UNIT 6

MULTI-VIEW DRAWING

Total Periods: 25

Unit Outcome

At the end of this unit, students should be able to:

- ✓ understand the basic principle of multi-view drawing;
- ✓ develop visualization skill to represent a 3D objects using the six principal views;
- ✓ appreciate the convention and principle of describing the shape of an object.

Unit Overview

The most fundamental method of presenting working drawings is to draw multiple views of the three dimensional object. In order to create these multi-view drawings drafters need to understand the basic principles of orthographic projection. Orthographic projection is the method by which 3D objects are projected onto two dimensional planes. Paper is a two dimensional medium and in order to print drawings on paper they are shown laying flat, and that is why multiple views are needed.

The basis for all drawing is the clear representation of the object through standard layouts of views to best fully describes the object. Multi-view drawings are the backbone of working drawings.

Lesson 6.1 *Introduction and types of projection*

Number of Periods: 3

Learning Competencies

At the end of this lesson, students should be able to:

- Explain the purpose of multi-view drawings;
- define the concept of projection.

Planning ahead

Prepare model and diagrams to show types of projection in class. You can also use a chart showing tree of projection. Make a further reading on types of projection too. The activities in this lesson are designed to give students a basic understanding about what orthographic projection drawings

Teacher uses one period for theoretical concept and demonstration about the construction polygons. Two periods for student practice on check points.

Hints for Teaching

The lesson concentrates on projection. .

Discussion

1. You can start the class by inviting students in text question about projection and multi-view drawing.

2. Discuss and demonstrate about types of projection and come to orthographic projection. Illustrate the theory of projection and let students discuss in group.
3. Have students take notes from the demonstration.
4. Allow students to practice on activity and check point 6.1.

Teaching Note

Engineering and technical graphics are dependent on projection methods. Two methods primarily used. The first is **parallel** when object positioned at infinity & viewed from multiple points on an imaginary line parallel to the object. The second is **Perspective** when object position at finite distance & viewed from a single point. Projection theory comprises of the principles used to graphically represent 3D objects on 2D media. It is based on 2 variables:

Line of Sight (LOS) is an imaginary ray of light between and observer's eye and an object. Parallel projection is when all LOS are parallel; whereas perspective is when all LOS start at a point. Plane of projection is an imaginary flat plane where the image created by LOS is projected.

Lesson 6.2 *Orthographic Projection*

Number of Periods: 7

(2 period theory and 5 periods for practice)

Learning Competencies

At the end of this lesson, students should be able to:

- Explain the concept orthographic projection;
- Identify the three main projection planes;

- Describe the methods of orthographic projection;
- Prepare arranged view with first angle projection;
- Prepare arranged view with 3rd angle projection;

Planning ahead

Prepare of objects and corresponding multi-view drawings. Examples might include rectangular boxes, books, or VHS tapes and Standard drawing equipment. Make a further reading on orthographic projection and multi-view drawing too.

Teacher uses two periods for theoretical concept and demonstration about orthographic projection and multi-view drawing. In addition five periods for student practice on activities and check points.

Hints for Teaching

Ask brain storming question from the textbook and explain the topic by showing examples of First and third angle projection. First, show the physical object (model) and compare it to actual drawings.

Select appropriate views for presentation. Show how an object can be turned to represent different views.

Have students take notes from the demonstration and allow students to practice on activity and check point 6.2.

Teaching Note

Explain in detail the following concept of orthographic projection.

- Projection of the features of the object is made by lines of sight that are perpendicular to the plane of projection.

- When a surface of the object is parallel to the plane of projection, the surface will appear in its true size and shape on the plane of projection.
- The object appears three-dimensional (width, height and depth) while the view on the plane of projection has only two dimensions (width and height).

Explain in detail the following concept of multi-view projection.

- Multi-view projection establishes views of an object projected upon two or more planes of projection.
- The result of multi-view projection is a multi-view drawing.
- A multi-view drawing represents the shape of an object using two or more views.
- Consideration should be given to choice and number of views used so that, when possible, the surfaces of the object are shown in their true size and shape.
- It is often easier for an individual to visualize a three-dimensional picture of an object than it is to visualize a two-dimensional drawing.
- Orthographic projection is any projection of the features of an object onto an imaginary plane called a plane of projection.

