Pictorial Drawings and Sketches

Unit: Graphic Agility

Problem Area: Pictorial Drawing

Lesson: Pictorial Drawings and Sketches

Student Learning Objectives.

Instruction in this lesson should result in students achieving the following objectives:

1. **Define axonometric, dimetric, isometric, and trimetric sketches.**
2. **Define oblique sketches.**
3. **Define perspectives sketches.**

Resources.

The following resources may be useful in teaching this lesson:

E-unit(s) corresponding to this lesson plan. CAERT, Inc. http://www.mycaert.com.

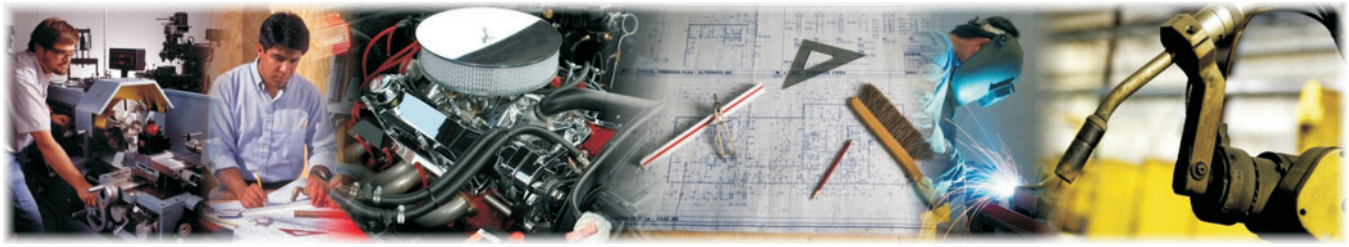
"Axonometric Projection," *Wikipedia*. Accessed Sept. 24, 2012. http://en.wikipedia.org/wiki/Axonometric_projection.

Kicklighter, Clois E., and Walter C. Brown. *Drafting & Design*, 7th ed. Goodheart-Willcox, 2008.

"Practicing Architecture," *The American Institute of Architects*. Accessed Sept. 24, 2012. http://www.aia.org/practicing/projects/index.htm.

"Showcase Gallery," *Autodesk® Education Community*. Accessed Sept. 24, 2012. http://students.autodesk.com/?nd=showcase_gallery.

"Technical Drawing," *Wikipedia*. Accessed Sept. 24, 2012. http://en.wikipedia.org/wiki/Technical_drawing.



Walker, John R., and Bernard D. Mathis. *Exploring Drafting*, 11th ed. Goodheart-Willcox, 2012.

Wohlers, Terry T. *Applying AutoCad 2012.* McGraw-Hill, 2012.

Equipment, Tools, Supplies, and Facilities

- ✓ Overhead or PowerPoint projector
- ✓ Visual(s) from accompanying master(s)
- ✓ Copies of sample test, lab sheet(s), and/or other items designed for duplication
- ✓ Materials listed on duplicated items
- ✓ Computers with printers and Internet access
- ✓ Classroom resource and reference materials

Key Terms. The following terms are presented in this lesson (shown in bold italics):

- axonometric sketch
- cabinet oblique sketch
- cavalier oblique sketch
- depth
- dimetric sketch
- ellipse
- freehand
- grid
- height
- isometric sketch
- oblique sketch
- one-point perspective sketch
- perspective sketch
- pictorial sketch
- profile
- projection plane
- three-point perspective sketch
- trimetric sketch
- two-point perspective sketch
- vanishing point
- visualize
- width

Interest Approach. Use an interest approach that will prepare the students for the lesson. Teachers often develop approaches for their unique class and student situations. A possible approach is included here.

> *Ask students to identify items in the room that have been designed or engineered before being manufactured or produced. Then have them freehand sketch one of those items. Create a list (i.e., desk, eraser, stapler, overhead projector, and room/building).*

> *Ask students to identify items in the room that have not been designed before being manufactured or produced. Then have them freehand sketch one of those items; create a list (i.e., people, animals, and plants).*

> *Ask students which of these items were created without sketches, drawings, models, or prototypes before first being produced. Emphasize the fact that everything that has been designed or built has started that process with sketches.*

CONTENT SUMMARY AND TEACHING STRATEGIES

Objective 1: Define axonometric, diametric, isometric, and trimetric sketches.

