, T. E., & Hesel, J. D. (2003). *Mechanical drawing*. New York: Glencoe McGraw-Hill.

Giachino, J., & Beukema H. (1973). *Everyday sketching and drafting*. Homewood, IL: American Technical Publishers.

Giachino, J., & Beukema H. (1973). *Freehand sketching*. Homewood, IL: American Technical Publishers.

Giesecke, F., Mitchell, A., Spencer, H., & Hill, I. (1991). *Technical drawing*. New York: Collier-MacMillan.

Larkin, J., & Duval, C. (2013). *Practical problems in mathematics for drafting and CAD*. Clifton Park, NY: Delmar.

Nichols, E., & Schwartz, S. (1999). *Mathematics dictionary and handbook*. Honesdale, PA: Nichols Schwartz Publishing.

Phagan, R. J. (2010). *Applied mathematics*. Tinley Park, IL: Goodheart-Willcox.

Smith, R., & Peterson, J. (2007). *Introductory technical mathematics*. Clifton Park, NY: Cengage Learning.

Unit 3: Lettering

Understandings and Goals

Enduring Understandings

In this unit, the student will:

- Demonstrate the proper techniques for lettering
- Explore the various text styles using CAD

Essential Questions

- How does lettering affect the overall appearance of a drawing?
- Why is it important to choose certain text styles for lettering when using CAD?
- Why is it important to demonstrate proper lettering when creating drawings?

Vocabulary

Identify and review the unit vocabulary.

Ames Lettering guide

Guidelines

Single-stroke Gothic lettering

Text

Text Styles

Suggested Learning Experiences

Competency 1: Demonstrate the techniques of lettering and construct uppercase gothic letters and numerals. <small>(DOK2, LLT)</small>		
Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Construct freehand letters and numerals in various script fonts. <small>CS6, CS7, CS8, CS9, CS10, CS11, CS12, CS13, CS14, CS15, CS16, CCR4, CCR7, CCW2, CCW4, CSL3, CCM1, CCM2, CCM3, CCM4, CCM5, CCM6, CCM10, T1, T2, T5</small>	a. Discuss and demonstrate the techniques of lettering. Provide students with handouts to practice these techniques and complete a lettering exercise. Demonstrate various text styles and sizes. Have students practice assigned text styles and sizes. Provide the students with text exercises that need to be edited and have them edit the exercises.	a. The exercise will be assessed for accuracy and neatness using a checklist. Assess the exercises using teacher observation and an editing key

Performance Task

Performance Task Title

You are a drafting technician; you have been assigned the task of completing the legend on a set of working drawings. You are to demonstrate proper lettering techniques to apply the information to the legend, so it can be sent for purchasing materials. The checker will evaluate legibility, neatness, and accuracy for processing. (See Appendix A.)

Attachments for Performance Task

Unit Resources

Brown, W. C., & Kicklighter, C. E. (1995). *Drafting for industry*. Tinley Park, IL: Goodheart-Willcox.

French, T. E., & Hesel, J. D. (2003). *Mechanical drawing*. New York: Glencoe McGraw-Hill.

Giachino, J., & Beukema H. (1973). *Everyday sketching and drafting*. Homewood, IL: American Technical Publishers.

Giachino, J., & Beukema H. (1973). *Freehand sketching*. Homewood, IL: American Technical Publishers.

Giesecke, F., Mitchell, A., Spencer, H., & Hill, I. (1991). *Technical drawing*. New York: Collier-MacMillian.

Walker, J. R., & Mathis, B. D. (2003). *Exploring drafting*. Tinley Park, IL: Goodheart-Willcox.

Unit 4: Geometric Construction

Understandings and Goals

Enduring Understandings

In this unit, the student will:

- Be able to recognize, create, and apply patterns, relations, and functions and their applications
- Utilize various formulas in problem-solving situations
- Apply geometric principles to technical drawings

Essential Questions

- How are these shapes used in everyday life?
- Why are these shapes important?
- How will knowing these shapes in drafting help me?

Vocabulary

Identify and review the unit vocabulary.

Bisect
Circumscribed
Concentric
Ellipse
Inscribed
Octagon
Pentagon
Regular polygon
Tangent
Right Triangle
Isosceles Triangle
Scalene Triangle
Rectangle
Rhomboid
Trapezoid
Equilateral Triangle
Square
Hexagon
Heptagon

Suggested Learning Experiences

Competency 1: Define basic geometric shapes and terms. <small>(DOK2, MAG)</small>		
Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
<p>a. Define geometric terms and identify shapes. <small>CS6, CS7, CS8, CCR1, CCR2, CCR3, CCR4, CCR10, CCW2, CCW4, CCL3, CCL4, CCL5, CCL6, CCM30, CCM31, CCM32, CCM33, CCM34, CCM35, CCM36, CCM37, CCM38, CCM39, CCM40, CCM41, CCM42, CCM43, CCM44, T1, T2, T3, T4, T5, T6</small></p>	<p>a. Provide the basic geometric shapes and terms using a handout, the textbook, and/or Microsoft PowerPoint.</p> <p>Have students match shapes and terms with definitions.</p>	<p>a. The activity will be assessed for accuracy using an answer key.</p>

Competency 2: Construct various geometric shapes using constructional techniques on a drawing table. <small>(DOK2, ASO, MAG, INM)</small>		
Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
<p>a. Construct various geometric shapes using constructional techniques on a drawing table.</p> <ul style="list-style-type: none"> • Bisect a line, arc, and angle. • Construct a perpendicular line from a point on a line. • Divide a line into equal parts. • Draw tangencies. • Construct various polygons. • Construct an octagon. • Construct a hexagon. • Construct a line parallel to a given line or plane. <small>CS6, CS7, CS8, CCR1, CCR2, CCR3, CCR4, CCR10, CCW2, CCW4, CCL3, CCL4, CCL5, CCL6, CCM30, CCM31, CCM32, CCM33,</small> 	<p>a. Demonstrate various geometric construction techniques using a drawing table.</p> <p>Have students perform practice exercises using the techniques and complete a test to demonstrate all of the geometric constructions.</p>	<p>a. The practice exercises will be assessed by teacher observation and a drawing key.</p> <p>The test will be assessed for accuracy using an answer key.</p>

CCM34, CCM35, CCM36, CCM37, CCM38, CCM39, CCM40, CCM41, CCM42, CCM43, CCM44, T1, T2, T3, T4, T5, T6		
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Performance Task

Performance Task Title

Shapes and Sizes

You are a drafting student identifying geometric shapes. You will be responsible for obtaining a photo or a drawing of your favorite object, airplane, car, boat, and so forth. You will place a piece of tracing paper over your picture and sketch in the various geometric shapes used in its design. You will identify each geometric shape and explain how it is used in the design. You will make an oral presentation using a poster board to illustrate your findings. You will present your design to the class and be assessed using the poster rubric and presentation rubric that evaluates your presentation. (See Appendix A.)

Attachments for Performance Task

Unit Resources

Larkin, J., & Duval, C. (2013). *Practical problems in mathematics for drafting and CAD*. Clifton Park, NY: Delmar.

Nichols, E., & Schwartz, S. (1999). *Mathematics dictionary and handbook*. Honesdale, PA: Nichols Schwartz Publishing.

Phagan, R. J. (2010). *Applied mathematics*. Tinley Park, IL: Goodheart-Willcox.

Walker, J. R., & Mathis, B. D. (2011) *Exploring drafting*. Tinley Park, IL: Goodheart-Wilcox.

Geometric shapes flashcards sets. Retrieve Feb. 8, 2012, from <http://quizlet.com/subject/geometric-shapes/>

Lesson #2. Retrieve Feb. 8, 2012, from http://www.ubatc.edu/course-d/intro-draft/geo_lessons.htm#t

Ethics in the workplace. Retrieved Feb. 8, 2012, from <http://www.articlesbase.com/human-resources-articles/ethics-in-the-workplace-629384.html>

Unit 5: Computer Aided Drafting (CAD)

Understandings and Goals

Enduring Understandings

In this unit, the student will:

- Develop foundation skills in CAD drafting software
- Learn to work as part of a team
- Learn good problem-solving skills
- Practice work ethics related to individual responsibility, integrity, honesty, and personal time management

Essential Questions

- Where can I find a job as a CAD technician?
- What type of industries requires CAD technicians?
- What kind of salary should I expect as a CAD technician?
- Will there be opportunities for advancements in CAD?

Vocabulary

Identify and review the unit vocabulary.

Absolute Coordinates
Array
Attributes
Bitmap Graphics
Break
Cartesian Coordinate System
Chamfer
Computer Aided Design/Computer Aided Manufacturing (CAD/CAM)
Coordinates
Extend
Fillet
Grid
Layers
Linetype
Menu
Object Snap
Orthogonal Mode
Parametric Modeling

Pixels
Polar Coordinates
Raster Objects
Relative Coordinates
Rendering
Resolution
Scanner
Snap
Solid Modeling
Surface Modeling
Symbol Library
Symbols
Template
Trim
User Coordinate System
Vector Object
World Coordinate System

Suggested Learning Experiences

Competency 1: Use CAD hardware and software. <small>(DOK2, DEM)</small>		
Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
<p>a. Recognize the various hardware components of a CAD system.</p> <ul style="list-style-type: none"> Define CAD hardware/software terms. Demonstrate care and maintenance of computer software/hardware. Startup/shut down CAD system. <p>Operate plotter/printer. <small>CS6, CS7, CS8, CS9, CS10, CS11, CS12, CS13, CS15, CCR1, CCR2, CCR4, CCR5, CCR7, CCR10, CCSL1, CCSL2, CCSL3, CCSL5, CCL1, CCL2, T1, T2, T3, T4, T5, T6</small></p>	<p>a. Provide terms and definitions of a CAD workstation.</p> <p>Have students identify the components of the computer and match the terms with their definitions using a matching activity.</p> <p>Discuss and demonstrate the proper use of a CAD system to include care and maintenance, start-up/shut-down, and operation of peripherals.</p>	<p>a. Assess the matching activity using an answer key.</p> <p>Assess the discussion for class participation by teacher observation.</p>

Competency 2: Create text using appropriate style and size on a CAD system. <small>(DOK2, DEM, LLT)</small>		
Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
<p>a. Demonstrate inserting text using CAD.</p> <ul style="list-style-type: none"> Select text style. Create various text sizes. Utilize CAD text-edit commands. Create borders and title blocks for various sheet sizes. <p><small>CS6, CS7, CS8, CS9, CS10, CS11, CS12, CS13, CS15, CCR1, CCR2, CCR4, CCR5, CCR7, CCR10, CCSL1, CCSL2, CCSL3, CCSL5, CCL1, CCL2, T1, T2, T3, T4, T5, T6</small></p>	<p>a. Demonstrate various text styles and sizes. Discuss the text-edit commands.</p> <p>Have students practice assigned text styles and sizes.</p> <p>Provide the students with text exercises that need to be edited and have them edit the exercises.</p> <p>Demonstrate creating borders and title blocks to specific sheet sizes.</p> <p>Have student's complete exercises from assigned specifications.</p>	<p>a. Assess the exercises using teacher observation and an editing key.</p> <p>Assess the exercises for accuracy using a key.</p>

Competency 3: Create a basic CAD drawing. (DOK3, ASO,LLT, INM)		
Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
<p>a. Identify basic commands for CAD drawing. CS6, CS7, CS8, CS9, CS10, CS11, CS12, CS13, CS15, CCR1, CCR2, CCR4, CCR5, CCR7, CCR10, CCSL1, CCSL2, CCSL3, CCSL5, CCL1, CCL2, T1, T2, T3, T4, T5, T6</p>	<p>a. Discuss and demonstrate CAD drawing commands.</p> <p>Provide students with activities to practice the commands and have them match CAD icons with their functions.</p> <p>Demonstrate the development of a CAD drawing and have the students practice the drawing techniques.</p> <p>Provide the students with a specific test exercise, and have them produce the basic CAD drawing.</p>	<p>a. Assess the matching exercise for accuracy with a matching key.</p> <p>Assess the test exercise for accuracy with a key.</p>
<p>b. Construct a CAD drawing using endpoint, midpoint, and intersection Osnaps correctly. CS6, CS7, CS8, CS9, CS10, CS11, CS12, CS13, CS15, CCR1, CCR2, CCR4, CCR5, CCR7, CCR10, CCSL1, CCSL2, CCSL3, CCSL5, CCL1, CCL2, T1, T2, T3, T4, T5, T6</p>	<p>b. Discuss and demonstrate the techniques of line intersecting, grid, and snap functions using CAD.</p> <p>Provide the students with a specific test exercise and have them produce the basic CAD drawing.</p>	<p>b. Assess the exercises using teacher observation and an editing key.</p> <p>Assess the test exercise for accuracy with a key.</p>
<p>c. Demonstrate inserting text using CAD.</p> <ul style="list-style-type: none"> • Select text style. • Create various text sizes. • Utilize CAD text-edit commands. • Create borders and title blocks for various sheet sizes. CS6, CS7, CS8, CS9, CS10, CS11, CS12, CS13, CS15, CCR1, CCR2, CCR4, CCR5, CCR7, CCR10, CCSL1, CCSL2, CCSL3, CCSL5, CCL1, CCL2, T1, T2, T3, T4, T5, T6 	<p>c. Discuss and demonstrate the techniques of lettering.</p> <p>Demonstrate various text styles and sizes. Discuss the text edit commands.</p> <p>Have students practice assigned text styles and sizes.</p> <p>Provide the students with text exercises that need to be edited and have them edit the exercises</p> <p>Demonstrate creating borders and title blocks to specific sheet sizes.</p>	<p>c. The exercise will be assessed for accuracy and neatness using a checklist.</p> <p>Assess the exercises using teacher observation and an editing key.</p>

Performance Task

Performance Task Title

CAD Skills

You are hired as a CAD technician for a company that is converting manual drawings to CAD drawings. You will be responsible for setting up the company template. This template should contain all ANSI standards for layers,

linetypes, lineweights, and so forth. You will also be incorporating the company's logo in the title block. You may also include any additional information that you see beneficial to the company. You will then e-mail your finished template to the engineering department for approval. The engineer will be assessing your template based on accuracy, knowledge of ANSI standards, and time management. (See Appendix A.)

Attachments for Performance Task

Unit Resources

Kalameja, J., & Lang, K. (2010). *AUTOCAD 2010*. Clifton Park, NY: Glencoe McGraw-Hill.

Larkin, J., & Duval, C. (2013). *Practical problems in mathematics for drafting and CAD*. Clifton Park, NY: Delmar.

Madsen, D. A., Palma, R., & Madsen, D. P., (2010) *Architectural drafting using AutoCAD 2010*. Tinley Park, IL: Goodheart-Willcox.

Manning, D. J. (2004). *Project-based AUTOCAD*. Peoria, IL: Glencoe McGraw-Hill.

Smith, D., Ramirez, A., & Autodesk. (2011). *Technical drawing 101 with AutoCAD*. Upper Saddle River, NJ: Prentice Hall

Tickoo, S. (2004). *AUTOCAD 2004: A problem-solving approach*. Clifton Park, NY: Delmar.

Unit 6: Orthographic Projection

Understandings and Goals

Enduring Understandings

In this unit, the student will:

- Know the terminology related to orthographic projection
- Understand principal views used in the drafting industry
- Be able to construct principal views of an object on the drafting board and a CAD system in accordance with industry standards

Essential Questions

- Why is terminology so specific when dealing with orthographic projection?
- Why is view placement critical in orthographic projection?
- In what ways are board drafting and CAD similar?

Vocabulary

Identify and review the unit vocabulary.

Orthographic projection
Principal views
Multi-view drawings
Height
Depth
Width
Projection plane
Foreshortened planes

Suggested Learning Experiences

Competency 1: Describe terms, views, line types, and the spacing of views used in orthographic projections. (DOK2, APS, ASO, MAG, LLT)		
Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Describe terms, views, line types, and the spacing of views used in orthographic projections. CS6, CS7, CS8, CS9, CS10, CS11, CS12, CS13, CS15, CCR1, CCR2, CCR3, CCR4, CCR5, CCR7, CCR8, CCR10, CCSL1, CCSL2, CCSL3, CCSL5, CCL1, CCL2, CCL4, CCL5, CCL6, CCM1, CCM2, CCM3, CCM4, CCM5, CCM30, CCM31, CCM32, CCM33, CCM34, CCM35, CCM36, CCM37, CCM38, CCM39, CCM40, CCM41, CCM42, CCM43, CCM44, T1, T2, T3, T4, T5, T6	a. Present the terms and definitions of orthographic projections. Discuss the possible views in a multiview drawing. Identify line types and weights used in orthographic projections. Calculate the spacing for the views on various sizes of paper.	a. Assess participating in the discussion using teacher observation.

Competency 2: Construct principal views in orthographic projections. (DOK3, APS, ASO, MAG, LLT, INM)		
Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Construct principal views in orthographic projections. CS6, CS7, CS8, CS9, CS10, CS11, CS12, CS13, CS15, CCR1, CCR2, CCR3, CCR4, CCR5, CCR7, CCR8, CCR10, CCSL1, CCSL2, CCSL3, CCSL5, CCL1, CCL2, CCL4, CCL5, CCL6, CCM1, CCM2, CCM3, CCM4, CCM5, CCM30, CCM31, CCM32, CCM33, CCM34, CCM35, CCM36, CCM37, CCM38, CCM39, CCM40, CCM41, CCM42, CCM43, CCM44, T1, T2, T3, T4, T5, T6	a. Discuss and demonstrate the projection of views. Have students practice and construct a third view from two given views, from a pictorial drawing, and/or from an object.	a. Assess drawings using teacher observation and a drawing key.

Competency 3: Construct orthographic views using a CAD station. (DOK3, APS, ASO, MAG, LLT, INM)		
Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Construct orthographic views using a CAD station. CS6, CS7, CS8, CS9, CS10, CS11, CS12, CS13, CS15, CCR1, CCR2, CCR3, CCR4, CCR5, CCR7, CCR8, CCR10, CCSL1, CCSL2, CCSL3,	a. Provide the student with a drawing exercise to incorporate CAD commands used in creating orthographic projections.	a. Assess the exercise using teacher observation and a drawing key.