Lesson 6.3 *The Six principal View and Visualization*

Number of Periods: 10

(3 period theory and 7 periods for practice)

Learning Competencies

At the end of this lesson, students should be able to:

- Identify the six principal views;
- Arrange the six principal views in 1st and 3rd angle projection methods;
- Identify the common dimension of views;
- analyze guide lines for orientation of an object and choose of views that most describe of an object
- Laying out one-view, two view and three-view drawings;
- Prepare the multi view drawing of an object;
- show hidden features of an object;
- Apply the rule of precedence of line in view drawings.

Planning ahead

Prepare models of objects and corresponding multi-view drawings. Examples might include rectangular boxes, books, or VHS tapes and diagrams to show the six principal view, Standard drawing equipment and make a further reading on one and two view drawings too.

Teacher uses three periods for theoretical concept and demonstration about rules and conventions on multi-view drawing in the text. In addition seven periods for student practice on activities and check points.

Hints for Teaching

When you teach this lesson you can use the following instructional guide:

1. Ask the class if anyone knows what an orthographic projection drawing is. Hold a rectangular box in your hand. Ask the class how many sides there are to a box. List the different sides on the board (Top, bottom, right side, left side, front, and back). Ask them if any of the sides are duplicate views. Erase the bottom, right side, and back. Explain that the remaining three views are known as an orthographic projection drawing (Top, front, and right side). Distribute graph paper and rulers to each student.
2. Demonstrate by drawing basic object in orthographic projection on the board and have the students to draw it on their paper. Distribute any worksheets or activities that you found on the Internet or other resources.
3. Discuss some of the careers that would use orthographic projection drawings.
4. Have students take notes from the demonstration.
5. Allow students to practice on activity and check point 6.1.

Teaching Note

You will practice in the next unit different techniques for drawing objects so that they appear to have a three-dimensional quality. These techniques are excellent for quickly communicating ideas to both

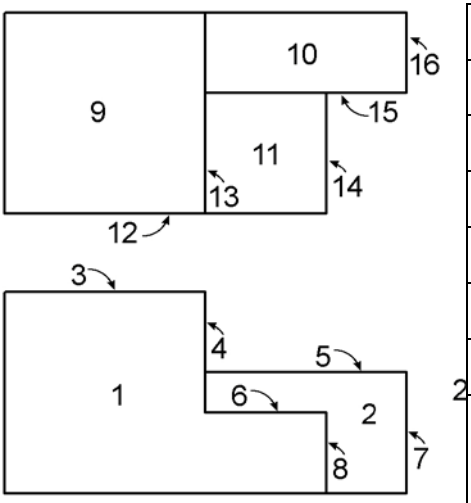
technical and non-technical people. Those who make their living building ideas require a different type of drawing format. A multi-view sketch, also referred to as an orthographic projection sketch, is the standard sketch format used by engineers to communicate ideas to professionals in the building trades.

However, pictorials do not provide accurate information about the true size and shape of an object and all of its features. It is often the case that engineered objects have features and edges that are obscured by the standard surface views of a multi-view drawing. These views require hidden lines. When engineers create drawings of cylindrical objects, or objects that have holes, they must represent their axes and axes points with centerlines. Knowing how to draw and interpret multi-views is an important skill for any engineer.

What to do

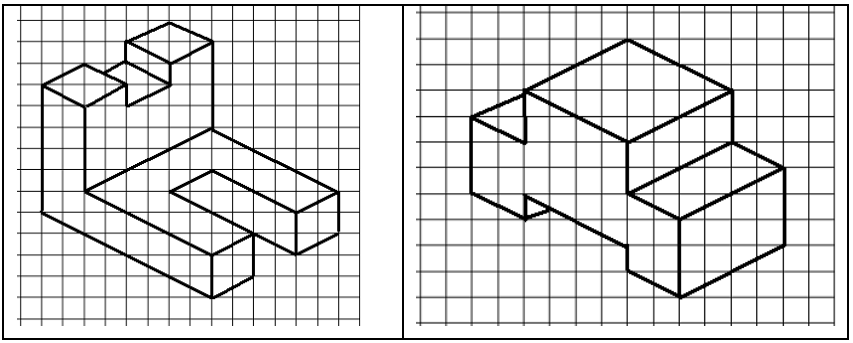
In this activity, you will develop your ability to see and sketch objects as a series of related two-dimensional views. Understanding and using the different line conventions, discussed earlier, will help when creating these views.