Anticipated Problem: What are axonometric, dimetric, isometric, and trimetric sketches?

I. Axonometric, dimetric, isometric, and trimetric sketches

A. An ***axonometric sketch*** is a form of pictorial sketch in which a drawing axis of various angles creates faces upon which to create a freehand sketch. The lines are perpendicular to the projection plane. A ***projection plane*** is an imaginary surface on which the view of the object is projected and drawn.

1. A ***pictorial sketch*** is a drawing that shows an object's height, width, and depth in a single view. A pictorial sketch is used to ***visualize*** (to form a mental image) an object during the design process. ***Freehand*** is a drawing created manually, without the aid of instruments (e.g., rulers).
2. Axis angles vary based on the type of sketch to be created.
3. The three faces are inclined at various angles to a projection plane. A projection plane meets to form edges from which sketches are started. A projection plane is an imaginary surface on which the view of the object is projected and drawn. A ***profile***, an outline of something as seen from one side, is created on a plane to begin the sketch.

4. The three edges represent height, width, and depth.
    a. ***Height*** is a measurement of someone or something from head to foot or from base to top.
    b. ***Width*** is the measurement of something from side to side.
    c. ***Depth*** is the distance from front to back.
5. A grid is often used as a drawing aide to create sketches upon. A ***grid*** is a network of lines that cross each other to form a series of squares or rectangles upon which to sketch. An ***ellipse*** is a regular oval shape often used to represent a circle, rounded edge, or hole in pictorial sketch.

B. An ***isometric sketch*** is a form of pictorial sketch in which all three drawing axes form equal angles of 120 degrees with the plane of projection.
1. All axis angles are equal.
2. Three faces are equally inclined to a projection plane.

C. A ***dimetric sketch*** is a form of pictorial sketch in which one of the three drawing axes are at different degrees with the plane of projection.
1. Two axis angles are equal.
2. One axis angle is unequal.
3. Two of three faces are equally inclined to the projection plane.

D. A ***trimetric sketch*** is a form of pictorial sketch in which the three drawing axes are at different degrees with the plane of projection.
1. All axis angles are unequal.
2. Three faces are unequally inclined to a projection plane.

Teaching Strategy: *Use VM–A and VM–B. Assign LS–A.*

Objective 2: Define oblique sketches.

Anticipated Problem: What are oblique sketches?

II. Oblique sketch types

A. An ***oblique sketch*** is a type of pictorial that represents an object's width and height, but the depth can be any size; it may be drawn at any angle.
1. It starts with a straight-on view of one of the object's faces.
2. Angled, parallel lines are drawn to one side to represent the object's depth.
3. Common oblique angles are 30, 45, and 60 degrees.
4. These projection lines are used to create sketch boxes, which are used to form the limits to the shape and size of the objects.

B. A ***cabinet oblique sketch*** is a pictorial sketch in which the height and width are sketched at full size, and depth is sketched at half size.
1. It starts with a straight-on view of one of the object's faces.

2. Common oblique angles are 30, 45, and 60 degrees. Of the three, 45 degrees is the most common angle used.
3. Angled, parallel lines are drawn to one side to represent the object's depth.
4. These projection lines are used to create sketch boxes that are used to form the limits of the shape and size for the objects.

C. A ***cavalier oblique sketch*** is a pictorial sketch in which the height, width, and depth are sketched at full size.

1. It starts with a straight-on view of one of the object's faces.
2. Common oblique angles are 30, 45, and 60 degrees. Of the three, 45 degrees is the most common angle used.
3. Angled, parallel lines are drawn to one side to represent the object's depth.
4. These projection lines are used to create sketch boxes, which are used to form the limits to the shape and size of objects.

Teaching Strategy: *Use VM–C. Assign LS–B.*

Objective 3: Define perspective sketches.