CCSL5, CCL1, CCL2, CCL4, CCL5, CCL6, CCM1, CCM2, CCM3, CCM4, CCM5, CCM30, CCM31, CCM32, CCM33, CCM34, CCM35, CCM36, CCM37, CCM38, CCM39, CCM40, CCM41, CCM42, CCM43, CCM44, T1, T2, T3, T4, T5, T6		
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Performance Task

Performance Task Title

Replacement Part

You are a drafter working for a machine shop. A customer has a damaged equipment part that needs replacing. You are to produce a multi-view drawing in order for the machinist to produce the part. Your drawing will be presented to the customer for approval and then sent to the machinist for fabrication. Your drawing will be evaluated on: correctness, neatness, line quality, correct use of line types, view placement, and legibility. (See Appendix A.)

Attachments for Performance Task

Unit Resources

- Brown, W. C., & Kicklighter, C. E. (2000). *Drafting for industry*. Tinley Park, IL: Goodheart-Willcox.
- French, T. E., & Hesel, J. D. (2003). *Mechanical drawing*. New York: Glencoe McGraw-Hill.
- Jefferis, A., Madsen, D. A., & Madsen, D.P. (2011) *Architectural drafting and design*. Clifton Park, NY: Delmar.
- Giesecke, F., Mitchell, A., Spencer, H., & Hill, I. (2008). *Technical drawing*. New York: Collier-MacMillian.
- Kalameja, J., & Lang, K. (2010). *AUTOCAD 2010*. Clifton Park, NY: Glencoe McGraw-Hill.
- Kicklighter, C. E. (2008). *Architectural residential drafting and design*. Tinley Park, IL: Goodheart-Willcox.
- Madsen, D. A., Palma, R., Madsen, D. P., (2010) *Architectural drafting using AutoCAD 2010*. Tinley Park, IL: Goodheart-Willcox.
- Manning, D. J. (2004). *Project-based AUTOCAD*. Peoria, IL: Glencoe McGraw-Hill.
- Spencer, H, & Dygdon, J. (2004). *Basic technical drawing*. New York: Glencoe McGraw-Hill.
- Smith, D., Ramirez, A., & Autodesk. (2011). *Technical drawing 101 with AutoCAD*. Upper Saddle River, NJ: Prentice Hall
- Tickoo, S. (2012). *AUTOCAD 2012: A problem-solving approach*. Clifton Park, NY: Delmar.
- Walker, J. R., & Mathis, B. D. (2012). *Exploring drafting*. Tinley Park, IL: Goodheart-Willcox.

Unit 7: Dimensioning

Understandings and Goals

Enduring Understandings

In this unit, the student will:

- Understand the rules, (Do's and Don'ts) of dimensioning (per ANSI standards) and how they apply to a drawing
- Describe terms related to dimensioning
- Demonstrate how to apply dimension on a drawing

Essential Questions

- Who is ANSI and why do they exist?
- Why is dimensioning a part so important?

Vocabulary

Identify and review the unit vocabulary.

Finish mark
Drill
Ream
Counterbore
Countersink
Spotface
Knurl
Fillet
Round
Chamfer
Bevel
Taper
Aligned dimensioning
Unidirectional dimensioning
Datum
Dual dimensioning
Dimension line
Extension line
Leader
Centerline
Size dimension
Location dimension

Suggested Learning Experiences

Competency 1: Apply general rules, line types, and notes for dimensioning per ANSI standards. <small>(DOK2, LLT, MAG, INM, DAN)</small>		
Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
<p>a. Identify line types used in dimensioning. <small>CS6, CS7, CS8, CS9, CS10, CS11, CS12, CS13, CS15, CCR1, CCR2, CCR3, CCR4, CCR5, CCR7, CCR8, CCR10, CCSL1, CCSL2, CCSL3, CCSL5, CCL1, CCL2, CCL4, CCL5, CCL6, CCM1, CCM2, CCM3, CCM4, CCM5, CCM30, CCM31, CCM32, CCM33, CCM34, CCM35, CCM36, CCM37, CCM38, CCM39, CCM40, CCM41, CCM42, CCM43, CCM44, T1, T2, T5, T6</small></p>	<p>a. Discuss the line types used in dimensioning. Have students identify the various line types.</p>	<p>a. Assess the activity using teacher observation and a key.</p>
<p>b. Dimension objects with various geometric shapes. <small>CS6, CS7, CS8, CS9, CS10, CS11, CS12, CS13, CS15, CCR1, CCR2, CCR3, CCR4, CCR5, CCR7, CCR8, CCR10, CCSL1, CCSL2, CCSL3, CCSL5, CCL1, CCL2, CCL4, CCL5, CCL6, CCM1, CCM2, CCM3, CCM4, CCM5, CCM30, CCM31, CCM32, CCM33, CCM34, CCM35, CCM36, CCM37, CCM38, CCM39, CCM40, CCM41, CCM42, CCM43, CCM44, T1, T2, T5, T6</small></p>	<p>b. Discuss dimensioning rules and use of line types and symbols. Have students dimension various shapes using drawing exercises.</p>	<p>b. Assess the dimensioning exercises using a drawing key.</p>
<p>c. Apply size and location dimensions of an object. <small>CS6, CS7, CS8, CS9, CS10, CS11, CS12, CS13, CS15, CCR1, CCR2, CCR3, CCR4, CCR5, CCR7, CCR8, CCR10, CCSL1, CCSL2, CCSL3, CCSL5, CCL1, CCL2, CCL4, CCL5, CCL6, CCM1, CCM2, CCM3, CCM4, CCM5, CCM30, CCM31, CCM32, CCM33, CCM34, CCM35, CCM36, CCM37, CCM38, CCM39, CCM40, CCM41, CCM42, CCM43, CCM44, T1, T2, T5, T6</small></p>	<p>c. Discuss and demonstrate the use of size and location dimensioning of objects. Have students perform dimensioning exercises for application of techniques.</p>	<p>c. Assess the dimensioning exercises using a drawing key.</p>
<p>d. Apply general rules, line types, and notes for dimensioning per ANSI standards. <small>CS6, CS7, CS8, CS9, CS10, CS11, CS12, CS13, CS15, CCR1, CCR2, CCR3, CCR4, CCR5, CCR7, CCR8,</small></p>	<p>d. Discuss dimensioning rules and demonstrate the use of line types, notations, and symbols used in dimensioning. Have students dimension various objects.</p>	<p>d. Assess the assignment using a drawing key.</p>

CCR10, CCSL1, CCSL2, CCSL3, CCSL5, CCL1, CCL2, CCL4, CCL5, CCL6, CCM1, CCM2, CCM3, CCM4, CCM5, CCM30, CCM31, CCM32, CCM33, CCM34, CCM35, CCM36, CCM37, CCM38, CCM39, CCM40, CCM41, CCM42, CCM43, CCM44, T1, T2, T5, T6		
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Performance Task

Performance Task Title

Size and Location Matters

Your colleague has been pulled from a current project without completing the dimensioning. As a drafter technician, you are assigned the job to apply the dimensions for the drawing to meet the deadline. The engineer will review the drawings for all necessary dimensions per ANSI standards.

Attachments for Performance Task

Unit Resources

- Brown, W. C., & Kicklighter, C. E. (2000). *Drafting for industry*. Tinley Park, IL: Goodheart-Willcox.
- French, T. E., & Hesel, J. D. (2003). *Mechanical drawing*. New York: Glencoe McGraw-Hill.
- Jefferis, A., Madsen, D. A., & Madsen, D.P. (2011) *Architectural drafting and design*. Clifton Park, NY: Delmar.
- Giesecke, F., Mitchell, A., Spencer, H., & Hill, I. (2008). *Technical drawing*. New York: Collier-MacMillian.
- Kalameja, J., & Lang, K. (2010). *AUTOCAD 2010*. Clifton Park, NY: Glencoe McGraw-Hill.
- Kicklighter, C. E. (2008). *Architectural residential drafting and design*. Tinley Park, IL: Goodheart-Willcox.
- Madsen, D. A., Palma, R., & Madsen, D. P. (2010) *Architectural drafting using AutoCAD 2010*. Tinley Park, IL: Goodheart-Willcox.
- Madsen, D. A., & Madsen, D. P. (2011) *Geometric dimensioning and tolerancing*. Tinley Park, IL: Goodheart-Willcox.
- Manning, D. J. (2004). *Project-based AUTOCAD*. Peoria, IL: Glencoe McGraw-Hill.
- Spencer, H, & Dygdon, J. (2004). *Basic technical drawing*. New York: Glencoe McGraw-Hill.
- Smith, D., Ramirez, A., & Autodesk. (2011). *Technical drawing 101 with AutoCAD*. Upper Saddle River, NJ: Prentice Hall
- Tickoo, S. (2012). *AUTOCAD 2012: A problem-solving approach*. Clifton Park, NY: Delmar.
- Walker, J. R., & Mathis, B. D. (2012). *Exploring drafting*. Tinley Park, IL: Goodheart-Willcox.

Unit 8: Sectional Views

Understandings and Goals

Enduring Understandings

In this unit, the student will:

- Describe what a section view is and why it is used
- Explain when a sectional view is needed
- Describe the different types of sectional views
- Draw sectional views
- Explain how sectional views are generated in computer-aided drafting

Essential Questions

- What is the purpose of a section view?
- Do all drawings need a section view?
- Which type of industries use sectional view drawings?
- How do I know what type of sectional view is required?

Vocabulary

Identify and review the unit vocabulary.

Aligned Section
Broken-out Section
Conventional Break
Crosshatch Patterns
Cutting-plane line
Full Section
Half Section
Offset Section
Outline Section
Removed Section
Revolved Section
Sectional View
Symmetrical

Suggested Learning Experiences

Competency 1: Demonstrate creating sectional views. <small>(DOK3, MAG, SSS)</small>		
Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
<p>a. Describe and identify the types of sectional views. <small>CS6, CS7, CS8, CS9, CS10, CS11, CS12, CS13, CS15, CCR1, CCR2, CCR3, CCR4, CCR5, CCR7, CCR8, CCR10, CCSL1, CCSL2, CCSL3, CCSL5, CCL1, CCL2, CCL4, CCL5, CCL6, CCM1, CCM2, CCM3, CCM4, CCM5, CCM30, CCM31, CCM32, CCM33, CCM34, CCM35, CCM36, CCM37, CCM38, CCM39, CCM40, CCM41, CCM42, CCM43, CCM44, T1, T2, T5, T6</small></p>	<p>a. Demonstrate the techniques for developing sectional views.</p> <p>Provide students with modeling clay to create objects for sectioning exercises. Each student will describe the type of section cut in an oral presentation.</p> <p>Have students identify the sectional views from a written test.</p>	<p>a. Assess the presentation for content and clarity using a checklist.</p> <p>Assess the test using an answer key.</p>
<p>b. Construct full, half, revolved, aligned, removed, offset, and broken-out section views. <small>CS6, CS7, CS8, CS9, CS10, CS11, CS12, CS13, CS15, CCR1, CCR2, CCR3, CCR4, CCR5, CCR7, CCR8, CCR10, CCSL1, CCSL2, CCSL3, CCSL5, CCL1, CCL2, CCL4, CCL5, CCL6, CCM1, CCM2, CCM3, CCM4, CCM5, CCM30, CCM31, CCM32, CCM33, CCM34, CCM35, CCM36, CCM37, CCM38, CCM39, CCM40, CCM41, CCM42, CCM43, CCM44, T1, T2, T5, T6</small></p>	<p>b. Provide students with drawing plates and have them construct a full- and half-section view.</p>	<p>b. Assess the drawings using a drawing key.</p>

Competency 2: Construct a sectional view using CAD. <small>(DOK3, MAG, SSS)</small>		
Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
<p>a. Identify CAD commands used to create sectional drawings. <small>CS6, CS7, CS8, CS9, CS10, CS11, CS12, CS13, CS15, CCR1, CCR2, CCR3, CCR4, CCR5, CCR7, CCR8, CCR10, CCSL1, CCSL2, CCSL3, CCSL5, CCL1, CCL2, CCL4, CCL5, CCL6, CCM1, CCM2, CCM3, CCM4, CCM5, CCM30, CCM31, CCM32, CCM33, CCM34, CCM35, CCM36, CCM37, CCM38, CCM39, CCM40, CCM41, CCM42,</small></p>	<p>a. Demonstrate and incorporate the commands associated with producing a sectional view.</p> <p>Have students use the commands to create CAD sectional drawings.</p>	<p>a. Assess the drawings using a drawing key.</p>

Performance Task

Performance Task Title

Table Tech

You are a drafting technician working in a furniture industry. You will be given a sketch of a new table-leg design.

You are to create a multi-view drawing and the necessary sectional views needed to fully describe the table leg.

You will present your drawings to the engineering design team. You will be assessed by using a drawing checklist and presentation rubric. (See Appendix A.)

Attachments for Performance Task

Unit Resources

- Brown, W. C., & Kicklighter, C. E. (2000). *Drafting for industry*. Tinley Park, IL: Goodheart-Willcox.
- French, T. E., & Hesel, J. D. (2003). *Mechanical drawing*. New York: Glencoe McGraw-Hill.
- Jefferis, A., Madsen, D. A., & Madsen, D.P. (2011) *Architectural drafting and design*. Clifton Park, NY: Delmar.
- Giesecke, F., Mitchell, A., Spencer, H., & Hill, I. (2008). *Technical drawing*. New York: Collier-MacMillian.
- Kalameja, J., & Lang, K. (2010). *AUTOCAD 2010*. Clifton Park, NY: Glencoe McGraw-Hill.
- Kicklighter, C. E. (2008). *Architectural residential drafting and design*. Tinley Park, IL: Goodheart-Willcox.
- Madsen, D. A., Palma, R., & Madsen, D. P. (2010) *Architectural drafting using AutoCAD 2010*. Tinley Park, IL: Goodheart-Willcox.
- Madsen, D. A., & Madsen, D. P. (2011) *Geometric dimensioning and tolerancing*. Tinley Park, IL: Goodheart-Willcox.
- Manning, D. J. (2004). *Project-based AUTOCAD*. Peoria, IL: Glencoe McGraw-Hill.
- Spencer, H, & Dygdon, J. (2004). *Basic technical drawing*. New York: Glencoe McGraw-Hill.
- Smith, D., Ramirez, A., & Autodesk. (2011). *Technical drawing 101 with AutoCAD*. Upper Saddle River, NJ: Prentice Hall
- Tickoo, S. (2012). *AUTOCAD 2012: A problem-solving approach*. Clifton Park, NY: Delmar.
- Walker, J. R., & Mathis, B. D. (2012). *Exploring drafting*. Tinley Park, IL: Goodheart-Willcox.

Unit 9: Auxiliary Views

Understandings and Goals

Enduring Understandings

In this unit, the student will:

- Describe what an auxiliary view is
- Determine when an auxiliary view is needed to fully describe an object
- Explain why an auxiliary view is constructed perpendicular to an angular surface
- Develop and draw simple auxiliary views

Essential Questions

- What is the purpose of an auxiliary view?
- Do all drawings require an auxiliary view?
- Which type of industries use auxiliary view drawings?

Vocabulary

Identify and review the unit vocabulary.

Auxiliary View
Complete Auxiliary View
Front Auxiliary View
Partial Auxiliary View
Right-Side Auxiliary View
Secondary Auxiliary View
Top Auxiliary View

Suggested Learning Experiences

Competency 1: Demonstrate creating auxiliary views. (DOK2, ASO, LLT, MAG, APS, INM, DAN)		
Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Describe and construct primary auxiliary views. ^{CS6, CS7, CS8, CS9, CS10, CS11, CS12, CS13, CS15,} CCR1, CCR2, CCR3, CCR4, CCR5, CCR7, CCR8, CCR10, CCSL1, CCSL2, CCSL3, CCSL5, CCL1, CCL2, CCL4, CCL5, CCL6, CCM1, CCM2, CCM3, CCM4, CCM5, CCM30, CCM31, CCM32, CCM33, CCM34, CCM35, CCM36, CCM37, CCM38, CCM39, CCM40, CCM41, CCM42, CCM43, CCM44, T1, T2, T5, T6	a. Discuss the purpose and demonstrate the procedure to develop a primary auxiliary view. Have students construct a primary auxiliary drawing from a multi-view drawing.	a. Assess the drawings using a drawing key.

Competency 2: Construct a primary auxiliary view using CAD. (DOK2, ASO, LLT, MAG, APS, INM, DAN)		
Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Identify CAD commands used to create a primary auxiliary view. ^{CS6, CS7, CS8, CS9, CS10, CS11, CS12, CS13, CS15,} CCR1, CCR2, CCR3, CCR4, CCR5, CCR7, CCR8, CCR10, CCSL1, CCSL2, CCSL3, CCSL5, CCL1, CCL2, CCL4, CCL5, CCL6, CCM1, CCM2, CCM3, CCM4, CCM5, CCM30, CCM31, CCM32, CCM33, CCM34, CCM35, CCM36, CCM37, CCM38, CCM39, CCM40, CCM41, CCM42, CCM43, CCM44, T1, T2, T5, T6	a. Demonstrate and incorporate the commands associated with producing a primary auxiliary view. Have students use the commands to create primary auxiliary drawings using	a. Assess the drawings using a drawing key.

Performance Task

Performance Task Title

Team Building

You are a first-year drafting student working on a team with other first-year students. Your team needs to make a collection of items from your classroom/school that would require auxiliary views to show their true shape and size. You will need to share your ideas with your teammates. Each team member will participate in the creation of

the drawings necessary. You will be assessed by the drawing checklist and the group-work assessment rubric. (See Appendix A.)