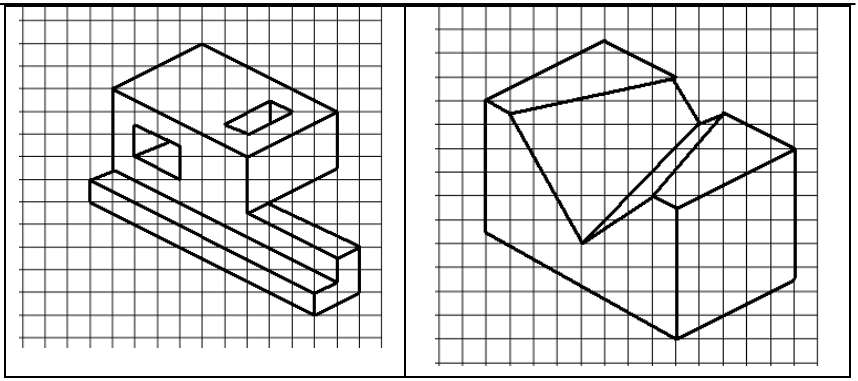
Study the image below. The various surfaces of the object are identified by letters on the isometric drawing and by numbers on the multi-view drawing. In the table, write the number that corresponds with the lettered surface in each of the top, front, and right side views.



	Top	Front	Side
A	**9**	**3**	**21**
B			
C			
D			
E			
F			
G			
H			

Study the images below. Use points, construction lines, hidden lines, center lines and object lines where applicable to draw the items as multi-view drawings. DO NOT ERASE YOUR POINTS AND CONSTRUCTION LINES.





What did you learn?

1. Why would building professionals, such as machinists and contractors, prefer multi-view drawings over pictorial drawings?
2. How would you describe the geometric relationship that exists between the adjacent views of a multi-view drawing?
3. Why is it important to layout a multi-view sketch with points and construction lines before drawing object lines?
4. What is the purpose of hidden lines and center lines?

Lesson 6.4 *Fundamental view of edges & surfaces and visualization*

Number of Periods: 5

(1 period theory and 4 periods for practice)

Learning Competencies

At the end of this lesson, students should be able to:

- identify normal, inclined, and oblique surface;
- Apply visualization skills by solid and surface to multi-view drawings

Planning ahead

Prepare object for teaching aid and diagrams to show the normal, inclined and oblique surface and Standard drawing equipment and make a further reading on visualization too.

Teacher uses two periods for theoretical concept and demonstration about fundamental views of edge and surface in the text and the principles of developing visualization. In addition four periods for student practice on activities and check points.

Hints for Teaching

When you teach this lesson you can use the following discussion points:

Discussion

1. Start the lesson by asking students from the textbook about normal, inclined and oblique surface.
2. Discuss and demonstrate by showing the normal, inclined and oblique surface from the teaching aid or diagram and also on black board.
3. Discuss and demonstrate how visualization will be developed. Have students take notes from the demonstration.
4. Activate students to do activities 6.4 and 6.4 from the textbook on fundamental views of edge and surface and also visualization.

Teaching Note

Surfaces are classified as Normal, inclined and oblique. A normal surface is one that is parallel to a principal of projection. If a normal surface is parallel to any of plane of projection, it will be shown in its true size and shape. Inclined surfaces are surfaces which appear

perpendicular to only one of the three projection planes. When a plane surface is inclined to all the three principal planes of projection, it is known as oblique surface.