Anticipated Problem: What are perspective sketches?

III. A ***perspective sketch*** is a drawing offering the most realistic three-dimensional view of all the pictorial methods, using vanishing points to project a view. A ***vanishing point*** is a point in space, usually located on the horizon, where parallel edges of an object appear to converge to create a view. A perspective sketch portrays the object in a manner that is most similar to how the human eye perceives the visual world.

A. A one-point perspective sketch is relatively simple to make compared to other types of perspectives sketches. The one-point perspective sketch is a drawing of a horizontal line, representing the horizon, across the upper portion of the paper.

1. One vanishing point is identified somewhere on the horizon line.
2. In a ***one-point perspective sketch***, all projection lines converge to the one vanishing point.
3. These lines frame the one-point perspective construction box for further detailing.

B. The two-point perspective is the most common perspective drawing. The two-point perspective sketch is a horizontal line, representing the horizon, which is drawn across the upper portion of the paper. Two vanishing points are then identified, one on either end of the horizon line.

1. A vertical construction line is drawn that represents the overall height of the object.
2. In a ***two-point perspective sketch***, projection lines converge from the top and bottom of the vertical line to the two horizontal vanishing points.

3. These lines frame the two-point perspective construction box for further detailing.

C. ***Three-point perspective sketch*** is a drawing that gives the viewer a worm's eye or bird's eye view of an object.

1. A horizontal line, representing the horizon, is drawn across the upper portion of the paper.
2. Two vanishing points are identified, one on either end of the horizon line.
3. A vertical construction line is drawn, which represents the overall height of the object.
4. Projection lines converge from the top and bottom of this vertical line to the two horizontal vanishing points.
5. A third vanishing point is identified near the bottom of an extension of the vertical construction line.
6. These lines frame the three-point perspective construction box for further detailing.

Teaching Strategy: *Use VM–D during a discussion. Then assign LS–C.*

Review/Summary.

Use the student learning objectives to summarize the lesson. Have students explain the content associated with each objective. Students will demonstrate competency and understanding by completing the lab sheets to show sketching proficiency. Student responses and work can be used in determining which objectives need to be reviewed or taught from a different angle. If a textbook is being used, questions at the ends of chapters may be included in the Review/Summary.

Application.

Use the included visual master(s) and lab sheet(s) to apply the information presented in the lesson.

Evaluation.

Evaluation should focus on student achievement of the objectives for the lesson. Various techniques can be used, such as student performance on the application activities. A sample written test is provided.

Answers to Sample Test:

Part One: Matching

1. e
2. c
3. a
4. d
5. b
6. f

Part Two: Multiple Choice

1. a
2. b
3. a
4. a
5. a
6. c
7. a
8. b

Part Three: True/False

1. T
2. T
3. F
4. T
5. F
6. T

Sample Test

Name _____

Pictorial Drawings and Sketches

Part One: Matching

Instructions: **Match the term with the correct definition.**

a. cabinet oblique
b. cavalier oblique
c. isometric
d. one-point perspective
e. two-point perspective
f. three-point perspective

_____1. A pictorial sketch in which projection lines converge from the top and bottom of the vertical line to the two horizontal vanishing points

_____2. A form of pictorial sketch in which all three drawing axes form equal angles of 120 degrees with the plane of projection