Attachments for Performance Task

Unit Resources

- Brown, W. C., & Kicklighter, C. E. (2000). *Drafting for industry*. Tinley Park, IL: Goodheart-Willcox.
- French, T. E., & Hesel, J. D. (2003). *Mechanical drawing*. New York: Glencoe McGraw-Hill.
- Jefferis, A., Madsen, D. A., & Madsen, D.P. (2011) *Architectural drafting and design*. Clifton Park, NY: Delmar.
- Giesecke, F., Mitchell, A., Spencer, H., & Hill, I. (2008). *Technical drawing*. New York: Collier-MacMillian.
- Kalameja, J., & Lang, K. (2010). *AUTOCAD 2010*. Clifton Park, NY: Glencoe McGraw-Hill.
- Kicklighter, C. E. (2008). *Architectural residential drafting and design*. Tinley Park, IL: Goodheart-Willcox.
- Madsen, D. A., Palma, R., & Madsen, D. P. (2010) *Architectural drafting using AutoCAD 2010*. Tinley Park, IL: Goodheart-Willcox.
- Madsen, D. A., & Madsen, D. P. (2011) *Geometric dimensioning and tolerancing*. Tinley Park, IL: Goodheart-Willcox.
- Manning, D. J. (2004). *Project-based AUTOCAD*. Peoria, IL: Glencoe McGraw-Hill.
- Spencer, H., & Dygdon, J. (2004). *Basic technical drawing*. New York: Glencoe McGraw-Hill.
- Smith, D., Ramirez, A., & Autodesk. (2011). *Technical drawing 101 with AutoCAD*. Upper Saddle River, NJ: Prentice Hall
- Tickoo, S. (2012). *AUTOCAD 2012: A problem-solving approach*. Clifton Park, NY: Delmar.
- Walker, J. R., & Mathis, B. D. (2012). *Exploring drafting*. Tinley Park, IL: Goodheart-Willcox.
- Auxiliary views*. Retrieved Feb. 8, 2012, from <http://www.indiabix.com/technical-drawing/auxiliary-views/>
- Task 44*. Retrieved Feb. 8, 2012, from <http://www.3d-cadcea.co.uk/html/task44.htm>
- Auxiliary views*. Retrieved Feb. 8, 2012, from <http://www.youtube.com/watch?v=OxWbQei0blg>

Unit 10: Pictorial Drawings

Understandings and Goals

Enduring Understandings

In this unit, the student will:

- Describe what a pictorial drawing is and why it is used
- Identify the basic types of pictorial views
- Construct pictorial views from multi-view drawings
- Correctly dimension isometric and oblique drawings
- Develop and construct simple perspective drawings
- Center pictorial drawings on a drawing sheet

Essential Questions

- Is this the same kind of pictorials drawings that are done in art class?
- Why are we drawing pictorials in drafting class?
- Do CAD drafters really use pictorial drawings on the job?

Vocabulary

Identify and review the unit vocabulary.

Angular perspective
Cabinet oblique
Cavalier oblique
Cutaway pictorial drawing
Exploded assembly drawing
General oblique
Horizon line
Isometric axes
Isometric drawing
Isoplanes
Nonisometric lines
Oblique drawing
One-point perspective
Parallel perspective
Perspective drawing
Pictorial drawing
Primitive objects
Two-point perspective
Vanishing points

Suggested Learning Experiences

Competency 1: Identify the different types of pictorial drawings. (DOK2, LLT, MAG, APS, LIT, DAN)		
Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
<p>a. Describe the methods of constructing pictorial drawings. CS6, CS7, CS8, CS9, CS10, CS11, CS12, CS13, CS15, CCR1, CCR2, CCR3, CCR4, CCR5, CCR7, CCR8, CCR10, CCSL1, CCSL2, CCSL3, CCSL5, CCL1, CCL2, CCL4, CCL5, CCL6, CCM1, CCM2, CCM3, CCM4, CCM5, CCM30, CCM31, CCM32, CCM33, CCM34, CCM35, CCM36, CCM37, CCM38, CCM39, CCM40, CCM41, CCM42, CCM43, CCM44, T1, T2, T5, T6</p>	<p>a. Discuss the various types of pictorial drawings, such as oblique, isometric, and perspective.</p> <p>Have students identify types of pictorials from provided illustrations.</p>	<p>a. Assess the activity with an answer key.</p>

Competency 2: Construct pictorial drawings. (DOK3, LLT, MAG, APS, LIT, DAN)		
Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
<p>a. Construct pictorial drawings.</p> <ul style="list-style-type: none"> Construct an isometric drawing. Construct an oblique drawing. Construct a perspective drawing. CS6, CS7, CS8, CS9, CS10, CS11, CS12, CS13, CS15, CCR1, CCR2, CCR3, CCR4, CCR5, CCR7, CCR8, CCR10, CCSL1, CCSL2, CCSL3, CCSL5, CCL1, CCL2, CCL4, CCL5, CCL6, CCM1, CCM2, CCM3, CCM4, CCM5, CCM30, CCM31, CCM32, CCM33, CCM34, CCM35, CCM36, CCM37, CCM38, CCM39, CCM40, CCM41, CCM42, CCM43, CCM44, T1, T2, T5, T6 	<p>a. Discuss and demonstrate the techniques for creating an isometric drawing.</p> <p>Have students produce an isometric drawing from 2-D or 3-D drawings provided.</p> <p>Demonstrate the techniques to create an isometric, oblique, and perspective drawing.</p> <p>Have the students complete pictorial drawing exercises.</p>	<p>a. Assess the activity with an answer key.</p> <p>Assess the drawing using a drawing key.</p>

Competency 3: Construct an isometric drawing on the CAD system. (DOK3, LLT, MAG, APS, LIT, DAN)		
Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies

<p>a. Identify CAD commands used to create an isometric drawing. CS6, CS7, CS8, CS9, CS10, CS11, CS12, CS13, CS15, CCR1, CCR2, CCR3, CCR4, CCR5, CCR7, CCR8, CCR10, CCSL1, CCSL2, CCSL3, CCSL5, CCL1, CCL2, CCL4, CCL5, CCL6, CCM1, CCM2, CCM3, CCM4, CCM5, CCM30, CCM31, CCM32, CCM33, CCM34, CCM35, CCM36, CCM37, CCM38, CCM39, CCM40, CCM41, CCM42, CCM43, CCM44, T1, T2, T5, T6</p>	<p>a. Demonstrate and incorporate the commands associated with producing an isometric drawing.</p> <p>Have students use the commands to create an isometric drawing using CAD.</p>	<p>a. Assess the drawing using a drawing key.</p>
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Performance Task

Performance Task Title

You are a drafting technician working in industry. A client has an idea for a new part and needs a drawing to present to the company executives. The client would like for you to create a pictorial drawing to better visualize the finished product. You will be given a multi-view drawing to work from. When your client returns, he or she will be expecting a pictorial drawing to use in his or her presentation. You will be assessed by using a drawing checklist. (See Appendix A.)

Attachments for Performance Task

Unit Resources

- Brown, W. C., & Kicklighter, C. E. (2000). *Drafting for industry*. Tinley Park, IL: Goodheart-Willcox.
- French, T. E., & Hesel, J. D. (2003). *Mechanical drawing*. New York: Glencoe McGraw-Hill.
- Jefferis, A., Madsen, D. A., & Madsen, D.P. (2011) *Architectural drafting and design*. Clifton Park, NY: Delmar.
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- Kicklighter, C. E. (2008). *Architectural residential drafting and design*. Tinley Park, IL: Goodheart-Willcox.
- Madsen, D. A., Palma, R., & Madsen, D. P. (2010) *Architectural drafting using AutoCAD 2010*. Tinley Park, IL: Goodheart-Willcox.
- Madsen, D. A., & Madsen, D. P. (2011) *Geometric dimensioning and tolerancing*. Tinley Park, IL: Goodheart-Willcox.
- Manning, D. J. (2004). *Project-based AUTOCAD*. Peoria, IL: Glencoe McGraw-Hill.
- Spencer, H, & Dygdon, J. (2004). *Basic technical drawing*. New York: Glencoe McGraw-Hill.
- Smith, D., Ramirez, A., & Autodesk. (2011). *Technical drawing 101 with AutoCAD*. Upper Saddle River, NJ: Prentice Hall.
- Tickoo, S. (2012). *AUTOCAD 2012: A problem-solving approach*. Clifton Park, NY: Delmar.
- Walker, J. R., & Mathis, B. D. (2012). *Exploring drafting*. Tinley Park, IL: Goodheart-Willcox.
- My CAD site*. Retrieved Feb. 8, 2012, from <http://we-r-here.com/cad/>
- Perspective drawings*. Retrieved Feb. 8, 2012, from <http://www.indiabix.com/technical-drawing/perspective-drawings/>

Unit 11: Machine Drafting

Understandings and Goals

Enduring Understandings

In this unit, the student will:

- Identify the types of threads, fasteners, and terminology used in machine drawings
- Describe terms related to machine drafting
- Prepare simple detail and assembly drawings

Essential Questions

- Why is it important to understand and identify different types of fasteners, bolts, and screws used in machine parts?
- Why are there so many types of fasteners, bolts, and screws used in industry?
- Why does industry sometimes use the metric scale?
- Why are working drawings needed?

Vocabulary

Identify and review the unit vocabulary.

Simplified threads
Schematic threads
Detailed threads
Major diameter
Minor diameter
Threads per inch
Pitch
External thread
Internal thread
Helix
Depth of thread
Class of Fit
Keyway
Washers
Machine Threads
Machine Screws
Screw Thread Series/Notation
Unified National Course (UNC)
Unified National Fine (UNF)
Working drawings

Assembly drawings
Detail drawings
Subassembly drawing
Parts list
Bill of materials

Suggested Learning Experiences

Competency 1: Identify terms and symbols associated with machining and manufacturing processes. (DOK2, ATI, DMR, SLG, MAG)		
Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
<p>a. Identify terms and symbols associated with machining and manufacturing processes. CS6, CS7, CS8, CS9, CS10, CS11, CS12, CS13, CS15, CCR1, CCR2, CCR3, CCR4, CCR5, CCR7, CCR8, CCR10, CCSL1, CCSL2, CCSL3, CCSL5, CCL1, CCL2, CCL4, CCL5, CCL6, CCM1, CCM2, CCM3, CCM4, CCM5, CCM30, CCM31, CCM32, CCM33, CCM34, CCM35, CCM36, CCM37, CCM38, CCM39, CCM40, CCM41, CCM42, CCM43, CCM44, T1, T2, T5, T6</p>	<p>a. Discuss and describe terms related to machine drafting, such as finish marks, tolerancing, forging, casting, and machine operations (drilling, reaming, countersinking, counterboring, spotfacing knurling, chamfering, etc.).</p> <p>Provide students with the symbols associated with machine drafting and have them match terms and symbols with descriptions.</p>	<p>a. Assess the activity using a matching key.</p>

Competency 2: Identify thread forms and representations of threads and fasteners. (DOK3, ATI, SCG, DAN, OPI GCD, MAG, DIN)		
Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
<p>a. Describe uses of threads. CS6, CS7, CS8, CS9, CS10, CS11, CS12, CS13, CS15, CCR1, CCR2, CCR3, CCR4, CCR5, CCR7, CCR8, CCR10, CCSL1, CCSL2, CCSL3, CCSL5, CCL1, CCL2, CCL4, CCL5, CCL6, CCM1, CCM2, CCM3, CCM4, CCM5, CCM30, CCM31, CCM32, CCM33, CCM34, CCM35, CCM36, CCM37, CCM38, CCM39, CCM40, CCM41, CCM42, CCM43, CCM44, T1, T2, T5, T6</p>	<p>a. Discuss the uses of threads and distinguish the various types.</p> <p>Provide an illustration to explain the thread note and thread representations and have students identify the information from a written test.</p> <p>Demonstrate internal and external thread form on a drawing and have students draw these thread forms</p>	<p>a. Assess the test using a key.</p> <p>Assess the drawing using a drawing key.</p>
<p>b. Describe and draw threads.</p> <ul style="list-style-type: none"> Describe types of threads. Match thread terms with definitions. Illustrate the various thread representations. Draw an internal and external thread form. 	<p>b. Discuss the uses of threads and distinguish the various types.</p> <p>Provide an illustration to explain the thread note and thread representations and have students identify the information from a written test.</p> <p>Demonstrate internal and external thread form on a drawing and have students draw these thread forms.</p> <p>Have students draw a detailed drawing illustrating thread forms.</p> <p>As a culminating project, provide students a reference</p>	<p>b. Assess the test using a key.</p> <p>Assess the drawing using a drawing key.</p>

<ul style="list-style-type: none"> Interpret thread notes. Create a detailed machine drawing illustrating threads. CS6, CS7, CS8, CS9, CS10, CS11, CS12, CS13, CS15, CCR1, CCR2, CCR3, CCR4, CCR5, CCR7, CCR8, CCR10, CCLS1, CCLS2, CCLS3, CCLS5, CCL1, CCL2, CCL4, CCL5, CCL6, CCM1, CCM2, CCM3, CCM4, CCM5, CCM30, CCM31, CCM32, CCM33, CCM34, CCM35, CCM36, CCM37, CCM38, CCM39, CCM40, CCM41, CCM42, CCM43, CCM44, T1, T2, T5, T6 	drawing and have them produce a detailed assembly drawing using the board and/or CAD.	
<p>c. Describe methods of thread representation. CS6, CS7, CS8, CS9, CS10, CS11, CS12, CS13, CS15, CCR1, CCR2, CCR3, CCR4, CCR5, CCR7, CCR8, CCR10, CCLS1, CCLS2, CCLS3, CCLS5, CCL1, CCL2, CCL4, CCL5, CCL6, CCM1, CCM2, CCM3, CCM4, CCM5, CCM30, CCM31, CCM32, CCM33, CCM34, CCM35, CCM36, CCM37, CCM38, CCM39, CCM40, CCM41, CCM42, CCM43, CCM44, T1, T2, T5, T6</p>	c. Demonstrate internal and external thread form on a drawing and have students draw these thread forms.	c. Assess the drawing using a drawing key.
<p>d. Draw an internal and external thread form. CS6, CS7, CS8, CS9, CS10, CS11, CS12, CS13, CS15, CCR1, CCR2, CCR3, CCR4, CCR5, CCR7, CCR8, CCR10, CCLS1, CCLS2, CCLS3, CCLS5, CCL1, CCL2, CCL4, CCL5, CCL6, CCM1, CCM2, CCM3, CCM4, CCM5, CCM30, CCM31, CCM32, CCM33, CCM34, CCM35, CCM36, CCM37, CCM38, CCM39, CCM40, CCM41, CCM42, CCM43, CCM44, T1, T2, T5, T6</p>	d. Demonstrate internal and external thread form on a drawing and have students draw these thread forms.	d. Assess the drawing using a drawing key.

Competency 3: Produce an assembly drawing. (DOK3, ATI, SCG, DAN, OPI, GCD, GDT, MAG, DIN)		
Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
<p>a. Produce a basic assembly drawing with fasteners. CS6, CS7, CS8, CS9, CS10, CS11, CS12, CS13, CS15, CCR1, CCR2, CCR3, CCR4, CCR5, CCR7, CCR8,</p>	<p>a. As a culminating project, provide students a reference drawing and have them produce a detailed assembly drawing using the board and/or CAD.</p>	<p>a. Assess the drawing using a drawing key.</p>

CCR10, CCSL1, CCSL2, CCSL3, CCSL5, CCL1, CCL2, CCL4, CCL5, CCL6, CCM1, CCM2, CCM3, CCM4, CCM5, CCM30, CCM31, CCM32, CCM33, CCM34, CCM35, CCM36, CCM37, CCM38, CCM39, CCM40, CCM41, CCM42, CCM43, CCM44, T1, T2, T5, T6		
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Performance Task

Performance Task Title

Git-r-done project

You are a design drafter; the engineer has sketched a design of a multipart product. You have been assigned the job to produce a working drawing using necessary views and dimensions (per ANSI standards). You are to also include the assembly drawing, including threaded fasteners. The engineer will approve your drawings before production of a prototype part. The project will be checked for solution, accuracy, neatness, line quality, and proper thread representation and for drawing layout. (See Appendix A.)

Attachments for Performance Task

Unit Resources

- Brown, W. C., & Kicklighter, C. E. (2000). *Drafting for industry*. Tinley Park, IL: Goodheart-Willcox.
- French, T. E., & Hesel, J. D. (2003). *Mechanical drawing*. New York: Glencoe McGraw-Hill.
- Giesecke, F., Mitchell, A., Spencer, H., & Hill, I. (2008). *Technical drawing*. New York: Collier-MacMillian.
- Kalameja, J., & Lang, K. (2010). *AUTOCAD 2010*. Clifton Park, NY: Glencoe McGraw-Hill.
- Madsen, D. A., & Madsen, D. P., (2011) *Geometric dimensioning and tolerancing*. Tinley Park, IL: Goodheart-Willcox.
- Manning, D. J. (2004). *Project-based AUTOCAD*. Peoria, IL: Glencoe McGraw-Hill.
- Spencer, H., & Dygdon, J. (2004). *Basic technical drawing*. New York: Glencoe McGraw-Hill.
- Smith, D., Ramirez, A., & Autodesk. (2011). *Technical drawing 101 with AutoCAD*. Upper Saddle River, NJ: Prentice Hall
- Tickoo, S. (2012). *AUTOCAD 2012: A problem-solving approach*. Clifton Park, NY: Delmar.
- Walker, J. R., & Mathis, B. D. (2012). *Exploring drafting*. Tinley Park, IL: Goodheart-Willcox.

Unit 12: Architectural Drafting Math (Ongoing throughout the year)

Understandings and Goals

Enduring Understandings

In this unit, the student will:

- Add, subtract, multiply, and divide feet and inches and basic fraction operations
- Calculate square footage for residential construction
- Interpret the architect's scale using the various scales

Essential Questions

- How does square footage play a role in residential design?
- Why is there a need for the different scales used on the architect's scale?

Vocabulary

Identify and review the unit vocabulary.