The ability to visualize can be developed by consistent practice. To improve visualization, the principle of orthographic projection can be applied to the following types of exercises:

1. Identification of surfaces
2. Missing line problems
3. Possible view problems
4. Missing or third view problems

Lesson Guide

Periods	Lesson title	Starter activity	Main activity	Concluding activity
3	6.1 Introduction and types of projection	• Ask brain storming question about projection and uses of multi-view drawings from the textbook.	• Discuss the ideas of design to solve problems and demonstrate the reasons for using multi-view projection and theory of projection. • Let the students to practice on activity 6.1.	• Students give feedback about today's lessons. (Teacher acts as facilitator.) • Give home work to do exercises from the textbook
7	6.2 orthographic projection	• Ask brain storming question about projection and uses of multi-view drawings from the textbook	• Discuss the ideas of orthographic projection and demonstrate the reasons for using first and third angle of projection. • Let the students to practice on check points 6.1.	• Students give feedback about today's lessons. (Teacher acts as facilitator.) • Give home work to do exercises from the textbook

10	6.3 the six principal projection.	• Askbrain storming question about individually to describe the differences and procedure for rotating an object to view it six different perspectives and have them demonstrate it using the step block.	• Demonstrate the differrent views and surfaces possible in an orthographic projection. • Use 3-D models to demonstrate the different views and surfaces possible in an orthographic projection. • Let the students to practice on activity & check points 6.2.	• Students give feedback about today's lessons. (Teacher acts as facilitator.) • Give home work to do exercises from the textbook
5	6.4 Fundamental views of edge and surface and visualization	• Ask brain storming question about fundamental views of edge and surface and the methods of developing visualization •	• Demonstrate the normal,inclined and oblique surface and method of visualization. • Let the students to practice on activities 6.3, 6.4 and 6.5 and check points 6.4, 6.5, and 6.6	• Students give feedback about today's lessons. (Teacher acts as facilitator.) • Give home work to do exercises from the textbook

Evaluation

Instruct your students to:

- state the use of multi-view projection.
- explain in brief the theory of projection and types of projection.
- explain the differences between first and third angle projections
- explain the principles of first and third angle projections.

Method

- Presentation,
- Demonstration
- Group discussion
- Individual practice

Assessments

The teacher should follow and assess each student's work continuously over the whole activity of the each lesson and compare it with the following description to determine whether the student has achieved the minimum required level.

Students working below the minimum requirement level will require extra help if they are to catch up with the rest of the class. They should be given extra attention in class and additional activities at the end of the lesson or during breaks.

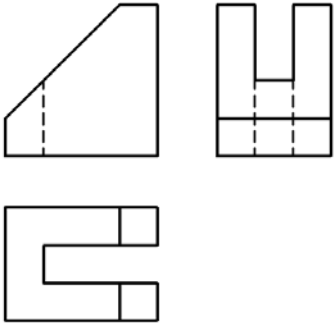
Students working above the minimum requirement level should be praised and their achievements recognized. They should be encouraged to continue working hard and not become complacent.

Answer to the Exercises for textbook

Answer to check point 6.4

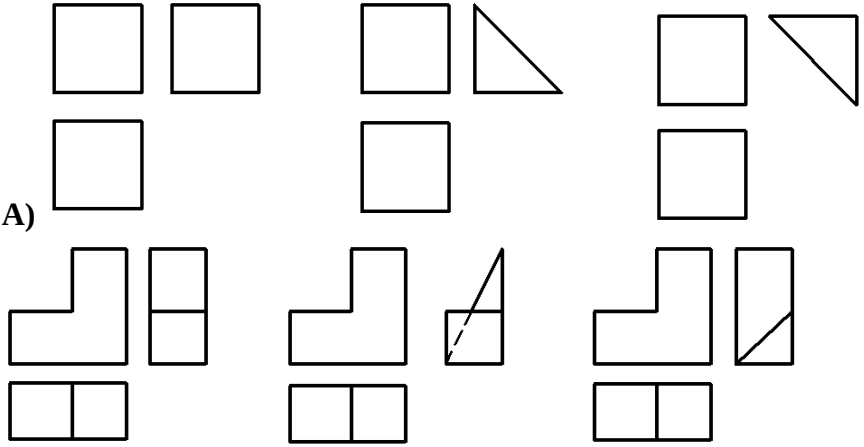
1. A-F	4. D-T	7. D-F	10. B-RS	13. B-F
2. E-F	5. E-LS	8. A-T	11. D-LS	14. E-T
3. C-LS	6. B-T	9. C-F	12. C-T	15. A-LS

