

## Technical Drafting Blueprint

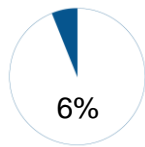
This Blueprint contains the subject matter content for the Career Essentials - Assessment.

**Note:** To fully prepare for the [Technical Drafting](#) SkillsUSA Championships contest, refer to the current year's SkillsUSA Championships Technical Standard, now included with your SkillsUSA Professional Membership. If you need help in accessing this benefit, contact the SkillsUSA Customer Care Team at 844-875-4557 or [customercare@skillsusa.org](mailto:customercare@skillsusa.org)

### Standards and Competencies

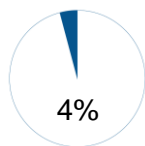
Competencies are weighted throughout the assessment. The percent shown is the weight of the competency. There are 50 questions per assessment.

#### Select the appropriate scale for the given drawing problem according to ANSI Standards



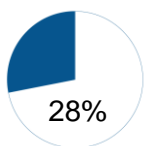
- Derive proper scaling and dimensions acceptable to industrial requirements on each assigned drawing
- Explain the different types of scales utilized in technical drafting and how they are used for measurements

#### Apply sketching knowledge and techniques to solve the problem identified by the technical committee according to ANSI standards



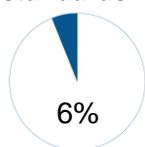
- Identify the types of sketches
- Make freehand drawings to solve problems and convey ideas
- Sketch to correct proportional sizes

#### Apply knowledge of orthographic projections to solve technical drafting problems according to ANSI standards



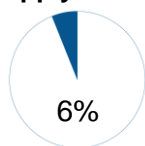
- Explain the Theory of Orthographic Projection and how it relates to technical drafting
- Draw two-dimensional orthographic projections from given three-dimensional views
- Apply the principles of orthographic projection using CAD

#### Utilize knowledge of auxiliary views to solve technical drafting problems according to ANSI standards



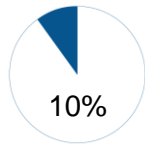
- Describe the true shape and size of incline and oblique surfaces in the form of "helper views" projected upon auxiliary planes
- Demonstrate how and determine when to use single and double auxiliary views

#### Apply knowledge of sectioning to solve technical drafting problems according to ANSI standards



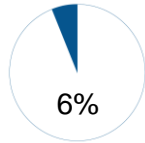
- Explain the purpose and theory of sectioning
- Describe the different types of sectioning
- Represent complex interior detail by using sectioning
- Represent different materials through the use of appropriate cross-hatching line symbols

**Implement techniques in dimensioning and tolerancing including geometric dimensioning and tolerances to solve technical drafting problems according to ANSI standards**



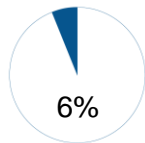
- Define basic tolerancing terminology
- Demonstrate correct dimensioning techniques and symbol applications
- Explain the theory of dimensioning
- Identify dimensioning styles and methods

**Apply knowledge of detail and assembly drawings**



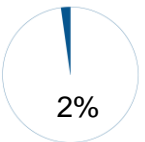
- Construct a detail drawing showing all necessary information
- Construct an assembly drawing showing all necessary information and details

**Demonstrate knowledge of fasteners and hardware**



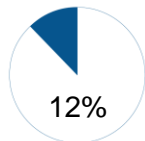
- List the common types of fasteners
- Draw and label fasteners correctly on production, assembly drawings and parts lists
- Draw threaded fasteners using detailed and schematic representations

**Demonstrate knowledge of construction materials and methods**



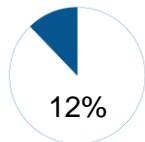
- Explain use of materials and specifications for each
- Explain manufacturing processes
  - List the manufacturing processes typically used today
  - Describe the roll quality control plays in manufacturing
- Explain power transmission
- Describe sheet metal developments

**Utilize CAD software to create a computer-generated 3-D model and drawing**



- Apply geometric constraints
- Apply features to a sketch (extrude, revolve, loft, sweep, rib, etc)
- Apply ANSI standards for correct generation and placement of 2-D views

**Apply reference materials and relevant mathematical formulas to assigned problems**



- Calculate mass properties including but not limited to volume, density and force
- Calculate volume measurements from given mathematical problems
- Use reference materials provided by the technical committee to effectively solve the technical drafting problem assigned to meet ANSI standards