Board feet
Estimating
Estimator
Cubic-foot method
Area

Suggested Learning Experiences

Competency 1: Calculate linear measurements. ^(DOK2, MAG)		
Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
<p>a. Calculate linear measurements. ^{CS2, CS6, CS7, CS8, CS9, CS11, CS12, CS13, CS14, CS15, CS16, CCR1, CCR2, CCR3, CCR4, CCR5, CCR6, CCR7, CCR8, CCR10, CCSL1, CCSL2, CCSL3, CCSL5, CCL1, CCL2, CCL4, CCL5, CCL6, CCM1, CCM2, CCM3, CCM4, CCM5, CCM6, CCM7, CCM8, CCM9, CCM10, CCM11, CCM12, CCM13, CCM14, CCM15, CCM16, CCM17, CCM18, CCM19, CCM20, CCM21, CCM22, CCM23, CCM24, CCM25, CCM26, CCM27, CCM28, CCM29, CCM30, CCM31, CCM32, CCM33, CCM34, CCM35, CCM36, CCM37, CCM38, CCM39, CCM40, CCM41, CCM42, CCM43, CCM44, T1, T2, T4, T5}</p>	<p>a. Explain how to add, subtract, multiply, and divide feet and inches.</p> <p>Have students' complete mathematical exercises.</p>	<p>a. Assess the exercises using mathematical keys.</p>

Competency 2: Read and interpret the architect and engineering scale. ^(DOK2, MAG)		
Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
<p>a. Read and interpret the architect and engineering scale for architectural and mechanical application. ^{CS2, CS6, CS7, CS8, CS9, CS11, CS12, CS13, CS14, CS15, CS16, CCR1, CCR2, CCR3, CCR4, CCR5, CCR6, CCR7, CCR8, CCR10, CCSL1, CCSL2, CCSL3, CCSL5, CCL1, CCL2, CCL4, CCL5, CCL6, CCM1, CCM2, CCM3, CCM4, CCM5, CCM6, CCM7, CCM8, CCM9, CCM10, CCM11, CCM12, CCM13, CCM14, CCM15, CCM16, CCM17, CCM18, CCM19, CCM20, CCM21, CCM22, CCM23, CCM24, CCM25, CCM26, CCM27, CCM28, CCM29, CCM30, CCM31, CCM32, CCM33, CCM34, CCM35, CCM36, CCM37, CCM38, CCM39, CCM40, CCM41, CCM42, CCM43, CCM44, T1, T2, T4, T5}</p>	<p>a. Explain basic fraction operations, reading fractional scales and measuring tools, conversions of fractional/decimal units of measurements, and conversions of English/metric measurements.</p> <p>Have students complete mathematical exercises.</p>	<p>a. Assess the exercises using mathematical keys.</p>

Competency 3: Calculate residential square footage. ^(DOK2, MAG)		
Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
<p>a. Calculate residential square footage for area, volume, and plan specification. ^{CS2, CS6, CS7, CS8, CS9, CS11, CS12, CS13, CS14, CS15, CS16, CCR1, CCR2, CCR3, CCR4, CCR5, CCR6, CCR7, CCR8, CCR10, CCSL1, CCSL2, CCSL3, CCSL5, CCL1, CCL2, CCL4, CCL5, CCL6, CCM1, CCM2, CCM3, CCM4, CCM5, CCM6, CCM7, CCM8, CCM9, CCM10, CCM11, CCM12, CCM13, CCM14, CCM15, CCM16, CCM17, CCM18, CCM19, CCM20, CCM21, CCM22, CCM23, CCM24, CCM25, CCM26, CCM27, CCM28, CCM29, CCM30, CCM31, CCM32, CCM33, CCM34, CCM35, CCM36, CCM37, CCM38, CCM39, CCM40, CCM41, CCM42, CCM43, CCM44, T1, T2, T4, T5}</p>	<p>a. Explain the process of calculating residential square footage.</p> <p>Have students complete area exercises.</p>	<p>a. Assess the exercises using mathematical keys.</p>

Competency 4: Employ the adjustable triangle to lay out angles. ^(DOK3, MAG)		
Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
<p>a. Utilize the adjustable triangle and/or protractor to indicate length and bearing of property lines using the Polar Coordinate System. ^{CS2, CS6, CS7, CS8, CS9, CS11, CS12, CS13, CS14, CS15, CS16, CCR1, CCR2, CCR3, CCR4, CCR5, CCR6, CCR7, CCR8, CCR10, CCSL1, CCSL2, CCSL3, CCSL5, CCL1, CCL2, CCL4, CCL5, CCL6, CCM1, CCM2, CCM3, CCM4, CCM5, CCM6, CCM7, CCM8, CCM9, CCM10, CCM11, CCM12, CCM13, CCM14, CCM15, CCM16, CCM17, CCM18, CCM19, CCM20, CCM21, CCM22, CCM23, CCM24, CCM25, CCM26, CCM27, CCM28, CCM29, CCM30, CCM31, CCM32, CCM33, CCM34, CCM35, CCM36, CCM37, CCM38, CCM39, CCM40, CCM41, CCM42, CCM43, CCM44, T1, T2, T4, T5}</p>	<p>a. Demonstrate the use of the adjustable triangle to lay out angles. Explain the Cartesian and Polar Coordinate Systems.</p> <p>Have students complete exercises to locate bearings and distances using the Polar Coordinate System and property corners using the Cartesian Coordinate System.</p>	<p>a. Assess the exercises using a key.</p>

Competency 5: Calculate and apply spatial requirements for residential design. (DOK2, MAG, ESC)		
Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
<p>a. Calculate the requirements of a residential design. CS2, CS6, CS7, CS8, CS9, CS11, CS12, CS13, CS14, CS15, CS16, CCR1, CCR2, CCR3, CCR4, CCR5, CCR6, CCR7, CCR8, CCR10, CCSL1, CCSL2, CCSL3, CCSL5, CCL1, CCL2, CCL4, CCL5, CCL6, CCM1, CCM2, CCM3, CCM4, CCM5, CCM6, CCM7, CCM8, CCM9, CCM10, CCM11, CCM12, CCM13, CCM14, CCM15, CCM16, CCM17, CCM18, CCM19, CCM20, CCM21, CCM22, CCM23, CCM24, CCM25, CCM26, CCM27, CCM28, CCM29, CCM30, CCM31, CCM32, CCM33, CCM34, CCM35, CCM36, CCM37, CCM38, CCM39, CCM40, CCM41, CCM42, CCM43, CCM44, T1, T2, T4, T5</p>	<p>a. Provide and explain handouts with the required size and space requirements for residential design. Students will participate in a class discussion concerning the future applications. Students will apply these handouts throughout the year.</p>	<p>a. Assess the discussion for class participation using teacher observation.</p>

Competency 6: Estimate material for a project. (DOK3 MAG, ESC, DBM)		
Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
<p>a. List the rule-of-thumb guidelines for estimating. CS2, CS6, CS7, CS8, CS9, CS11, CS12, CS13, CS14, CS15, CS16, CCR1, CCR2, CCR3, CCR4, CCR5, CCR6, CCR7, CCR8, CCR9, CCR10, CCSL1, CCSL2, CCSL3, CCSL4, CCSL5, CCSL6, CCM1, CCM2, CCM3, CCM4, CCM5, CCM6, CCM7, CCM8, CCM9, CCM10, CCM11, CCM12, CCM13, CCM14, CCM15, CCM16, CCM17, CCM18, CCM19, CCM20, CCM21, CCM22, CCM23, CCM24, CCM25, CCM26, CCM27, CCM28, CCM29, CCM30, CCM31, CCM32, CCM33, CCM34, CCM35, CCM36, CCM37, CCM38, CCM39, CCM40, CCM41, CCM42, CCM43, CCM44, T1, T2, T3, T4, T5, T6</p>	<p>a. Discuss the rule-of-thumb guidelines for estimating. Provide the student with a plan for a job. The student will figure the estimation for each job. This may be done by hand and/or on a computer.</p>	<p>a. Assessment for the estimation will be determined by the accuracy of the estimation.</p>

Performance Task

Performance Task Title

Does It Add Up?

You are a trainee for an architecture firm and have been assigned the task of calculating the square footage for several homes designed for a subdivision. Your boss has informed you that the homes should stay within a certain area. You will relay to him any discrepancies you find. The task will be assessed using a calculation key.

Attachments for Performance Task

Unit Resources

- Fatzinger, J. (2004). *Basic estimating for construction*. Upper Saddle River, NJ: Prentice Hall
- Larkin, J., & Duval, C. (2013). *Practical problems in mathematics for drafting and CAD*. Clifton Park, NY: Delmar.
- Nichols, E., & Schwartz, S. (1999). *Mathematics dictionary and handbook*. Honesdale, PA: Nichols Schwartz Publishing.
- Phagan, R. J. (2010). *Applied mathematics*. Tinley Park, IL: Goodheart-Willcox.
- Pratt, D. (2012). *Estimating for residential construction*. Clifton Park, NY: Cengage Learning.
- Pratt, D. (2011). *Fundamentals of construction estimating*. Clifton Park, NY: Cengage Learning.
- Smith, R., & Peterson, J. (2007). *Introductory Technical Mathematics*. Clifton Park, NY: Cengage Learning.
- Walker, J. R., & Mathis, B. D. (2012). *Exploring drafting*. Tinley Park, IL: Goodheart-Willcox.

Unit 13: Residential Architectural Drafting I

Understandings and Goals

Enduring Understandings

In this unit, the student will:

- Develop an understanding of the three main residential areas
- Identify architectural terms and symbols used in residential house plans
- Produce an architecturally correct set of residential house plans, including a floor plan, a foundation plan, exterior elevations, and wall-section detail

Essential Questions

- Why are plans needed to construct a house?
- Why can't all the plans be included on one sheet?
- Why are drawings produced at a scale of $1/4" = 1'-0"$?

Vocabulary

Identify and review the unit vocabulary.

- Living area
- Sleeping area
- Service area
- Floor plan
- Foundation plan
- Elevation
- Wall section
- Scale
- Exterior wall
- Interior wall
- Plumbing wall
- Door jamb
- Stud
- Sill plate
- Sole plate
- Top plate
- Ceiling joist
- Floor joist
- Rafter
- Header
- Girder

- Pier
- Footing
- Slab
- Overhang
- T-foundation
- Concrete
- Rebar
- Anchor bolt
- Wire mesh
- Vapor barrier
- Brick ledge
- Brick veneer
- Sheathing
- Grade
- Cornice
- Fascia board
- Drip board or (Drip cap)
- Ridge
- Soffit
- Pitch
- Lookout
- Truss
- Span
- Base cabinet
- Wall cabinet
- Work triangle
- CMU
- Subfloor

Suggested Learning Experiences

Competency 1: Produce sketches in planning the three main residential areas. (DOK3, MAG, FPL, HPE, RPI, FFP, FPI, SSS, SDW)		
Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
<p>a. Describe requirements for the three main residential areas. CS1, CS2, CS3, CS5, CS6, CS7, CS8, CS9, CS10, CS11, CS12, CS13, CS14, CS15, CCR1, CCR2, CCR3, CCR4, CCR5, CCR6, CCR7, CCR8, CCR10, CCW2, CCW3, CCW4, CCW5, CCW6, CCW7, CCSL1, CCSL2, CCSL3, CCSL5, CCL1, CCL2, CCL4, CCL5, CCL6, CCM1, CCM2, CCM3, CCM4, CCM5, CCM10, CCM15, CCM16, CCM17, CCM18, CCM19, CCM20, CCM21, CCM22, CCM25, CCM26, CCM27, CCM28, CCM29, T1, T2, T3, T4, T5, T6</p>	<p>a. Discuss and describe the design requirements for the three main residential areas. Students will create a design portfolio for the three areas as specified.</p> <p>Written tests will be administered on the design requirements.</p> <p>Explain how to read and interpret an architect scale.</p> <p>Have students perform scaling exercises.</p> <p>Provide and explain handouts with the required size and space requirements for residential design. Students will participate in a class discussion concerning the future applications. Students will apply these handouts throughout the year.</p> <p>Explain how to add, subtract, multiply, and divide feet and inches.</p>	<p>a. Design portfolio will be assessed with a checklist or rubric.</p> <p>Assess the discussion for class participation using teacher observation.</p> <p>Assess the exercises using keys.</p> <p>Assess the sketch for content using a checklist.</p>
<p>b. Sketch rooms, including service, living, and sleeping areas, and floor plan. CS1, CS2, CS3, CS5, CS6, CS7, CS8, CS9, CS10, CS11, CS12, CS13, CS14, CS15, CCR1, CCR2, CCR3, CCR4, CCR5, CCR6, CCR7, CCR8, CCR10, CCW2, CCW3, CCW4, CCW5, CCW6, CCW7, CCSL1, CCSL2, CCSL3, CCSL5, CCL1, CCL2, CCL4, CCL5, CCL6, CCM1, CCM2, CCM3, CCM4, CCM5, CCM10, CCM15, CCM16, CCM17, CCM18, CCM19, CCM20, CCM21, CCM22, CCM25, CCM26, CCM27, CCM28, CCM29, T1, T2, T3, T4, T5, T6</p>	<p>b. Have students sketch rooms included in the service, living, and sleeping areas.</p>	<p>b. Assess the sketch for content using a checklist.</p>

Competency 2: Produce an architecturally correct floor plan. (DOK3, MAG, FPL, HPE, RPI, FFP, SSS, SDW)		
Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
<p>a. Identify architectural terms and symbols related to floor plans. CS1,</p>	<p>a. Provide and discuss the terms, symbols, and requirements related to floor plans.</p>	<p>a. Assess the terms, symbols, and requirements using a key.</p>

<p>CS2, CS3, CS5, CS6, CS7, CS8, CS9, CS10, CS11, CS12, CS13, CS14, CS15, CCR1, CCR2, CCR3, CCR4, CCR5, CCR6, CCR7, CCR8, CCR10, CCW2, CCW3, CCW4, CCW5, CCW6, CCW7, CCSL1, CCSL2, CCSL3, CCSL5, CCL1, CCL2, CCL4, CCL5, CCL6, CCM1, CCM2, CCM3, CCM4, CCM5, CCM10, CCM15, CCM16, CCM17, CCM18, CCM19, CCM20, CCM21, CCM22, CCM25, CCM26, CCM27, CCM28, CCM29, T1, T2, T3, T4, T5, T6</p>	<p>Have students match terms and symbols in a written exercise/test.</p>	
<p>b. Construct architectural letters. CS1, CS2, CS3, CS5, CS6, CS7, CS8, CS9, CS10, CS11, CS12, CS13, CS14, CS15, CCR1, CCR2, CCR3, CCR4, CCR5, CCR6, CCR7, CCR8, CCR10, CCW2, CCW3, CCW4, CCW5, CCW6, CCW7, CCSL1, CCSL2, CCSL3, CCSL5, CCL1, CCL2, CCL4, CCL5, CCL6, CCM1, CCM2, CCM3, CCM4, CCM5, CCM10, CCM15, CCM16, CCM17, CCM18, CCM19, CCM20, CCM21, CCM22, CCM25, CCM26, CCM27, CCM28, CCM29, T1, T2, T3, T4, T5, T6</p>	<p>b. Provide various styles of architectural lettering and have students practice techniques to develop their own styles.</p>	<p>b. Assess the practice exercises by teacher observation.</p>
<p>c. Draw and dimension a floor plan. CS1, CS2, CS3, CS5, CS6, CS7, CS8, CS9, CS10, CS11, CS12, CS13, CS14, CS15, CCR1, CCR2, CCR3, CCR4, CCR5, CCR6, CCR7, CCR8, CCR10, CCW2, CCW3, CCW4, CCW5, CCW6, CCW7, CCSL1, CCSL2, CCSL3, CCSL5, CCL1, CCL2, CCL4, CCL5, CCL6, CCM1, CCM2, CCM3, CCM4, CCM5, CCM10, CCM15, CCM16, CCM17, CCM18, CCM19, CCM20, CCM21, CCM22, CCM25, CCM26, CCM27, CCM28, CCM29, T1, T2, T3, T4, T5, T6</p>	<p>c. Have students create an architectural library using CAD.</p> <p>Have students produce a floor plan.</p>	<p>c. Assess the floor plan for content using a checklist.</p>

Competency 3: Produce an architecturally correct foundation plan. (DOK3, MAG, FFP)		
Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
<p>a. Describe terms, symbols, and requirements related to foundation plans. CS1, CS2, CS3, CS5, CS6, CS7, CS8, CS9, CS10, CS11, CS12, CS13, CS14, CS15, CCR1, CCR2, CCR3, CCR4, CCR5, CCR6, CCR7, CCR8, CCR10, CCW2, CCW3, CCW4, CCW5, CCW6, CCW7, CCSL1, CCSL2,</p>	<p>a. Provide and discuss the terms, symbols, and requirements related to a foundation plan.</p> <p>Have students match terms and symbols in a written exercise or test.</p> <p>Have students produce a foundation plan.</p>	<p>a. Assess the terms, symbols, and requirements using a key.</p> <p>Assess the foundation plan for content using a checklist.</p>

CCSL3, CCSL5, CCL1, CCL2, CCL4, CCL5, CCL6, CCM1, CCM2, CCM3, CCM4, CCM5, CCM10, CCM15, CCM16, CCM17, CCM18, CCM19, CCM20, CCM21, CCM22, CCM25, CCM26, CCM27, CCM28, CCM29, T1, T2, T3, T4, T5, T6		
b. Draw and dimension a foundation plan. CS1, CS2, CS3, CS5, CS6, CS7, CS8, CS9, CS10, CS11, CS12, CS13, CS14, CS15, CCR1, CCR2, CCR3, CCR4, CCR5, CCR6, CCR7, CCR8, CCR10, CCW2, CCW3, CCW4, CCW5, CCW6, CCW7, CCSL1, CCSL2, CCSL3, CCSL5, CCL1, CCL2, CCL4, CCL5, CCL6, CCM1, CCM2, CCM3, CCM4, CCM5, CCM10, CCM15, CCM16, CCM17, CCM18, CCM19, CCM20, CCM21, CCM22, CCM25, CCM26, CCM27, CCM28, CCM29, T1, T2, T3, T4, T5, T6	b. Explain the process of calculating volume of concrete in cubic yards. Have students complete volume exercises.	b. Assess the exercises using mathematical keys.
c. Draw footing details. CS1, CS2, CS3, CS5, CS6, CS7, CS8, CS9, CS10, CS11, CS12, CS13, CS14, CS15, CCR1, CCR2, CCR3, CCR4, CCR5, CCR6, CCR7, CCR8, CCR10, CCW2, CCW3, CCW4, CCW5, CCW6, CCW7, CCSL1, CCSL2, CCSL3, CCSL5, CCL1, CCL2, CCL4, CCL5, CCL6, CCM1, CCM2, CCM3, CCM4, CCM5, CCM10, CCM15, CCM16, CCM17, CCM18, CCM19, CCM20, CCM21, CCM22, CCM25, CCM26, CCM27, CCM28, CCM29, T1, T2, T3, T4, T5, T6	c. Have students produce an architecturally correct slab-foundation plan.	c. Assess the slab-foundation plan for content using a checklist.

