

Mechanical Drawing

Unit 1 Study Guide for Chapters 1-5

Chapter 1 Drafting Careers

Section 1.1 Identifying Drafting Careers

A. Career Opportunities: What should you consider when choosing and planning a career?

1. Specialized Career Paths
 - a. Engineering
 - b. Architecture
 - c. Mechanical Design
 - d. Technical Illustration
2. Entrepreneurship

B. Board and Computer-Aided Drafting: How has technology impacted the drafting industry?

1. Computer-Aided Drafting
 - a. Advantages of CAD Use
 - b. Production Input
 - c. Plan Extraction
 - d. Disadvantages of CAD Use

Section 1.2 Preparing for a Career in Drafting

A. Making a Career Plan: How should your interests influence your career path?

1. Evaluating Choices
2. Preparing for a Drafting-Related Career
 - a. Education
 - b. Experience
3. Setting Your Goals
 - a. Short-Term Goals
 - b. Long-Term Goals

B. Lifelong Learning: What kinds of learning activities can you do after you graduate?

1. Certification, Licenses, and Permits

C. Searching and Applying for a Job: What are the best ways to present yourself to prospective employers?

1. Assembling Your Portfolio
2. Creating Your Resume
 - a. Electronic Formats
3. Writing the Cover Letter
4. Interviewing
 - a. Attending the Interview
 - b. Following Up after the Interview
5. Adapting to a New Job

D. Demonstrating Workplace Skills: How can aspects of your character or personality affect your career success?

1. Professional Relationships
2. Attitude
3. Communication Skills
4. Self-Management
5. Time Management
6. Ethical Behavior
7. Leadership
8. Teamwork

E. Recognizing Rights and Responsibilities: How does an employee show respect for work and the workplace?

1. Basic Employee Rights
2. Employee Responsibilities
3. Workplace Safety

Chapter 2 Design and Sketching

Section 2.1 Design and Freehand Sketching

- A. Aspects of Design: How are new design ideas initiated?
- B. Refinement in Design: How does refinement play an important role in the design of new products?
- C. The Design Process: How do the traditional and concurrent engineering design models differ?
 1. Traditional Engineering Design
 2. Concurrent Engineering Design
- D. Freehand Sketching
 1. Multiview Sketches
 - a. One-View Sketches
 - b. Two-View Sketches
 - c. Sketches with Three or More Views
 - d. The Glass Box
 2. Pictorial Sketches
 - a. Oblique Sketches
 - b. Isometric Sketches
 3. Proportions for Sketching
 - a. Estimating Proportions
 - b. Technique in Developing Proportion
 4. Dimensioning a Sketch
- E. Learning to Sketch: How does sketching help in the design process?
 1. Rough Sketches
 2. Refined Sketches
 3. Presentation Sketches
 4. Temporary Sketches
 5. Permanent Sketches
 6. The Overlay
- F. Materials for Sketching: What are the advantages of sketching over drawing?
 1. Paper
 2. Pencils and Erasers
- G. Sketching Techniques: What techniques can help you achieve the natural feeling of a freehand sketch?
 1. Straight Lines
 2. Slanted Lines and Specific Angles
 3. Circles and Arcs
- H. Making a Proportional Sketch: Why is observation an important step in sketching?
 1. Oblique Layout
 - a. Oblique Sketching on Graph Paper
 - b. Oblique Circles
 2. Isometric Layout
 - a. Isometric Circles and Arcs
 - b. Irregular Curves
- I. Lettering: What are some reasons for adding text to a drawing?
 1. Composition
 2. Types of Lettering

Section 2.2 Computer-Aided Sketching

- A. Sketching with CAD: How does the concept of a sketch differ when using CAD?
 1. The SKETCH Command

- B. CAD Lettering: Why is lettering style an important design element?
 - 1. Setting the Text Style
 - 2. Adding Text to a Drawing
 - a. Using TEXT
 - b. Using MTEXT
 - 3. Editing Text