_____3. A pictorial sketch in which the height and width are sketched at full size, and depth is sketched at half size

_____4. A pictorial sketch in which all projection lines converge to one vanishing point

_____5. A pictorial sketch in which the height, width, and depth are sketched at full size

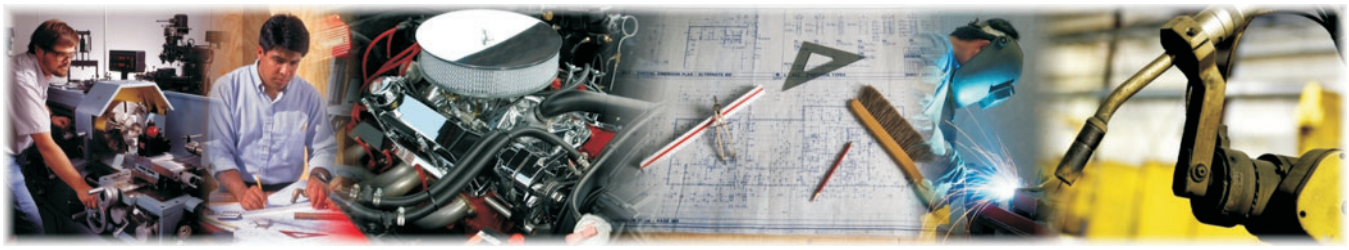
_____6. A perspective drawing that gives the viewer a worm's eye or bird's eye view of an object

Part Two: Multiple Choice

Instructions: **Circle the letter of the correct answer.**

_____1. A/an _____ is a regular oval shape, often used to represent a circle, rounded edge, or hole in a pictorial sketch.

a. ellipse
b. octagon
c. rhomboid
d. trapezoid



_____2. A cabinet oblique sketch has a depth axis drawn at _____ scale.

a. one-quarter
b. one-half
c three-quarter
d. full

_____3. A/an _____ sketch is a form of pictorial sketch in which the three drawing axes are at different degrees with the plane of projection.

a. trimetric
b. multiview
c. isometric
d. orthographic

_____4. An oblique drawing starts with a/an _____ view of one of the object's faces.

a. straight-on
b. side
c. top
d. bottom

_____5. In a/an _____ sketch, the lines of sight are perpendicular to the plane of projection.

a. axonometric
b. oblique
c. parallel perspective
d. angular perspective

_____6. A/an _____ drawing gives the viewer a worm's eye or bird's eye view of an object.

a. one-point perspective
b. two-point perspective
c. three-point perspective
d. angular perspective

_____7. In a/an _____ drawing, projection lines converge to one vanishing point.

a. one-point perspective
b. two-point perspective
c. three-point perspective
d. angular perspective

_____8. A/an _____ is the most common perspective drawing.

a. one-point perspective
b. two-point perspective
c. three-point perspective
d. angular perspective