Competency 4: Draw, dimension, and label an exterior wall section. (DOK3, MAG, FPL, FFP, SDW)		
Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Identify building material terms, symbols, and requirements. CS1, CS2, CS3, CS5, CS6, CS7, CS8, CS9, CS10, CS11, CS12, CS13, CS14, CS15, CCR1, CCR2, CCR3, CCR4, CCR5, CCR6, CCR7, CCR8, CCR10, CCW2, CCW3, CCW4, CCW5, CCW6, CCW7, CCSL1, CCSL2, CCSL3, CCSL5, CCL1, CCL2, CCL4, CCL5, CCL6, CCM1, CCM2, CCM3, CCM4, CCM5, CCM10, CCM15, CCM16, CCM17, CCM18, CCM19, CCM20, CCM21, CCM22, CCM25, CCM26,	a. Provide and discuss the terms, symbols, and requirements related to an exterior wall section. Have students match terms and symbols in a written exercise or test.	a. Assess the terms, symbols, and requirements using a key.

CCM27, CCM28, CCM29, T1, T2, T3, T4, T5, T6		
<p>b. Draw, dimension, and label a typical exterior wall section.</p> <p>CS1, CS2, CS3, CS5, CS6, CS7, CS8, CS9, CS10, CS11, CS12, CS13, CS14, CS15, CCR1, CCR2, CCR3, CCR4, CCR5, CCR6, CCR7, CCR8, CCR10, CCW2, CCW3, CCW4, CCW5, CCW6, CCW7, CCSL1, CCSL2, CCSL3, CCSL5, CCL1, CCL2, CCL4, CCL5, CCL6, CCM1, CCM2, CCM3, CCM4, CCM5, CCM10, CCM15, CCM16, CCM17, CCM18, CCM19, CCM20, CCM21, CCM22, CCM25, CCM26, CCM27, CCM28, CCM29, T1, T2, T3, T4, T5, T6</p>	<p>b. Have students produce a typical wall section.</p>	<p>b. Assess the typical wall section using a key.</p>

Competency 5: Draw and note exterior elevations. (DOK3, MAG, LIT, BCG,ELE)		
Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
<p>a. Identify architectural terms, symbols, and requirements related to elevations.</p> <ul style="list-style-type: none"> Construct a front elevation. Construct side elevations. Construct a rear elevation. <p>CS1, CS2, CS3, CS5, CS6, CS7, CS8, CS9, CS10, CS11, CS12, CS13, CS14, CS15, CCR1, CCR2, CCR3, CCR4, CCR5, CCR6, CCR7, CCR8, CCR10, CCW2, CCW3, CCW4, CCW5, CCW6, CCW7, CCSL1, CCSL2, CCSL3, CCSL5, CCL1, CCL2, CCL4, CCL5, CCL6, CCM1, CCM2, CCM3, CCM4, CCM5, CCM10, CCM15, CCM16, CCM17, CCM18, CCM19, CCM20, CCM21, CCM22, CCM25, CCM26, CCM27, CCM28, CCM29, T1, T2, T3, T4, T5, T6</p>	<p>a. Discuss the various elevation terms, symbols, and requirements including architectural styles, roof types, and calculations of roof slope.</p> <p>Have students match terms and symbols in a written exercise or test.</p> <p>Have students draw and note exterior elevations.</p>	<p>a. Assess the terms, symbols, and requirements using a key.</p> <p>Assess the elevations using a checklist.</p>

Performance Task

Performance Task Title

Home sweet home

You are an architectural drafter at a small architectural firm. A couple has come to the firm with some ideas for a small starter home. The couple needs a preliminary set of plans to get a cost estimate from a builder. You will need to produce a floor plan, a foundation plan, exterior elevations, and wall-section detail. After you have completed the plans, the architect will review the plans for correctness, neatness, correct use of line types, legibility, and meeting of the client's needs. The plans will be evaluated individually using a rubric designed by the instructor for floor plans, foundation plans, exterior elevations, and wall-section details.

Attachments for Performance Task

Architecture Residential Drafting and Design textbook

Unit Resources

Jefferis, A., Madsen, D. A., & Madsen, D.P. (2011) *Architectural drafting and design*. Clifton Park, NY: Delmar.

Kalameja, J., & Lang, K. (2010). *AUTOCAD 2010*. Clifton Park, NY: Glencoe McGraw-Hill.

Kicklighter, C. E. (2008). *Architectural residential drafting and design*. Tinley Park, IL: Goodheart-Willcox.

Madsen, D. A., Palma, R., & Madsen, D. P. (2010). *Architectural drafting using AutoCAD 2010*. Tinley Park, IL: Goodheart-Willcox.

Manning, D. J. (2004). *Project-based AUTOCAD*. Peoria, IL: Glencoe McGraw-Hill.

Tickoo, S. (2012). *AUTOCAD 2012: A problem-solving approach*. Clifton Park, NY: Delmar.

Walker, J. R., & Mathis, B. D. (2012). *Exploring drafting*. Tinley Park, IL: Goodheart-Willcox.

Unit 14: Residential Architectural Drafting II

Understandings and Goals

Enduring Understandings

In this unit, the student will:

- Have knowledge of industry standards and be able to produce electrical, plumbing, and HVAC plans
- Have knowledge of industry standards and be able to produce residential plot/site plans

Essential Questions

- Why are there industry standards related to electrical, plumbing, and HVAC?
- How do I produce plans for the electrical, plumbing, and HVAC industries?
- Why is the plot/site plan important?

Vocabulary

Identify and review the unit vocabulary.

- Electrical panel
- Single-pole switch
- Receptacle/convenience outlet
- Lighting outlet/fixture
- Three-way switch
- GFI
- Plumbing fixtures
- Water heater
- Sewer/septic system
- Water supply lines
- House drain
- Vent stack
- Trap
- Mechanical system
- Duct
- Register
- HVAC
- Inlets
- Return air
- Thermostat
- Property lines
- Contour lines
- Bearing
- North arrow
- Survey

Suggested Learning Experiences

Competency 1: Produce an electrical, plumbing, or HVAC plan. <small>(DOK3, MAG, BCG, HPE)</small>		
Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
<p>a. Describe terms, symbols, and requirements related to an electrical, plumbing, and HVAC plan. <small>CS1, CS2, CS3, CS5, CS6, CS7, CS8, CS9, CS10, CS11, CS12, CS13, CS14, CS15, CCR1, CCR2, CCR3, CCR4, CCR5, CCR6, CCR7, CCR8, CCR10, CCW2, CCW3, CCW4, CCW5, CCW6, CCW7, CCSL1, CCSL2, CCSL3, CCSL5, CCL1, CCL2, CCL4, CCL5, CCL6, CCM1, CCM2, CCM3, CCM4, CCM5, CCM10, CCM15, CCM16, CCM17, CCM18, CCM19, CCM20, CCM21, CCM22, CCM25, CCM26, CCM27, CCM28, CCM29, T1, T2, T3, T4, T5, T6</small></p>	<p>a. Provide and discuss the terms, symbols, and requirements related to an electrical, plumbing, and HVAC plan.</p> <p>Have students match terms and symbols in a written exercise or test.</p>	<p>a. Assess the terms, symbols, and requirements using a key.</p>
<p>b. Draw an electrical, plumbing, or HVAC plan. <small>CS1, CS2, CS3, CS5, CS6, CS7, CS8, CS9, CS10, CS11, CS12, CS13, CS14, CS15, CCR1, CCR2, CCR3, CCR4, CCR5, CCR6, CCR7, CCR8, CCR10, CCW2, CCW3, CCW4, CCW5, CCW6, CCW7, CCSL1, CCSL2, CCSL3, CCSL5, CCL1, CCL2, CCL4, CCL5, CCL6, CCM1, CCM2, CCM3, CCM4, CCM5, CCM10, CCM15, CCM16, CCM17, CCM18, CCM19, CCM20, CCM21, CCM22, CCM25, CCM26, CCM27, CCM28, CCM29, T1, T2, T3, T4, T5, T6</small></p>	<p>b. Have students produce an electrical, plumbing, or HVAC plan.</p>	<p>b. Assess the electrical, plumbing, or HVAC plan with a checklist.</p>

Competency 2: Develop a residential plot/site plan. <small>(DOK3, MAG, LIT, DAN, BCG, ELE)</small>		
Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
<p>a. Describe terms, symbols, and requirements related to a plot/site plan. <small>CS1, CS2, CS3, CS5, CS6, CS7, CS8, CS9, CS10, CS11, CS12, CS13, CS14, CS15, CCR1, CCR2, CCR3, CCR4, CCR5, CCR6, CCR7, CCR8, CCR10, CCW2, CCW3, CCW4, CCW5, CCW6, CCW7, CCSL1, CCSL2, CCSL3, CCSL5, CCL1, CCL2, CCL4, CCL5, CCL6, CCM1, CCM2, CCM3, CCM4, CCM5,</small></p>	<p>a. Provide and discuss the terms, symbols, and requirements related to a plot/site plan.</p> <p>Have students match terms and symbols in a written exercise or test.</p>	<p>a. Assess the terms, symbols, and requirements using a key.</p>

CCM10, CCM15, CCM16, CCM17, CCM18, CCM19, CCM20, CCM21, CCM22, CCM25, CCM26, CCM27, CCM28, CCM29, T1, T2, T3, T4, T5, T6		
b. Draw a plot/site plan. CS1, CS2, CS3, CS5, CS6, CS7, CS8, CS9, CS10, CS11, CS12, CS13, CS14, CS15, CCR1, CCR2, CCR3, CCR4, CCR5, CCR6, CCR7, CCR8, CCR10, CCW2, CCW3, CCW4, CCW5, CCW6, CCW7, CCSL1, CCSL2, CCSL3, CCSL5, CCL1, CCL2, CCL4, CCL5, CCL6, CCM1, CCM2, CCM3, CCM4, CCM5, CCM10, CCM15, CCM16, CCM17, CCM18, CCM19, CCM20, CCM21, CCM22, CCM25, CCM26, CCM27, CCM28, CCM29, T1, T2, T3, T4, T5, T6	b. Have students produce a plot/site plan.	b. Assess the plot/site plan with a checklist.
c. Plot the X and Y values of the Cartesian Coordinate System. CS2, CS6, CS7, CS8, CS9, CS11, CS12, CS13, CS14, CS15, CS16, CCR1, CCR2, CCR3, CCR4, CCR5, CCR6, CCR7, CCR8, CCR10, CCSL1, CCSL2, CCSL3, CCSL5, CCL1, CCL2, CCL4, CCL5, CCL6, CCM1, CCM2, CCM3, CCM4, CCM5, CCM6, CCM7, CCM8, CCM9, CCM10, CCM11, CCM12, CCM13, CCM14, CCM15, CCM16, CCM17, CCM18, CCM19, CCM20, CCM21, CCM22, CCM23, CCM24, CCM25, CCM26, CCM27, CCM28, CCM29, CCM30, CCM31, CCM32, CCM33, CCM34, CCM35, CCM36, CCM37, CCM38, CCM39, CCM40, CCM41, CCM42, CCM43, CCM44, T1, T2, T4, T5	c. Have students complete exercises to locate bearings and distances using the Polar Coordinate System and property corners using the Cartesian Coordinate System.	c. Assess the exercises using a key.

Performance Task

Performance Task Title

You are an architect's assistant working for an architectural firm. The other architect's assistant is behind schedule on producing a set of plans. The architect has assigned you to produce the electrical and plot plan. The plans are to meet industry standards and also include features requested by the customer. After being checked by the architect, a meeting will be set for the customer to review and approve. The plans will be evaluated individually using a rubric designed by the instructor for electrical and plot plans.

Attachments for Performance Task

Unit Resources

- Brown, W. C., & Dorfmueller, D. P. (2013). *Print reading for construction*. Tinley Park, IL: Goodheart-Willcox.
- Jefferis, A., Madsen, D. A., & Madsen, D.P. (2011) *Architectural drafting and design*. Clifton Park, NY: Delmar.
- Guest, J. R., D’Arcangelo, B., & D’Arcangelo, B. (1989). *Blueprint reading for plumbers residential and commercial*. Albany, NY: Delmar Publishers, Inc.
- Joyce, M. (2009). *Blueprint reading and drafting for plumbers*. Clifton Park, NY: Cengage Learning.
- Kalameja, J., & Lang, K. (2010). *AUTOCAD 2010*. Clifton Park, NY: Glencoe McGraw-Hill.
- Kicklighter, C. E. (2008). *Architectural residential drafting and design*. Tinley Park, IL: Goodheart-Willcox.
- Madsen, D. A., Palma, R., & Madsen, D. P. (2010). *Architectural drafting using AutoCAD 2010*. Tinley Park, IL: Goodheart-Willcox.
- Manning, D. J. (2004). *Project-based AUTOCAD*. Peoria, IL: Glencoe McGraw-Hill.
- Moravek, J & Miller, F. (2013). *Blueprints and Plans for HVAC*. Clifton Park, NY: Delmar.
- Tickoo, S. (2012). *AUTOCAD 2012: A problem-solving approach*. Clifton Park, NY: Delmar.
- Walker, J. R., & Mathis, B. D. (2012). *Exploring drafting*. Tinley Park, IL: Goodheart-Willcox.

Unit 15: Field Applications of Architectural Drafting

Understandings and Goals

Enduring Understandings

In this unit, the student will:

- Describe employment opportunities and responsibilities
- Explore career opportunities for architectural and mechanical designers and drafters

Essential Questions

- What is the nature of work relating to drafting?
- How do I differentiate between architectural and mechanical designers and drafters?
- What educational training is needed for architectural and mechanical designers and drafters?
- What qualifications are needed for architectural and mechanical designers and drafters?

Vocabulary

Identify and review the unit vocabulary.

Artistic

Ethics

Interview

Qualifications

Résumé

Suggested Learning Experiences

Competency 1: Integrate business/industry experiences with the drafting program. (DOK1, {AAD-PDC}, {MAD-PDC})		
Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
<p>a. Explore how architectural and mechanical drafting are used in business and industry. CS1, CS2, CS3, CS5, CS6, CS7, CS8, CS9, CS11, CS13, CS14, CS15, CCR1, CCR2, CCR3, CCR4, CCR5, CCR6, CCR7, CCR8, CCR9, CCR10, CCW1, CCW2, CCW3, CCW4, CCW5, CCW6, CCW7, CCW8, CCW9, CCW10, CCSL1, CCSL2, CCSL3, CCSL4, CCSL5, CCSL6, CCL1, CCL2, CCL3, CCL4, CCL5, CCL6, T1, T2, T5, T6</p>	<p>a. Lead students to participate in field trips, field exercises, and/or listening to guest speakers.</p> <p>Have students prepare an oral and/or written summary of the experience.</p>	<p>a. Assess for class participation by teacher observation.</p> <p>Assess the summary for content using a checklist.</p>

Competency 2: Investigate career opportunities related to architectural drafting. (DOK1, {AAD-PDC})		
Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
<p>a. Explore career opportunities for architectural designers and drafters. CS1, CS2, CS3, CS5, CS6, CS7, CS8, CS9, CS11, CS13, CS14, CS15, CCR1, CCR2, CCR3, CCR4, CCR5, CCR6, CCR7, CCR8, CCR9, CCR10, CCW1, CCW2, CCW3, CCW4, CCW5, CCW6, CCW7, CCW8, CCW9, CCW10, CCSL1, CCSL2, CCSL3, CCSL4, CCSL5, CCSL6, CCL1, CCL2, CCL3, CCL4, CCL5, CCL6, T1, T2, T5, T6</p>	<p>a. Have students explore career opportunities in the drafting field. Students may research using the Internet, interviews, job shadowing/mentoring experiences, and other resources.</p> <p>Have students complete a career-related project, such as a paper, oral presentation, or model building.</p>	<p>a. Assess student exploration of career opportunities using teacher observation.</p> <p>Assess the project for content and completeness using a checklist.</p>

Competency 3: Investigate career opportunities related to mechanical drafting. (DOK1, {MAD-PDC})		
Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
<p>a. Explore career opportunities for mechanical designers and drafters. CS1, CS2, CS3, CS5, CS6, CS7, CS8, CS9, CS11, CS13, CS14, CS15, CCR1, CCR2, CCR3, CCR4,</p>	<p>a. Have students explore career opportunities in the drafting field. Students may research using the Internet, interviews, job shadowing/mentoring experiences, and other resources.</p> <p>Have students complete a career-related project, such</p>	<p>a. Assess student exploration of career opportunities using teacher observation.</p> <p>Assess the project for</p>

CCR5, CCR6, CCR7, CCR8, CCR9, CCR10, CCW1, CCW2, CCW3, CCW4, CCW5, CCW6, CCW7, CCW8, CCW9, CCW10, CCSL1, CCSL2, CCSL3, CCSL4, CCSL5, CCSL6, CCL1, CCL2, CCL3, CCL4, CCL5, CCL6, T1, T2, T5, T6	as a paper, oral presentation, or model building.	content and completeness using a checklist.
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Performance Task

Performance Task Title

No performance task is needed for the unit.