Chapter 3 Drafting Equipment

Section 3.1 Board-Drafting Equipment

- A. Basic Board-Drafting Equipment
 - 1. Drawing Tables and Desks
 - 2. Drawing Boards
 - 3. T-Squares
 - 4. Parallel-Ruling Straightedges
 - 5. Triangles
 - 6. Protractors
 - 7. Drafting Machines
 - 8. Other Basic Tools
 - 9. Irregular Curves
 - 10. Templates
- B. Drafting Media: What qualities are important for drafting media
 - 1. Types of Drafting Media
 - 2. Sizes of Drafting Media
- C. Drawing Instruments: What types of instruments are included in a typical drafting kit?
 - 1. Dividers
 - 2. Compasses
 - 3. Beam Compasses
 - 4. Bow Instruments
- D. Drafting Pencils and Pens: How do pencils, pens, and erasing tools affect the quality of a drawing?
 - 1. Drafting Pencils
 - a. Grades of Graphite Sticks or Pencils
 - b. Pencils for Film
 - 2. Technical Pens
 - a. Drawing Ink
 - b. Lettering Guides and Equipment
 - 3. Erasers and Erasing Shields
- E. Scales: How does a drafter represent objects that are either very large or very small?
 - 1. Customary-Inch Scales
 - a. The Architect's Scale
 - b. The Mechanical Engineer's Scale
 - c. The Civil Engineer's Scale
 - d. The Decimal-Inch Scale
 - 2. The Metric Scale

Section 3.2 Board-Drafting Equipment

- A. CAD Hardware Equipment: What factors should you consider when setting up a CAD system?
 - 1. The CPU
 - 2. Monitors
 - a. Resolution
 - 3. Input Devices
 - 4. Printers and Plotters
- B. CAD Software: Why might a CAD drafter require more than one CAD program?
 - 1. Maintenance and Repair

C. The CAD Workstation: What considerations should determine your choice of computer furniture?

1. CAD Furniture
2. Safety
 - a. Ergonomics
 - b. Electrical Safety
 - c. Hazardous Waste

Chapter 4 Basic Drafting Techniques

Section 4.1 Getting Ready to Draw

A. Preparing the Drawing Sheet: What are the steps in preparing a drawing sheet?

1. Choosing the Drawing Sheet
2. Fastening the Drawing Sheet to the Board
 - a. Sheet Layout
 - b. Sheet Layout: U.S. Customary
 - c. Sheet Layout: Metric

B. Getting Ready to Create a CAD Drawing: How does preparing a CAD drawing differ from preparing a drawing sheet?

1. Creating a New Drawing
2. Setting the Drawing Units
3. Setting the Drawing Limits
4. Limits for Printing at Full Size
5. Limits for Printing a Scaled Drawing
6. Working with Layers
7. Creating a New Layer
 - a. Setting the Layer Color
 - b. Setting the Linetype
 - c. Selecting the Line Width
8. Finishing Layer Setup

Section 4.2 Creating a Drawing

A. Working with Drafting Pencils and Pens: When using drawing tools, why is it important to keep the drawing neat and clean?

1. Sharpening the Pencil
2. Techniques for Using a Drafting Pencil
3. Inking Techniques
4. Using Erasers

B. Alphabet of Lines: Why is the term "alphabet" used to describe the various lines used in drafting?

C. Techniques for Drawing Lines: Why does line drawing require special instruments?

1. Horizontal Lines
2. Vertical Lines
3. Inclined Lines
 - a. 30°, 45°, and 60° Lines
 - b. Lines Inclined at 15° Increments
4. Techniques for Special Lines and Surfaces
 - a. Hidden Lines
 - b. Centerlines

D. Working With Drawing Instruments: How can you further improve the accuracy of your drawings?

1. Using the Dividers
2. Using the Compass
3. Using the Bow Instruments
 - a. Bow Pencil
 - b. Drop-Spring Bow Compass

- c. Adjusting Bow Instruments
 - 4. Using Irregular Curves
- E. Applying Drawing Skills: How do abbreviations and symbols help in drafting?
 - 1. Applying Basic Drawing Skills
- F. Working with CAD Commands: Which basic CAD commands are needed to create a simple CAD drawing?
 - 1. Drawing Straight Lines
 - a. Horizontal and Vertical Lines
 - b. Inclined Lines
 - c. Polylines
 - 2. Drawing Circles and Arcs
 - 3. Using Snap and Grid
 - 4. Erasing
 - 5. Creating the Layout in Paper Space
 - 6. Printing the Drawing
- G. Applying the Concepts: In what ways are board-drafting techniques different than CAD techniques?