Part Three: True/False

Instructions: **Write *T* for true or *F* for false.**

_____1. A dimetric drawing has two faces equally inclined to the plane of projection.

_____2. Pictorial drawings have considerable use in industries.

_____3. The three types of oblique drawings are cavalier, cabinet, and reduced.

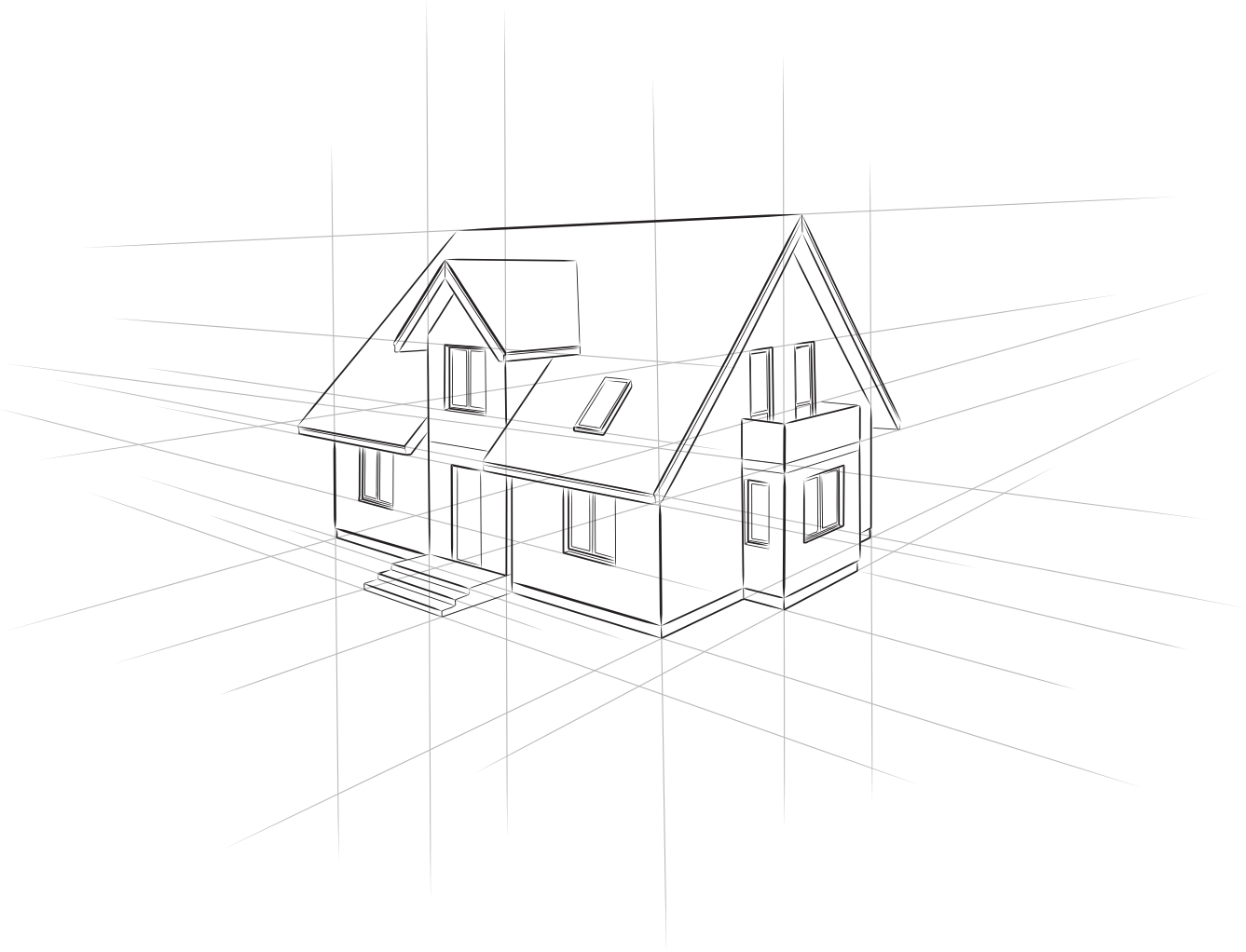
_____4. The three basic types of perspective drawings are one-point, two-point, and three-point perspectives.

_____5. In a cavalier oblique sketch, the height, width, and depth are not full size.

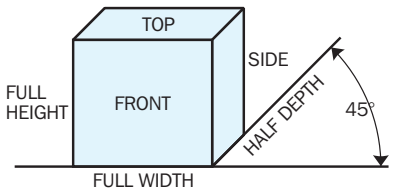
_____6. A grid is a network of lines that cross each other to form a series of squares or rectangles.