## **Committee Identified Academic Skills**

The SkillsUSA national technical committee has identified that the following academic skills are embedded in the technical drafting training program and assessment:

### **Math Skills**

- Use fractions to solve practical problems
- Use proportions and ratios to solve practical problems
- Simplify numerical expressions
- Solve practical problems involving percents
- Solve single variable algebraic expressions
- Measure angles
- Find surface area and perimeter of two- dimensional objects
- Find volume and surface area of three- dimensional objects
- Apply transformations (rotate or turn, reflect or flip, translate or slide, and dilate or scale) to geometric figures
- Construct three-dimensional models
- Apply Pythagorean Theorem
- Make comparisons, predictions, and inferences using graphs and charts
- Solve problems using proportions, formulas, and functions
- Solve problems involving symmetry and transformation
- Use measures of interior and exterior angles of polygons to solve problems
- Find arc length and the area of a sector

### **Science Skills**

- Describe and recognize solids, liquids and gases
- Describe characteristics of types of matter based on physical and chemical properties
- Use knowledge of physical properties (shape, density, solubility, odor, melting point, boiling point, color)
- Use knowledge of classification of elements as metals, metalloids and nonmetals
- Use knowledge of mechanical, chemical and electrical energy
- Use knowledge of heat, light and sound energy
- Use knowledge of temperature scales, heat and heat transfer
- Use knowledge of sound and technological applications of sound waves
- Use knowledge of simple machines, compound machines, powered vehicles, rockets and restraining devices
- Use knowledge of principles of electricity and magnetism
- Use knowledge of static electricity, current electricity and circuits
- Use knowledge of motors and generators

### **Language Arts Skills**

- Provide information in conversations and in group discussions
- Provide information in oral presentations
- Demonstrate use of verbal communication skills, such as word choice, pitch, feeling, tone and voice
- Demonstrate use of nonverbal communication skills, such as eye contact, posture and gestures using interviewing techniques to gain information
- Demonstrate knowledge of appropriate reference materials



## Connections to National Standards

State-level academic curriculum specialists identified the following connections to national academic standards.

### Math Standards

- Numbers and operations
- Algebra
- Geometry
- Measurement
- Problem solving
- Communication
- Connections
- Representation

**Source:** NCTM Principles and Standards for School Mathematics. To view high school standards, visit: <http://www.nctm.org/standards/content.aspx?id=16909>.

### Science Standards

- Understands the structure and properties of matter
- Understands the sources and properties of energy
- Understands forces and motion
- Understands the nature of scientific inquiry

**Source:** McREL compendium of national science standards. To view and search the compendium, visit: [www.mcrel.org/standards-benchmarks/](http://www.mcrel.org/standards-benchmarks/).

### Language Arts Standards

- Students read a wide range of print and nonprint texts to build an understanding of texts, of themselves and of the cultures of the United States and the world; to acquire new information; to respond to the needs and demands of society and the workplace; and for personal fulfillment. Among these texts are fiction and nonfiction, classic and contemporary works
- Students apply a wide range of strategies to comprehend, interpret, evaluate and appreciate texts. They draw on their prior experience, their interactions with other readers and writers, their knowledge of word meaning and of other texts, their word identification strategies and their understanding of textual features (e.g., sound-letter correspondence, sentence structure, context, graphics)
- Students adjust their use of spoken, written, and visual language (e.g., conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes
- Students employ a wide range of strategies as they write and use different writing process elements appropriately to communicate with different audiences for a variety of purposes
- Students apply knowledge of language structure, language conventions (e.g., spelling and punctuation), media techniques, figurative language and genre to create, critique and discuss print and nonprint texts
- Students conduct research on issues and interests by generating ideas and questions, and by posing problems. They gather, evaluate and synthesize data from a variety of sources (e.g., print and nonprint texts, artifacts, people) to communicate their discoveries in ways that suit their purpose and audience
- Students use a variety of technological and information resources (e.g., libraries, databases, computer networks, video) to gather and synthesize information and to create and communicate knowledge
- Students use spoken, written and visual language to accomplish their own purposes (e.g., for learning, enjoyment, persuasion and the exchange of information)

**Source:** IRA/NCTE Standards for the English Language Arts. To view the standards, visit: [www.readwritethink.org/standards/index.html](http://www.readwritethink.org/standards/index.html).