Attachments for Performance Task

None

Unit Resources

Bureau of Labor Statistics. (2012). *Occupational outlook handbook* (2012-2013 edition).

<http://www.bls.gov/oco/> retrieved March 12, 2012.

Fruehling, R., & Moore, R. (2011). *Career success: The attitude advantage*. Tinley Park, IL: Goodheart-Willcox.

National Center for Construction Education and Research. (2009). *Tools for success*. Upper Saddle River, NJ: Pearson Prentice Hall.

Walker, J. R., & Mathis, B. D. (2011). *Exploring drafting*. Tinley Park, IL: Goodheart-Wilcox.

XAP. (2012). *Choices planner*. Author.

Student Competency Profile

Student 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 it 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: Orientation and Safety		
	1.	Demonstrate understanding of local program requirements. (DOK1, PDC)
	2.	Explore leadership skills and personal development opportunities provided students by student organizations to include SkillsUSA. (DOK 1, PDC)
	3.	Research career opportunities, earnings, and educational requirements in the architecture industry. (DOK1, PDC)
Unit 2: Introduction to Drafting		
	1.	Explain the purpose of technical drawing and freehand technical sketches. (DOK2, ASO, LLT)
	2.	Create freehand technical sketches. (DOK2, ASO, LLT)
	3.	Identify and demonstrate drafting tools and media. (DOK2, DEM, INM)
	4.	Demonstrate skills in mathematical concepts related to drafting technology. (DOK2, MAG)
Unit 3: Lettering		
	1.	Demonstrate the techniques of lettering, and construct uppercase gothic letters and numerals. (DOK2, LLT)
Unit 4: Geometric Construction		
	1.	Define basic geometric shapes and terms. (DOK2, MAG)
	2.	Construct various geometric shapes using constructional techniques on a drawing table. (DOK2, ASO, MAG, INM)
Unit 5: Computer Aided Drafting (CAD)		
	1.	Use CAD hardware and software. (DOK2, DEM)
	2.	Create text using appropriate style and size on a CAD system. (DOK2, DEM, LLT)
	3.	Create a basic CAD drawing. (DOK3, ASO, LLT, INM)
Unit 6: Orthographic Projection		
	1.	Describe terms, views, line types, and the spacing of views used in orthographic projections. (DOK2, APS, ASO, MAG, LLT)
	2.	Construct principal views in orthographic projections. (DOK3, APS, ASO, MAG, LLT, INM)
	3.	Construct orthographic views using a CAD station. (DOK3, APS, ASO, MAG, LLT, INM)
Unit 7: Dimensioning		
	1.	Apply general rules, line types, and notes for dimensioning per ANSI standards. (DOK2, LLT, MAG, INM, DAN)

Unit 8: Sectional Views	
1.	Demonstrate creating sectional views. (DOK3, MAG, SSS)
2.	Construct a sectional view using CAD. (DOK3, MAG, SSS)
Unit 9: Auxiliary Views	
1.	Demonstrate creating auxiliary views. (DOK2, ASO, LLT, MAG, APS, INM, DAN)
2.	Construct a primary auxiliary view using CAD. (DOK2, ASO, LLT, MAG, APS, INM, DAN)
Unit 10: Pictorial Drawings	
1.	Identify the different types of pictorial drawings. (DOK2, LLT, MAG, APS, LIT, DAN)
2.	Construct pictorial drawings. (DOK3, LLT, MAG, APS, LIT, DAN)
3.	Construct an isometric drawing on the CAD system. (DOK3, LLT, MAG, APS, LIT, DAN)
Unit 11: Machine Drafting	
1.	Identify terms and symbols associated with machining and manufacturing processes. (DOK2, ATI, DMR, SLG, MAG)
2.	Identify thread forms and representations of threads and fasteners. (DOK3, ATI, SCG, DAN, OPI, GCD, MAG, DIN)
3.	Produce an assembly drawing. (DOK3, ATI, SCG, DAN, OPI, GCD, GDT, MAG, DIN)
Unit 12: Architectural Drafting Math (Ongoing throughout the year)	
1.	Calculate linear measurements. (DOK2, MAG)
2.	Read and interpret the architect and engineering scale. (DOK2, MAG)
3.	Calculate residential square footage. (DOK2, MAG)
4.	Employ the adjustable triangle to lay out angles. (DOK3, MAG)
5.	Calculate and apply spacial requirements for residential design. (DOK2, MAG, ESC)
6.	Estimate material for a project. (DOK3, MAG, ESC, DBM)
Unit 13: Residential Architectural Drafting I	
1.	Produce sketches in planning the three main residential areas. (DOK3, MAG, FPL, HPE, RPI, FFP, FPI, SSS, SDW)
2.	Produce an architecturally correct floor plan. (DOK3, MAG, FPL, HPE, RPI, FFP, SSS, SDW)
3.	Produce an architecturally correct foundation plan. (DOK3, MAG, FFP)
4.	Draw, dimension, and label an exterior wall section. (DOK3, MAG, FPL, FFP, SDW)
5.	Draw and note exterior elevations. (DOK3, MAG, LIT, BCG, ELE)
Unit 14: Residential Architectural Drafting II	
1.	Produce an electrical, plumbing, and HVAC plan. (DOK3, MAG, BCG, HPE)
2.	Develop a residential plot/site plan. (DOK3, MAG, LIT, DAN, BCG, ELE)
Unit 15: Field Applications of Architectural Drafting	
1.	Integrate business/industry experiences with the drafting program. (DOK1, {AAD-PDC}, {MAD-PDC})
2.	Investigate career opportunities related to Architectural drafting. (DOK1, {AAD-PDC})
3.	Investigate career opportunities related to Mechanical drafting. (DOK1, {MAD-PDC})

Appendix A: Activities and Rubrics

Poster Assessment Rubric

	Exemplary	Accomplished	Developing	Beginning	Score
	4 Points	3 Points	2 Points	1 Point	
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 1 of the required content elements is included on the poster.	Several required content elements were 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 were 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 1-2 grammatical or mechanical mistakes on the poster.	There are 3-4 grammatical or mechanical mistakes on the poster.	There are more than 4 grammatical or mechanical mistakes on the poster.	

Written Report Assessment Rubric

	Exemplary	Accomplished	Developing	Beginning	Score
	4 points	3 points	2 points	1 point	
Content	Clear thesis and focus that remains apparent	Thesis and focus that remains 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	

Presentation Assessment Rubric

	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, grammatically correct	Adequate, mostly accurate, few grammatical errors	Poorly planned, somewhat accurate, some grammatical errors	Weak, inaccurate, 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 information	No eye contact because reading information	

PRESENTATION EVALUATION SHEET

- _____/16 Preparation
- _____/28 Organization
- _____/24 Thoroughness
- _____/19 Extra Materials
- _____/13 Actual Presentation

Preparation

1. ____/2 Information written (neatly)
2. ____/2 Sources used listed
3. ____/5 Worked every day (did not waste time)
4. ____/5 Had all materials ready for use
5. ____/2 Cooperative

Organization

1. ____/2 Report in a logical order
2. ____/2 Interesting manner
3. ____/20 Notebook check
4. ____/2 Understanding of topic
5. ____/2 Spelling and sentence structure (did not copy from books)

Thoroughness

1. ____/5 Main points given
2. ____/5 Details to explain given
3. ____/5 Information presented clearly
4. ____/4 More than one source used
5. ____/5 Extra materials as appropriate

Extra Materials

1. ____/2 Neatness
2. ____/7 Creativity
3. ____/2 Dramatic value
4. ____/3 Usefulness
5. ____/5 Correctness

Actual Presentation

1. ____/3 Spoke clearly and distinctly
2. ____/2 Used extra materials effectively
3. ____/2 Posture
4. ____/3 Pronounced all words correctly
5. ____/3 Organized in thought

_____/100 Total points earned

WRITTEN REPORT EVALUATION SHEET

- _____/16 Preparation
- _____/28 Organization
- _____/24 Thoroughness
- _____/19 Extra Materials
- _____/13 Final Report

Preparation

1. ____/2 Information written (neatly)
2. ____/2 Sources used listed
3. ____/5 Worked every day (did not waste time)
4. ____/5 Had all materials ready for use
5. ____/2 Cooperative

Organization

1. ____/2 Report in a logical order
2. ____/2 Interesting manner
3. ____/20 Notebook check
4. ____/2 Understanding of topic
5. ____/2 Spelling and sentence structure (do not copy from books)

Thoroughness

1. ____/5 Main points given
2. ____/5 Details to explain given
3. ____/5 Information presented clearly
4. ____/4 More than one source used
5. ____/5 Extra materials are appropriate

Extra Materials

1. ____/2 Neatness
2. ____/7 Creativity
3. ____/2 Dramatic value
4. ____/3 Useful
5. ____/5 Correctness

Final Report

1. ____/3 Written clearly
2. ____/2 Organized
3. ____/2 Sources documented correctly
4. ____/2 Spelling
5. ____/2 Grammar
6. ____/2 Neatness

_____/100 Total points earned

Role Play or Skit Assessment Rubric

	Excellent 4 Points	Good 3 Points	Average 2 Points	Needs Improvement 1 Point	Total
Accuracy	All information was accurate	Almost all information was accurate	Most information was accurate	Very little information was accurate	
Role	Excellent character development, student contributed in a significant manner	Good character development, student contributed in a cooperative manner	Fair character development, student may have contributed	Little or no character development, student did not contribute much at all	
Knowledge Gained	Can clearly explain several ways in which his or her character “saw” things differently than other characters and can explain why	Can clearly explain several ways in which his or her character “saw” things differently than other characters	Can clearly explain one way in which his or her character “saw” things differently than other characters	Cannot explain any way in which his or her character “saw” things differently than other characters	
Props	Used several props and showed considerable creativity	Used 1 or 2 appropriate props that made the presentation better	Used 1 or 2 props that made the presentation better	Used no props to make the presentation better	
Required Elements	Included more information than required	Included all required information	Included most required information	Included less information than required	

Group Work Assessment Rubric

	Highly Successful	Meeting Success	Experiencing Difficulty	Score
	3 points	2 points	1 point	
Sharing	Shared ideas with others	Occasionally shared ideas with others	Seldom shared ideas with others	
Listening	Always listened to peers	Occasionally listened to peers	Ignored ideas of peers	
Respecting	Interacted with, encouraged, and supported ideas of others	Occasionally encouraged and supported others	Seldom encouraged and supported others	
Participating	Shared the task equally with group members	Did most of the task	Did very little of the task	

Resume Assessment Rubric

	Excellent 25 Points	Well Done 20 Points	Meets Standards 15 Points	Beginning 10 Points	No Evidence 0 Points	Score
Format	Résumé contains name, address, objective, education, experience, and references. All words spelled correctly	Contains at least 6 of the criteria, no more than 2 spelling errors	Contains at least 5 of the criteria, no more than 4 spelling errors	Contains minimal information, more than 4 spelling errors	Assignment was not submitted	
Education	Education includes all schools attended, graduation dates, diploma/degree awarded, and major field of study	Education includes 3 of the criteria	Education includes 2 of the criteria	Education includes 1 of the criteria	Assignment was not submitted	
Experience	Experience includes internships, entry-level jobs, current position	Experience includes 2 of the criteria	Experience includes 1 of the criteria	Experience includes current position only	Assignment was not submitted	
Factual	Contains factual names and dates, is believable	Résumé is fairly believable with factual names OR dates	Résumé has unrealistic dates or names	Résumé is unrealistic and contains conflicting information	Assignment was not submitted	

Drawing Checklist

1. _____ Accuracy
2. _____ Neatness
3. _____ Layers
4. _____ Line-types
5. _____ Line-weights
6. _____ Text Height
7. _____ Creativity
8. _____ Pictorial
9. _____ Multi-views
10. _____ Time Management

Assessment Checklist

1. _____ Accuracy
2. _____ Neatness
3. _____ Layers
4. _____ Linetypes
5. _____ Lineweights
6. _____ Text Height
7. _____ Creativity
8. _____ Logo
9. _____ Title Block
10. _____ Time Management

Appendix B: Glossary

UNIT 1

Architecture - is both the process and the product of planning, designing, and construction

Drafting - is the act and discipline of composing plans that visually communicate how something functions or has to be constructed

UNIT 2

Architect's scale - a scale that is divided into proportional feet and inches

Border line - the heaviest line used in drafting. It is drawn at approximately 0.47 in. thick and ranges in thickness from 0.31 in. to 0.62 in., depending on the size of the drawing sheet

Centerline – a thin line, approximately 0.014 in. thick, used to represent the exact center of an object.

Cleaning pad - a small, mesh pouch filled with very fine eraser particles

Compass - a drafting instrument used to draw circles and arcs

Construction line - the lightest line used, approximately 0.012 in. thick, used to lay out a drawing

Cutting plane line - indicates where an object has been cut to show interior features.

Dimension line - a thin line used to show the direction of a dimension. Dimension lines generally have an arrowhead at each end to show where the dimension begins and ends. Sometimes the arrowheads are replaced by other symbols, such as dots or slash marks.

Divider - an instrument used to divide or transfer a distance from one place to another

Dusting brush - used to remove eraser crumbs and dirt particles from the drawing

Eraser - used to clean soiled spots or light pencil marks from a drawing

Erasing shield - a drawing aid for use with erasers that shields surrounding lines from erasure

French curve (Irregular curve) - used to draw noncircular curves, such as involutes, spirals, and ellipses. It can also be used to plot motions and forces and to make some engineering and scientific graphs.

Hidden line – a thin line, approximately 0.014 in. thick and made up of a series of dashes, used to represent edges and intersections that are not visible to the viewer

Lettering guide - usually has three basic tools: a scribe, lettering templates, and technical pens.

Long break line - Freehanded thin lines with zig-zag space at approximately 1.5-in. intervals.

Mechanical pencils - available in different lead diameters and produce accurate results; they are very popular

Phantom line - used to show alternate positions of a moving part, repeated details, or the path of motion of an object. A type of line that resembles a centerline except that it has two dashes.

Protractor - a drafting instrument used to measure and lay out angles other than angles best created with triangles.

Section lines - thin parallel lines, normally drawn at a 45° angle, that are used to indicate internal features of an object exposed by a cutting plane

Short break line - freehanded thick, wavy lines

Technical sketching - the process of producing a rough, preliminary drawing representing the main features of a product or structure

Templates - are available in an almost unlimited range of shapes and sizes, made of thin, transparent plastic, contain openings of different sizes and shapes

T-Square - a drafting instrument that consists of a head that lines up with a true edge of the drafting board and a blade, or straightedge, that provides a true edge.

Triangles - used to draw lines at 30°, 45°, and 60° angles. Two primary triangles are used by drafters and engineers, the 30/60 and the 45.

Visible lines (Object lines) - thick lines used to represent visible edges and intersections.

Unit 3

Ames Lettering guide - a drafting device that helps establish the correct letter height and spacing.

Guidelines - the lightest line used, approximately .012" thick, to keep lettering uniform in height.

Single-stroke Gothic lettering - the most common type of lettering known to drafting.

Text - lettering in a CADD drawing is generally referred to as text.

Text Styles - several lettering styles are included in most CAD programs. Each style is right for a particular use. It is the drafter's responsibility to set up a text style and size that is appropriate for the drawing.

UNIT 4

Bisect – to divide into two equal parts

Circumscribed – a figure encircled so as to touch in as many places as possible

Concentric –_having the same point as center

Ellipse – a closed curve in the form of a symmetrical oval

Equilateral Triangle – a triangle with three equal sides and three equal angles

Heptagon - a polygon that has seven equal sides and seven equal angles

Hexagon – a polygon that has six equal sides and six equal angles

Inscribed – a figure drawn within another figure so as to touch in as places as possible

Isosceles Triangle – a triangle with two equal sides and two equal angles

Octagon – a polygon that has eight equal sides and eight equal angles

Pentagon – a polygon that has five equal sides and five equal angles

Rectangle – a plane figure bound by parallel sides of different lengths to form opposite sides that are equal, and having four 90° angles

Regular Pentagon – a plane figure with equal straight sides and equal angles; it can be circumscribed around or inscribed in a circle

Rhomboid – parallelogram with two lengths of sides and no 90° angles

Right Triangle – a triangle with one 90° angle

Scalene Triangle – a triangle with no angles or sides equal

Square – a plane figure bound by four equal sides, and having four 90° angles

Tangent – meeting a curved line or surface, touching at one and only one point, but most definitely not intersecting

Trapezoid – a quadrilateral which has at least one pair of parallel sides

Unit 5

Absolute coordinates - coordinates located in relation to the Cartesian coordinate system origin, (0, 0, 0)

Array - an orientation of copied objects in a rectangular or polar pattern

Attributes - text strings of information about related symbols, such as product numbers, sizes, or materials.

Bitmap graphics - in computer graphics, a raster graphics image, or bitmap, is a dot matrix data structure representing a generally rectangular grid of pixels, or points of color, viewable via a monitor, paper, or other display medium. Raster images are stored in image files with varying formats.

Break - this command can remove a portion of an object or split an object at a single point; it is used for splitting objects into two or multiple objects.

Cartesian coordinate system – coordinates establish points of measure along the X,Y, and Z axes in relation to the 0,0,0 origin. The XY axes of the Cartesian coordinate system divide the drawing plane into 4 quadrants. Coordinates have positive or negative X and Y values.

Chamfer - an angle cut made to remove corner of two perpendicular surfaces. The CHAMFER command makes mitered (angled) corners.

Computer aided design/computer aided manufacturing- a type of manufacturing in which machining data is generated from CAD drawings and used by computer numerical control machines.