PICTORIAL DRAWINGS AND SKETCHES

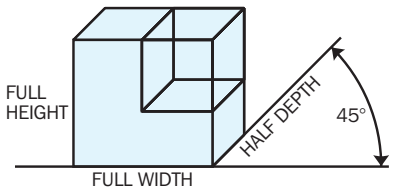
AXONOMETRIC SKETCHING



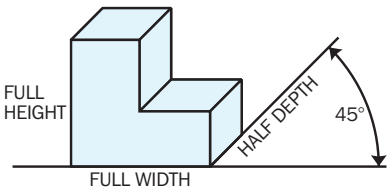
OBLIQUE SKETCHING



CABINET OBLIQUE CUBE



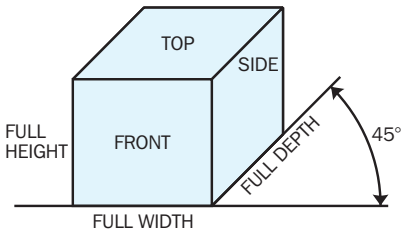
CABINET OBLIQUE CUBE



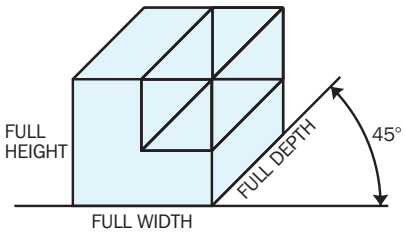
CABINET OBLIQUE CUBE

Oblique cube layout

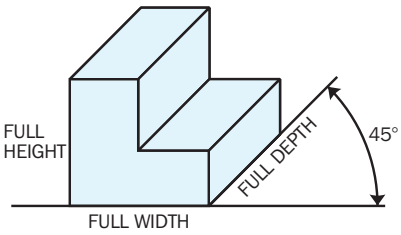
Cabinet Oblique Sketch—Sample



CAVALIER OBLIQUE CUBE



CAVALIER OBLIQUE CUBE

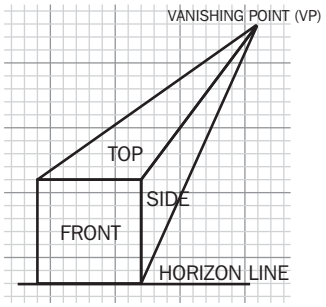


CAVALIER OBLIQUE CUBE

Oblique cube layout

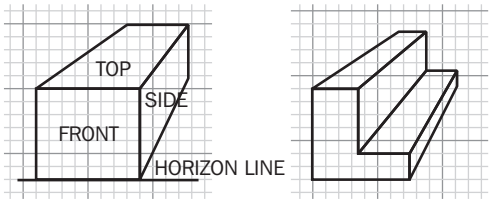
Cabinet Oblique Sketch—Sample

OBLIQUE SKETCHING



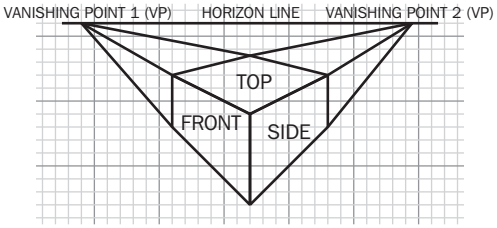
1 POINT PERSPECTIVE ON GRAPH PAPER

1 Point Perspective layout



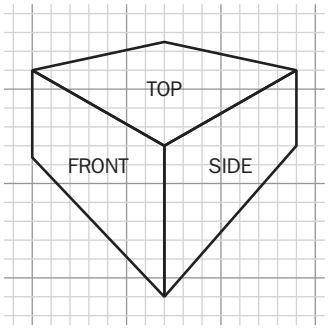
1 POINT PERSPECTIVE ON GRAPH PAPER

1 Point Samples

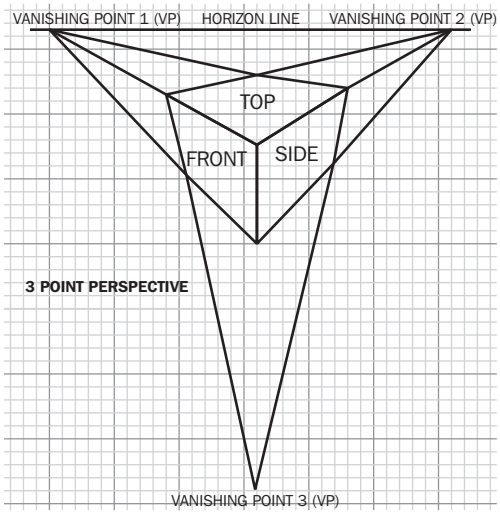


2 POINT PERSPECTIVE ON GRAPH PAPER

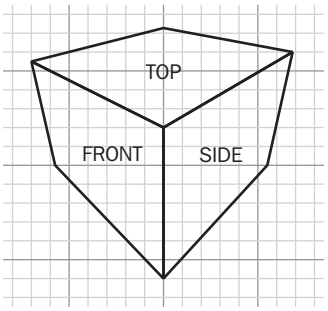
2 Point Perspective layout



2 Point Sample



3 Point Perspective layout



3 Point Sample

LS–A

Name _____

Axonometric Sketches

Purpose

The purpose of this activity is to create axonometric sketches.