Chapter 5 Geometry for Drafting

Section 5.1 Applied Geometry for Board Drafting

- A. Geometry and Geometric Constructions: What do you need to be able to understand geometric constructions?
- B. Bisect a Line, an Arc, or an Angle
 - 1. Bisect an Angle
- C. Divide a Line into any Number of Equal Parts
 - 1. Divide a Line into Equal Parts
 - 2. Divide a Line into Five Equal Parts
- D. Construct a Perpendicular Line
 - 1. Method 1
 - 2. Method 2
 - 3. Method 3
 - 4. Method 4
- E. Draw a Parallel Line
 - 1. Method 1
 - 2. Method 2
 - 3. Method 3
- F. Copy an Angle
- G. Construct a Triangle
 - 1. Method 1
 - 2. Method 2
 - 3. Method 3
 - 4. Method 4
 - 5. Method 5
- H. Construct a Circle
- I. Construct Lines Tangent to a Circle
 - 1. Method 1
 - 2. Method 2
 - 3. Method 3
 - 4. Method 4
 - 5. Method 5
- J. Construct Arcs Tangent to Straight Lines and Other Arcs
 - 1. Construct an Arc Tangent to Two Straight Lines

2. Construct an Arc Tangent to Two Given Arcs
 3. Construct an Arc Tangent to a Line and an Arc
- K. Construct a Square
1. Construct a Square When the Length of One Side Is Known
 2. Construct a Square Inscribed in a Circle
 3. Construct a Square Circumscribed in a Circle
- L. Construct a Pentagon
1. Regular Pentagon When the Length of One Side Is Known
 2. Inscribe a Pentagon Within a Circle
- M. Construct a Hexagon
1. Construct a Regular Hexagon When the Distance Across the Flats Is Known
 2. Construct a Regular Hexagon When the Distance Across the Corners Is Known
 - a. Method 1
 - b. Method 2
- N. Construct an Octagon
1. Construct an Octagon Circumscribed about a Circle
 2. Construct an Octagon Inscribed Within a Circle
 3. Construct an Octagon Inscribed Within a Square
- O. Construct an Ellipse
1. Pin-and-String Method to Construct an Ellipse
 2. Trammel Method to Construct an Ellipse
 3. Use of Major and Minor Axes to Construct an Ellipse
- P. Reduce or Enlarge a Drawing
1. Reduce or Enlarge a Square or Rectangular
 2. Reduce or Enlarge a Drawing That Is Not Square or Rectangular

Section 5.2 Applied Geometry for CAD Systems

- A. Using Geometry with CAD Systems: What do object snaps allow a drafter to do?
1. Object Snaps
- B. Bisect or Divide a Line, an Arc, or an Angle: What actions do the LINE, TRIM, and DIVIDE commands perform?
1. Bisect a Line or an Arc
 2. Bisect an Angle
 3. Divide a Line into Eight Equal Parts
- C. Construct Lines with a CAD System
1. Construct a Perpendicular Line
 2. Construct Lines Parallel to a Given Line
- D. Construct a Polygon
1. Create a Square
 2. Inscribe a Pentagon in a Circle
 3. Circumscribe a Hexagon about a Circle
- E. Construct an Ellipse
- F. Copy an Angle
- G. Construct a Triangle
1. Construct an Isosceles Triangle

2. Construct a Right Triangle

H. Construct Tangents

1. Construct a Tangent Line

2. Construct a Tangent Arc

3. Construct an Arc Tangent to Two Lines

4. Construct an Arc Tangent to Two Given Arcs

I. Construct an Ogee Curve

J. Reduce or Enlarge a Drawing