Coordinates - the positions or locations of points on the X, Y, and Z planes. In a CAD system, the points represent units of real measurement from a fixed point.

Extend – to extend an entity to touch another entity in a drawing.

Fillet - an arc representing an inside rounded corner; rounds the edges of objects.

Grid - in a CAD system, a network of uniformly spaced points used to determine distances.

Layers - in CAD drafting, user-defined object settings that can be displayed or “turned off” to distinguish the different types of content in a drawing.

Linetype - in CAD drafting, a user-defined object setting used to describe a line definition in the alphabet of lines.

Menu - any list or set of items, activities, etc., from which to choose

Object snap - in CAD system, a function that allows the cursor to be “snapped” to specific locations on an object.

Orthogonal mode - in a CAD system, a drawing mode used to draw horizontal and vertical lines by confining the cursor to horizontal and vertical movement.

Parametric modeling - in CAD drafting, a type of 3-D-based drawings in which changes to object parameters during the modeling process affect the entire model.

Pixels- in computer drawing, tiny shapes of data making up a raster image; also called picture elements.

Polar coordinates - in a CAD system, coordinates located at a given distance and angle.

Raster objects - In computer drawing, objects made up of pixels. Also known as bitmap graphics.

Relative coordinates - in CAD system, coordinates located in relation to the last point specified (or the origin, if a previous point has not been specified).

Rendering - in CAD drafting, a highly realistic representation of a model with lighting, shadows, and other visual effects applied.

Resolution - a term used to describe the visual quality of a raster image, determined by the number of pixels making up the image.

Scanner - a computer hardware device used to convert a hard copy image into digital form.

Snap - in a CAD system, a function that allows the user to align or “snap” the cursor to specific increments in an invisible grid.

Solid modeling - in CAD drafting, a type of 3-D- based drawing used to create solids. Solid modeling (or modeling) is a consistent set of principles for mathematical and computer modeling of three dimensional solids.

Symbol library - in CAD drafting, a collection of related drawing symbols.

Symbols - in CAD drafting, saved or pre-drawn objects designed for multiple uses in drawing projects.

Trim - Trims objects at a cutting edge defined by other objects.

User coordinates system - a method of representing points in a space of given dimensions by coordinates.

Vector object - In computer drawing, objects made up of lines and arcs, defined with point coordinates in space.

World coordinate system - in a CAD program, a system for locating points using Cartesian coordinates on the XYZ axes in relation to the 0, 0, 0 origin.

Unit 6

Depth- horizontal distance measured from the front to the back of an object

Foreshortened - this type of surface is drawn smaller than true size and shape and is common for objects with inclined surfaces.

Height- vertical distance measured from the bottom to the top of an object.

Multi-view drawings- a drawing that requires more than one two-dimensional view in order to provide an accurate shape and size description of the object being produced.

Orthographic projection- a method of showing a three-dimensional object in two dimensions by displaying various views.

Principal views- the six basic views (front, top, right side, left side, rear, and bottom) used to develop three-dimensional objects in orthographic projection.

Projection plane- the face of the glass box to which the primary view of a given feature is projected.

Width- defined as the horizontal distance measured from the bottom to the top of an object.

UNIT 7

Aligned dimensioning – all dimension figures are aligned with the dimension lines so that they may be read from the bottom or from the right side of the sheet.

Bevel – an inclined edge; not a right angle to joining surface

Center line – a line used to indicate the center of a cylindrical feature

Chamfer – a slight bevel removed from an edge

Counterbore – an enlargement of the end of a hole to a specified diameter and depth

Countersink – a funnel-like bevel at the surface end of a drilled hole; standard included angle is 82°

Datum – a theoretically perfect surface, plane, axis, center plane, or point from which dimensions for related features are established

Dimension line – lines where dimension lines are placed

Drill – a tool with a pointed cutting edge used to make a hole in hard surfaces

Dual dimensioning – the drafting practice of using multiple units of measure in a dimension in the same direction of a feature.

Extension line – lines extending from object line where dimension lines are placed

Fillet – an interior rounded intersection between two surfaces

Finish Mark - a symbol used to indicate a surface to be machined

Knurl – the process of rolling depressions in the surface of an object

Leader – a line extending from a note to the object that requires special attention

Location dimension – any type of dimension that locates a feature on an object

Ream – to enlarge a finished hole slightly to a very precise diameter with a reamer

Round – an exterior rounded intersection of two surfaces

Size location – any type of dimension that tells how large or small an object is

Spot face – a machined circular spot on the surface of a part to provide a flat bearing surface for a bolt head

Taper – a gradual decrease or change of diameter from one end to the other

Unidirectional dimensioning – all dimension figures and notes are lettered horizontally on the sheet and read from the bottom of the drawing

Unit 8

Aligned section – used to align features such as spokes, holes, and ribs along a common plane so that they can be detailed more easily

Broken-out section – an area broken out of a view that shows only a portion of that view in section

Conventional break – used in making a shortened view of a long simple object

Crosshatch patterns – special filled objects used in CAD drafting

Cutting-plane line – section lines are shown only along the borders of a large part for clarity and to save time

Full section – the cutting plane passes completely through an object and the cross section behind the cutting plane is exposed to view.

Half section – the cutting planes are passed at right angles to each other along the center lines and one-fourth of object is removed.

Offset section – has a cutting plane line to pick up features that are not along a common cutting plane.

Outline section – section lines are shown along the borders of a large part for clarity and to save time

Removed section – a revolved section drawn off the principal view and placed in elsewhere on the drafting sheet

Revolved section – primarily utilized to show the shapes of objects such as spokes, ribs, and stock metal shapes. A revolved section is also known as a rotated section. It is created by revolving the cutting plane about an axis.

Sectional view – a view that shows the interior features of an object in an orthographic or pictorial view as visible edges and intersections as opposed to hidden lines.

Symmetrical – having the same shape, size, and relative position on opposite sides of a dividing line or plane.

Unit 9

Auxiliary view – a view showing the true length and true width of an angular surface, projected in a perpendicular direction from an edge view of the surface.

Complete auxiliary view – shows what the entire object would look like when viewed from a point of view that is perpendicular to the incline.

Front auxiliary view – projected from the front view

Partial auxiliary view – shows only the incline portion of the object in its true shape and size

Right-side auxiliary view – projected from the right side

Secondary auxiliary view – an auxiliary view of an auxiliary view

Top auxiliary view – projected from the top view

Unit 10

Angular perspective – has lines that converge to two vanishing points, also known as a two-point perspective

Cabinet oblique – an oblique drawing in which the depth axis lines are drawn at one-half scale

Cavalier oblique – an oblique drawing in which the depth axis lines are drawn at full scale

Cutaway pictorial drawing – shows the interior features of an assembled picture

Exploded assembly drawing – a series of pictorial drawings that show how the parts of a disassembled object fit together

General oblique – an oblique drawing in which the scale of the depth axis lines varies from one-half to full scale

Horizon line – a line in a perspective drawing where receding lines converge to one or more vanishing points

Isometric axes – the horizontal and vertical axes of an isometric drawing

Isoplanes – the isometric planes formed by the isometric axes in isometric drawing mode

Nonisometric lines – lines that form the inclined edges of inclined surfaces of isometric drawings.

Oblique drawing – a pictorial drawing in which the front view of an object is parallel to the projection plane and shown in its true size and shape

One-point perspective – has lines that converge to a single vanishing point, also known as a parallel perspective

Parallel perspective – has lines that converge to a single vanishing point

Perspective drawing – a pictorial drawing in which lines are projected to one or more vanishing points to show the depth of an object as it would appear when viewed from a certain position.

Pictorial drawing – A single-view drawing showing an object in three dimensions as it appears to the human eye

Primitive objects – in a CAD program, simple geometric shapes that can be used to develop solid models or surface models.

Two-point perspective – also known as angular perspective; has lines that converge to two vanishing points; what our eye actually sees in nature.

Vanishing points – the point to which lines converge in a perspective drawing

Unit 11

Assembly drawings – the type of working drawing that contains views showing where and how the various parts of an object fit into the assembled product.

Bill of materials – similar to a parts list but includes additional information, such as the material needed for manufacture, manufacturer’s names, and pricing.

Class of fit – standard working tolerances for thread accuracy, indicated by the last number of a thread description. (Ex. 3/8-16UNC-2A)

Depth of thread – distance from the crest of a thread to the root of that same thread.

Detail drawings – a type of working drawing that includes one or more views of a product, with dimensions and other pertinent information required to make the part.

Detailed threads – a screw thread representation in which the threads are drawn to look like the actual threads.

External thread – a screw thread “set” on an outside surface.

Helix – the basic shape of a screw thread, formed by a point curve that wraps around a cylinder in a spiral.

Internal thread – threads on the inside of a tube

Keyway – a small piece of metal partially fitted into a shaft and partially into a hub to prevent rotation of a gear, wheel, or pulley on the shaft. The slot in the hub is the keyway. The slot in the shaft is the keyset.

Machine screws – fastening device used in general assembly work

Machine threads – threads that are produced by a machining process

Major diameter – the largest diameter of a thread measured perpendicular to the axis. In a thread note (ex. 3/8-16UNC-2A) the first number is the major diameter of threads.

Minor diameter – the smallest diameter on a screw thread measured across the root of the thread and perpendicular to the axis.

Parts list – calls out part numbers and part names

Pitch – a screw thread designation measuring the distance from a point on one thread to a corresponding point on the next thread. Pitch is equal to 1 over the number of threads per inch.

Schematic threads – a screw thread representation in which schematic symbols are used to represent the threads.

Screw thread series – standard specifications grouping used to classify different types of screw threads

Simplified threads – a screw thread representation that uses regular object and hidden lines to show details.

Subassembly drawing – drawing used to show the assembly of a portion of a complete product.

Threads per inch – the classification of threads in a thread note (ex. 3/8-**16**UNC-2A); the second number is the number of threads per inch.

Unified National Course – thread series used to specify standards for course screw threads. (Ex. 3/8-16UNC-2A)

Unified National Fine – thread series uses to specify standards for fine screw threads. (Ex. 3/8-32UNF-2A)

Working drawings – a drawing that gives the craft worker necessary information to make and assemble a product.

UNIT 12

Area – sum of height x width

Board feet – same as board foot

Board foot – unit of measure for lumber that equals 1” x 12” x 12”

Cubic-foot method – produces an estimate of the building cost based on the volume of the house

Estimating – an organized effort to determine the total cost of materials, labor, and other services required to build a house.

Estimator – the person who calculates the costs of materials and labor for a building structure

Unit 13

Anchor bolt – a threaded rod inserted in masonry construction to anchor the sill plate to the foundation.

Base cabinet – lower kitchen cabinets, 2’ deep

Brick ledge – the portion of the foundation on which the brick veneer rests

Brick veneer – a facing of brick laid against and fastened to sheathing of a frame wall or tile wall construction

Ceiling joist – a number of horizontal beams, running parallel from one wall to the opposite wall of the structure

CMU – concrete masonry unit

Concrete – the result of combining cement, sand, aggregate (usually stone or gravel) and water

Cornice – the overhang of the roof at the eave line that forms a connection between the roof and side walls

Door jamb – the frame for a door that fits inside the rough opening

Drip board (Drip cap) – used over the top piece of door trim in frame construction to shed water

Elevation – drawn for each side of the structure, typically as orthographic projections showing the exterior features of the building.

Exterior wall – Load bearing walls that consist of sole plate, studs, and double top plates; must be fastened to the interior walls that they intersect.

Fascia board – a horizontal board nailed onto ends of the rafters

Floor plan – identifies the location and dimensions of exterior and interior walls, windows, doors, major appliances, cabinets, fireplaces, and other fixed features of the house; section view taken about halfway up the wall.

Floor joist – provides support for the floor

Footings – increase the supporting capacity of the foundation wall by spreading the load over a larger area.

Foundation plan – a plan view drawing in section that provides all of the information to construct the foundation; illustrates the foundation size and material.

Girder – a large support beam of wood or steel used to support concentrated loads at isolated points along its length.

Grade – the surface of the ground around a building

Header – a beam placed perpendicular to joists and to which joists are nailed in framing for chimneys, stairway, or other opening such as doors and windows.

Interior wall – consist of sole plate, studs, and double top plates; must be fastened to the exterior walls that they intersect.

Living area – where the family relaxes, entertains guests, dines, and meets together

Lookout – a short wooden framing member used to support an overhanging portion of a roof; extends from the wall to the underside surfacing of the overhang.

Overhang – the projecting area of a roof or upper story beyond the wall of the lower part

Pier – a masonry pillar, usually below a building to support the floor framing; piers are shorter than columns.

Pitch – the slope of a roof, usually expressed as a ratio

Plumbing wall – stud walls that house plumbing lines

Rafter – the most basic member of roof framing; designed to support loads

Rebar – refers to steel rods which are put in footings and grade beams in a concrete foundation; could vary in size depending on the structure and what size foundation is being poured.

Ridge – the top edge of the roof where two slopes meet

Scale – type of ruler used in drafting; the primary scale used in architecture is $\frac{1}{4}'' = 1'-0''$, with the whole numbers being feet and the little marks on the opposite side of 0 being inches.

Service area – the part of the house where food is prepared, clothes are laundered, goods are stored, the car is parked, and equipment for upkeep of the house is stored.

Sheathing – the structural covering, usually wood boards or plywood, used over studs or rafters of the structure.

Sill plate – the lowest member of the framework of a structure; rests on the foundation and supports the floor joist or the uprights (studs) of the wall; designed to drain water away and provide support for side jambs.

Slab foundation – an extension of a slab floor; it is placed at the same time as the floor is cast and is not a separate unit. It is sometimes called a thickened slab.

Sleeping area – where the family sleeps, rests, and bathes

Soffit – usually the underside of an overhanging cornice

Sole plate – the bottom horizontal member of the wall on which studs rest

Span – distance between 2 supports

Stud – a vertical wall framing member

Subfloor – affixed to the floor joists; provides the surface on which the underlayment for the final finished floor will rest.

T-foundation – the most common type of foundation; the name is derived from the shape of the foundation and footing, which looks like an inverted T.

Top plate – framing member located on top of stud; the first top plate is placed on and nailed to top of studs. A second top plate is added after the wall is in place on which the ceiling joists rest.

Truss – structural members arranged and fastened in triangular units to form a rigid framework for support of loads over a long span.

Vapor barrier – damp proofing, usually a heavy coat of hot tar or two coats of cement-based paint

Wall cabinet – upper kitchen cabinets, 1' deep

Wall section – section cut through the foundation to the roof showing all building components.

Wire mesh – foundation wire is used as a re-enforcement for concrete slabs.

Work triangle – a measure of kitchen efficiency, it is determined by drawing a line from the front-center of range to the refrigerator to the sink and back to range.

Unit 14

Bearing – location of lines on map in degrees from north or south, and minutes and seconds.

Contour lines – helps describe the topography of the site by depicting shapes and elevation of the land.

Duct – used in a forced-air system to move large quantities of air for heating or cooling.

Electrical panel – the foundation of an electrical system; houses the circuit breaker or fuse and switch type of electrical distribution.

GFCI (Ground Fault Circuit Interrupter) – a safety device that continually monitors the amount of current going to the load and compares it to that coming back

House drain – a drain line that into which all stacks empty.

HVAC – mechanical system that controls heating, ventilation, and air conditioning

Inlets – required for forced-air heating and cooling systems, the received air to be returned to the furnace or air conditioning coil.

Lighting outlet/fixture – an outlet intended for a lighting fixture

Mechanical system – a mechanical system in a building that provides fresh air

North arrow – points to the direction of true north to give the orientation of the view

Plumbing fixtures – any device, such as a bathtub, shower, sink, water closet, dishwasher, etc., that requires water.

Property Lines – define the site boundaries; length and bearing of each line must be identified on the plot plan.

Receptacle/convenience outlet – a contact attached to a circuit to allow electricity to be drawn off for appliances or lighting.

Register – the outlet in a forced air system

Return air – air that has circulated through a building as supply air and has been returned to the HVAC system for additional conditioning or release from the building

Sewer/septic system – private sewage disposal systems that are used for rural and isolated home sites that cannot be connect to public sewers.

Survey – drawing showing the exact size, shape, and levels of a property

Single-pole switch – a light switch that simply opens and closes the circuit

Thermostat – an automatic sensor device that sends a signal to the furnace or air conditioner at a temperature set by the homeowner.

Trap – installed below each fixture to prevent gases from escaping through the fixture drain into the house

Three-way switch – a light that allows the fixture to be turned on and off from two locations

Vent stack – a vertical soil pipe connected to allow ventilation and pressure equalization.

Water heater – electrically heats water

Water supply lines – transport water from the main supply, through filtration, and throughout the residence.

Unit 15

Artistic – appreciative or sensitive to art

Ethics – the study of the general nature of morals and the specific moral choices to be made by an individual.

Interview – a formal meeting in which one or more persons question, consult, or evaluate another person.

Qualifications – a quality, accomplishment, etc., that fits a person for a function.

Résumé – a brief written account of personal, educational, and professional qualifications and experience.