Objectives

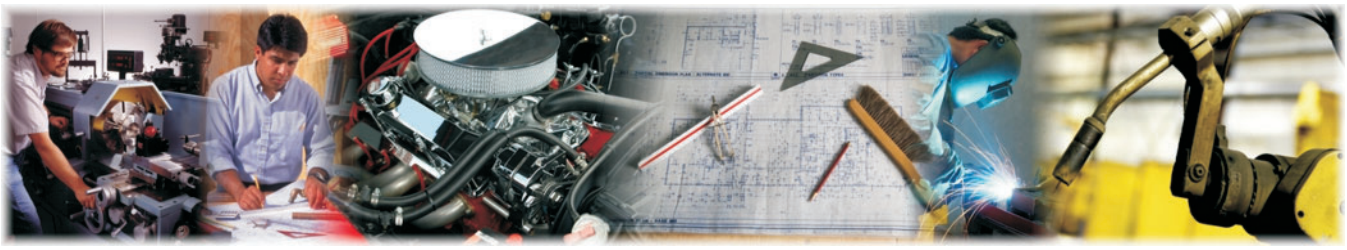
1. Create isometric sketches of simple geometric solids.
2. Demonstrate competency and understanding by completing sketching exercises.

Materials

- graph paper
- VM–B
- pencil
- eraser
- various objects to sketch

Procedure

1. Create various sketches as assigned.
2. Use graph paper, a pencil, an eraser, and various objects to produce sketches.
3. Create an isometric sketch of an object.
4. Create a dimetric sketch of an object.
5. Create a trimetric sketch of an object.
6. Submit your sketches to the teacher for evaluation.



LS–B

Name _____

Oblique Sketches

Purpose

The purpose of this activity is to create oblique sketches.

Objectives

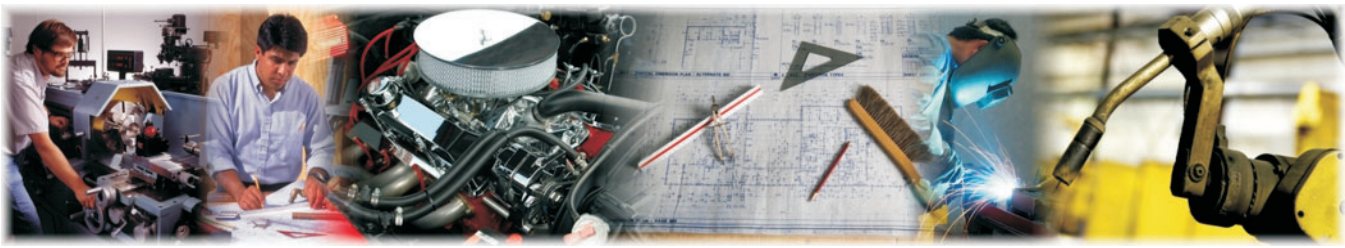
1. Create oblique sketches of simple geometric solids.
2. Demonstrate competency and understanding by completing sketching exercises.

Materials

- graph paper
- VM–C
- pencil
- eraser
- various objects to sketch

Procedure

1. Create various sketches as assigned.
2. Use graph paper, a pencil, an eraser, and various objects to produce sketches.
3. Create a cabinet oblique sketch of an object.
4. Create a cavalier oblique sketch of an object.
5. Submit sketches to the teacher for evaluation.



Name _____

Perspective Sketches

Purpose

The purpose of this activity is to create perspective sketches.

Objectives

1. Create perspective sketches of simple geometric solids.
2. Demonstrate competency and understanding by completing sketching exercises.

Materials

- graph paper
- VM–D
- pencil
- eraser
- various objects to sketch

Procedure

1. Create various sketches as assigned.
2. Use graph paper, a pencil, an eraser, and various objects to produce sketches.
3. Create a one-point perspective sketch of an object.
4. Create a two-point perspective sketch of an object.
5. Create a three-point perspective sketch of an object.
6. Submit your sketches to the teacher for evaluation.