Appendix C: Industry Standards

ADDA International

ADDA International Crosswalk for Architecture and Drafting

	Units	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8	Unit 9	Unit 10
Architectural Apprentice Drafter											
PDC		X									
DEM			X			X					
ASO			X		X	X	X			X	
LLT			X	X		X	X	X		X	X
MAG			X		X		X	X	X	X	X
APS							X			X	X
LIT											X
INM			X		X	X	X	X		X	
DAN								X		X	X
FPL											
HPE											
RPI											
ELE											
FFP											
FPL											
SSS									X		
BCG											
SDW											
ESC											
DBM											

	Units	Unit 11	Unit 12	Unit 13	Unit 14	Unit 15
Architectural Apprentice Drafter						
PDC						X
DEM						
ASO						
LLT						
MAG		X	X	X	X	
APS						
LIT				X	X	
INM						
DAN					X	
FPL						
HPE					X	
RPI				X		
ELE				X		
FFP				X		
FPL				X		
SSS				X		
BCG				X	X	
SDW				X		
ESC			X			
DBM			X			

Mechanical Apprentice Drafter						
ATI		X				
DMR		X				
SLG		X				
DAN		X				
OPI		X				
GCD		X				
GDT		X				
DIN		X				
PDC						X

Architectural Apprentice Drafter *

PDC. Professional Drafting Practices in the Workplace – Communications

DEM. Drafting Equipment – Media – Reproduction

ASO. Architectural Sketching – Orthographic Projection

LLT. Lines – Lettering – General Terminology

MAG. Mathematics and Geometry

APS. Architectural Products – Styles – History – Identification and Terminology

LIT. Site Layout – Identifications and Terminology

INM. Drawing Identification – Architectural Numbering – Drawing Management

DAN. Dimensioning and Notations

FPL. Floor Plan Layout – Relationships – Identification and Terminology

HPE. HVAC – Plumbing – Electrical Plans – Identification and Terminology

RPI. Roof Plans – Identification and Terminology

ELE. Elevations

FFP. Framing – Framing Plans – Identification and Terminology

FPI. Foundation Plans – Identification and Terminology

SSS. Sections, Stairs and Steps

BCG. Building Codes and Governing Bodies

SDW. Schedules – Doors – Windows – Finishes

ESC. Estimations – Specifications – Calculations

DBM. Definitions and Building Materials

Mechanical Apprentice Drafter *

ATI. Abbreviations – Terms – Identification

DMR. Drafting Equipment – Media – Reproduction

SLG. Shapes – Lettering – Geometric Symbolology

DAN. Dimensioning and Notations

OPI. Orthographic Projections – Identification and Terminology

GCD. Geometric Construction and Descriptive Geometry

GDT. Basic Tolerancing – GD&T

MAG. Basic Math and Geometry – Drafting Math

DIN. Drawing Implementation – Identification – Numbering – Drawing Management

PDC. Professional Drafting Practices in the Workplace – Communications

Appendix D: 21st Century Skills¹

21st Century Crosswalk for Architecture and Drafting

	Units	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8	Unit 9	Unit 10
21 st Century Standards											
CS1		X									
CS2											
CS3		X									
CS4											
CS5											
CS6		X	X	X	X	X	X	X	X	X	X
CS7		X	X	X	X	X	X	X	X	X	X
CS8		X	X	X	X	X	X	X	X	X	X
CS9			X			X	X		X	X	X
CS10			X			X	X		X	X	X
CS11		X	X			X	X		X	X	X
CS12		X	X			X	X	X	X	X	X
CS13		X	X			X	X	X	X	X	X
CS14		X	X								
CS15		X	X			X	X		X	X	X
CS16		X	X								

	Units	Unit 11	Unit 12	Unit 13	Unit 14	Unit 15
21 st Century Standards						
CS1				X	X	X
CS2			X	X	X	X
CS3				X	X	X
CS4						
CS5				X	X	X
CS6		X	X	X	X	X
CS7		X	X	X	X	X
CS8		X	X	X	X	X
CS9		X	X	X	X	
CS10		X	X	X	X	X
CS11		X	X	X	X	X
CS12		X	X	X	X	
CS13		X	X	X	X	X
CS14			X	X	X	X
CS15		X	X	X	X	X
CS16			X			

CSS1-21st Century Themes

CS1 Global Awareness

- Using 21st century skills to understand and address global issues
- Learning from and working collaboratively with individuals representing diverse cultures, religions, and lifestyles in a spirit of mutual respect and open dialogue in personal, work, and community contexts
- Understanding other nations and cultures, including the use of non-English languages

CS2 Financial, Economic, Business, and Entrepreneurial Literacy

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

1. Knowing how to make appropriate personal economic choices
2. Understanding the role of the economy in society
3. Using entrepreneurial skills to enhance workplace productivity and career options

CS3 Civic Literacy

1. Participating effectively in civic life through knowing how to stay informed and understanding governmental processes
2. Exercising the rights and obligations of citizenship at local, state, national, and global levels
3. Understanding the local and global implications of civic decisions

CS4 Health Literacy

1. Obtaining, interpreting, and understanding basic health information and services and using such information and services in ways that enhance health
2. Understanding preventive physical and mental health measures, including proper diet, nutrition, exercise, risk avoidance, and stress reduction
3. Using available information to make appropriate health-related decisions
4. Establishing and monitoring personal and family health goals
5. Understanding national and international public health and safety issues

CS5 Environmental Literacy

1. Demonstrating knowledge and understanding of the environment and the circumstances and conditions affecting it, particularly as relates to air, climate, land, food, energy, water, and ecosystems
2. Demonstrating knowledge and understanding of society's impact on the natural world (e.g., population growth, population development, resource consumption rate, etc.)
3. Investigating and analyzing environmental issues, and making accurate conclusions about effective solutions
4. Taking individual and collective action toward addressing environmental challenges (e.g., participating in global actions, designing solutions that inspire action on environmental issues)

CSS2-Learning and Innovation Skills

CS6 Creativity and Innovation

1. Think creatively
2. Work creatively with others
3. Implement innovations

CS7 Critical Thinking and Problem Solving

1. Reason effectively
2. Use systems thinking
3. Make judgments and decisions
4. Solve problems

CS8 Communication and Collaboration

1. Communicate clearly
2. Collaborate with others

CSS3-Information, Media, and Technology Skills

CS9 Information Literacy

1. Access and evaluate information
2. Use and manage information

CS10 Media Literacy

1. Analyze media
2. Create media products

CS11 ICT Literacy

1. Apply technology effectively

CSS4-Life and Career Skills

CS12 Flexibility and Adaptability

1. Adapt to change
2. Be Flexible

CS13 Initiative and Self-Direction

1. Manage goals and time
2. Work independently
3. Be self-directed learners

CS14 Social and Cross-Cultural Skills

1. Interact effectively with others
2. Work effectively in diverse teams

CS15 Productivity and Accountability

1. Manage projects
2. Produce results

CS16 Leadership and Responsibility

1. Guide and lead others
2. Be responsible to others

Appendix E: Common Core Standards

Common Core Crosswalk for Architecture and Drafting											
	Units	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8	Unit 9	Unit 10
Common Core Standards											
CCR1		X	X		X	X	X	X	X	X	X
CCR2		X	X		X	X	X	X	X	X	X
CCR3		X	X		X		X	X	X	X	X
CCR4		X	X	X	X	X	X	X	X	X	X
CCR5		X				X	X	X	X	X	X
CCR6		X									
CCR7		X	X	X		X	X	X	X	X	X
CCR8		X					X	X	X	X	X
CCR9											
CCR10		X			X	X	X	X	X	X	X
CCW1											
CCW2				X	X						
CCW3											
CCW4		X		X	X						
CCW5		X									
CCW6		X									
CCW7		X									
CCW8		X									
CCW9		X									
CCW10		X									
CCSL1		X	X			X	X	X	X	X	X
CCSL2			X			X	X	X	X	X	X
CCSL3		X	X	X	X	X	X	X	X	X	X
CCSL4											
CCSL5		X				X	X	X	X	X	X
CCSL6											
CCL1		X				X	X	X	X	X	X
CCL2		X				X	X	X	X	X	X
CCL3		X	X	X							
CCL4					X		X	X	X	X	X
CCL5					X		X	X	X	X	X
CCL6			X		X		X	X	X	X	X
CCM1			X	X			X	X	X	X	X
CCM2			X	X			X	X	X	X	X
CCM3			X	X			X	X	X	X	X
CCM4			X	X			X	X	X	X	X
CCM5			X	X			X	X	X	X	X
CCM6			X	X							
CCM7				X							
CCM8											
CCM9											
CCM10			X								
CCM11				X							
CCM12											
CCM13											
CCM14											
CCM15			X								
CCM16			X								
CCM17			X								
CCM18			X								
CCM19			X								
CCM20											

CCM21											
CCM22											
CCM23											
CCM24											
CCM25											
CCM26											
CCM27											
CCM28											
CCM29											
CCM30					X		X	X	X	X	X
CCM31					X		X	X	X	X	X
CCM32					X		X	X	X	X	X
CCM33					X		X	X	X	X	X
CCM34					X		X	X	X	X	X
CCM35					X		X	X	X	X	X
CCM36					X		X	X	X	X	X
CCM37					X		X	X	X	X	X
CCM38					X		X	X	X	X	X
CCM39					X		X	X	X	X	X
CCM40					X		X	X	X	X	X
CCM41					X		X	X	X	X	X
CCM42					X		X	X	X	X	X
CCM43					X		X	X	X	X	X
CCM44					X		X	X	X	X	X
CCM45											
CCM46											
CCM47											
CCM48											
CCM49											
CCM50											
CCM51											
CCM52											
CCM53											

Common Core Crosswalk for Architecture and Drafting

	Units	Unit 11	Unit 12	Unit 13	Unit 14	Unit 15
Common Core Standards						
CCR1		X	X	X	X	X
CCR2		X	X	X	X	X
CCR3		X	X	X	X	X
CCR4		X	X	X	X	X
CCR5		X	X	X	X	X
CCR6		X	X	X	X	X
CCR7		X	X	X	X	X
CCR8		X	X	X	X	X
CCR9						X
CCR10		X	X	X	X	X
CCW1						X
CCW2				X	X	X
CCW3				X	X	X
CCW4				X	X	X
CCW5				X	X	X
CCW6				X	X	X
CCW7				X	X	X
CCW8						X
CCW9						X
CCW10						X
CCSL1		X	X	X	X	X
CCSL2		X	X	X	X	X
CCSL3		X	X	X	X	X
CCSL4						X
CCSL5		X	X	X	X	X
CCSL6						X
CCL1		X	X	X	X	X
CCL2		X	X	X	X	X
CCL3						X
CCL4		X	X	X	X	X
CCL5		X	X	X	X	X
CCL6		X	X	X	X	X
CCM1		X	X	X	X	
CCM2		X	X	X	X	
CCM3		X	X	X	X	
CCM4		X	X	X	X	
CCM5		X	X	X	X	
CCM6			X			
CCM7			X			
CCM8			X			
CCM9			X			
CCM10			X	X	X	
CCM11			X			
CCM12			X			
CCM13			X			
CCM14			X			
CCM15			X	X	X	
CCM16			X	X	X	
CCM17			X	X	X	
CCM18			X	X	X	
CCM19			X	X	X	
CCM20			X	X	X	
CCM21			X	X	X	

CCM22			X	X	X	
CCM23			X			
CCM24			X			
CCM25			X	X	X	
CCM26			X	X	X	
CCM27			X	X	X	
CCM28			X	X	X	
CCM29			X	X	X	
CCM30		X	X			
CCM31		X	X			
CCM32		X	X			
CCM33		X	X			
CCM34		X	X			
CCM35		X	X			
CCM36		X	X			
CCM37		X	X			
CCM38		X	X			
CCM39		X	X			
CCM40		X	X			
CCM41		X	X			
CCM42		X	X			
CCM43		X	X			
CCM44		X	X			
CCM45						
CCM46						
CCM47						
CCM48						
CCM49						
CCM50						
CCM51						
CCM52						
CCM53						

English Language Arts (6-12)

College and Career Readiness Anchor Standards for *Reading*

Key Ideas and Details

CCR1: Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.

CCR2: Determine central ideas or themes of a text, and analyze their development; summarize the key supporting details and ideas.

CCR3: Analyze how and why individuals, events, and ideas develop and interact over the course of a text.

Craft and Structure

CCR4: Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.

CCR5: Analyze the structure of texts, including how specific sentences, paragraphs, and larger portions of the text (e.g., a section, chapter, scene, or stanza) relate to each other and the whole.

CCR6: Assess how point of view or purpose shapes the content and style of a text.

Integration of Knowledge and Ideas

CCR7: Integrate and evaluate content presented in diverse formats and media, including visually and quantitatively, as well as in words.

CCR8: Delineate and evaluate the argument and specific claims in a text, including the validity of the reasoning as well as the relevance and sufficiency of the evidence.

CCR9: Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.

Range of Reading and Level of Text Complexity

CCR10: Read and comprehend complex literary and informational texts independently and proficiently.

College and Career Readiness Anchor Standards for *Writing*

Text Types and Purposes

CCW1: Write arguments to support claims in an analysis of substantive topics or texts using valid reasoning and relevant and sufficient evidence.

CCW2: Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.

CCW3: Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences.

Production and Distribution of Writing

CCW4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

CCW5: Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.

CCW6: Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.

Research to Build and Present Knowledge

CCW7: Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.

CCW8: Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.

CCW9: Draw evidence from literary or informational texts to support analysis, reflection, and research.

Range of Writing

CCW10: Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.

College and Career Readiness Anchor Standards for *Speaking and Listening*

Comprehension and Collaboration

CCSL1: Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.

CCSL2: Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.

CCSL3: Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric.

Presentation of Knowledge and Ideas

CCSL4: Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.

CCSL5: Make strategic use of digital media and visual displays of data to express information and enhance understanding of presentations.

CCSL6: Adapt speech to a variety of contexts and communicative tasks, demonstrating command of formal English when indicated or appropriate.

College and Career Readiness Anchor Standards for *Language*

Conventions of Standard English

CCL1: Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

CCL2: Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

Knowledge of Language

CCL3: Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.

Vocabulary Acquisition and Use

CCL4: Determine or clarify the meaning of unknown and multiple-meaning words and phrases by using context clues, analyzing meaningful word parts, and consulting general and specialized reference materials as appropriate.

CCL5: Demonstrate understanding of figurative language, word relationships, and nuances in word meanings.

CCL6: Acquire and use accurately a range of general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.

Mathematics (High School)

Number and Quantity

The Real Number System

CCM1: Extend the properties of exponents to rational exponents.

CCM2: Use properties of rational and irrational numbers.

Quantities

CCM3: Reason quantitatively and use units to solve problems.

The Complex Number System

CCM4: Perform arithmetic operations with complex numbers.

CCM5: Represent complex numbers and their operations on the complex plane.

CCM6: Use complex numbers in polynomial identities and equations.

Vector and Matrix Quantities

CCM7: Represent and model with vector quantities.

CCM8: Perform operations on vectors.

CCM9: Perform operations on matrices and use matrices in applications.

Algebra

Interpret the structure of expressions

CCM10: Write expressions in equivalent forms to solve problems.

Arithmetic with Polynomials and Rational Expressions

CCM11: Perform arithmetic operations on polynomials.

CCM12: Understand the relationship between zeros and factors of polynomials.

CCM13: Use polynomial identities to solve problems.

CCM14: Rewrite rational expressions.

Creating Equations

CCM15: Create equations that describe numbers or relationships.

Reasoning with Equations and Inequalities

CCM16: Understand solving equations as a process of reasoning, and explain the reasoning.

CCM17: Solve equations and inequalities in one variable.

CCM18: Solve systems of equations.

CCM19: Represent and solve equations and inequalities graphically.

Functions

CCM20: Understand the concept of a function and use function notation.

CCM21: Interpret functions that arise in applications in terms of the context.

CCM22: Analyze functions using different representations.

Building Functions

CCM23: Build a function that models a relationship between two quantities.

CCM24: Build new functions from existing functions.

Linear, Quadratic, and Exponential Models

CCM25: Construct and compare linear, quadratic, and exponential models, and solve problems.

CCM26: Interpret expressions for functions in terms of the situation they model.

Trigonometric Functions

CCM27: Extend the domain of trigonometric functions using the unit circle.

CCM28: Model periodic phenomena with trigonometric functions.

CCM29: Prove and apply trigonometric identities.

Geometry

CCM30: Experiment with transformations in the plane.

CCM31: Understand congruence in terms of rigid motions.

CCM32: Prove geometric theorems.

CCM33: Make geometric constructions.

Similarity, Right Triangles, and Trigonometry

CCM34: Understand similarity in terms of similarity transformations.

CCM35: Prove theorems involving similarity.

CCM36: Define trigonometric ratios and solve problems involving right triangles.

CCM37: Apply trigonometry to general triangles.

Circles

CCM38: Understand and apply theorems about circles.

CCM39: Find arc lengths and areas of sectors of circles.

Expressing Geometric Properties with Equations

CCM40: Translate between the geometric description and the equation for a conic section.

CCM41: Use coordinates to prove simple geometric theorems algebraically.

Geometric Measurement and Dimension

CCM42: Explain volume formulas and use them to solve problems.

CCM43: Visualize relationships between two-dimensional and three-dimensional objects.

Modeling with Geometry

CCM44: Apply geometric concepts in modeling situations.

Statistics and Probability

CCM45: Summarize, represent, and interpret data on a single count or measurement variable.

CCM46: Summarize, represent, and interpret data on two categorical and quantitative variables.

CCM47: Interpret linear models.

Making Inferences and Justifying Conclusions

CCM48: Understand and evaluate random processes underlying statistical experiments.

CCM49: Make inferences and justify conclusions from sample surveys, experiments, and observational studies.

Conditional Probability and the Rules of Probability

CCM50: Understand independence and conditional probability and use them to interpret data.

CCM51: Use the rules of probability to compute probabilities of compound events in a uniform probability model.

Using Probability to Make Decisions

CCM52: Calculate expected values and use them to solve problems.

CCM53: Use probability to evaluate outcomes of decisions.

Appendix F: National Educational Technology Standards for Students (NETS-S)

NETS Crosswalk for Architecture and Drafting											
	Course	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8	Unit 9	Unit 10
NETS Standards											
T1		X	X	X	X	X	X	X	X	X	X
T2		X	X	X	X	X	X	X	X	X	X
T3		X	X		X	X	X				
T4			X		X	X	X				
T5		X	X	X	X	X	X	X	X	X	X
T6		X	X		X	X	X	X	X	X	X

	Course	Unit 11	Unit 12	Unit 13	Unit 14	Unit 15
NETS Standards						
T1		X	X	X	X	X
T2		X	X	X	X	X
T3		X		X	X	X
T4		X	X	X	X	X
T5		X	X	X	X	X
T6		X		X	X	X

- 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.

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.