Answer to check point 6.5



Answer to check point 6.6

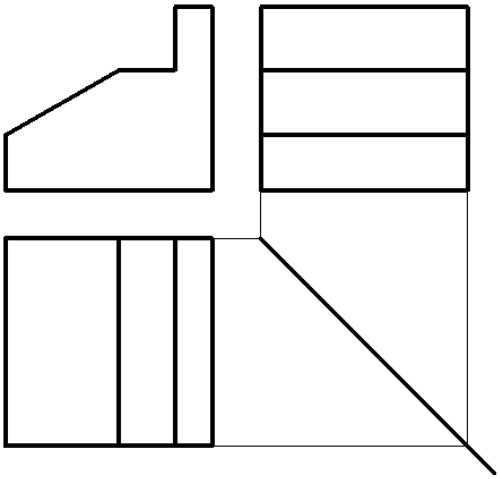
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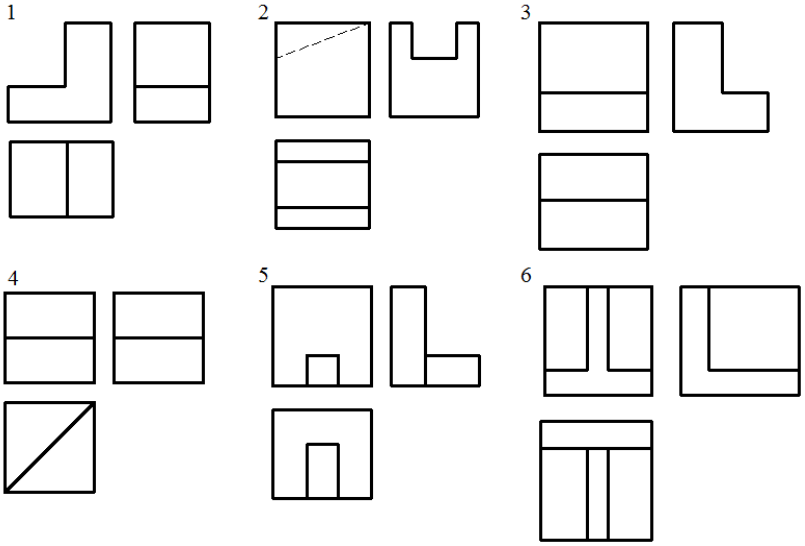
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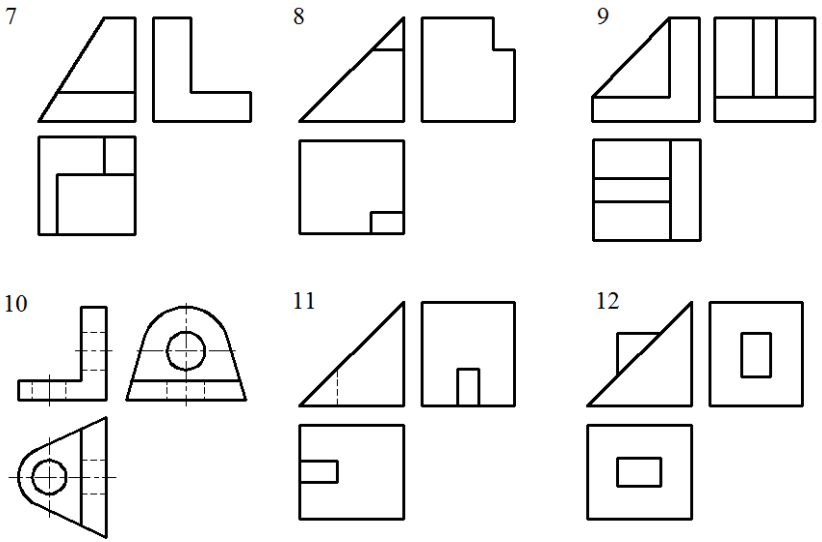
Answer to exercise 6.7

B)

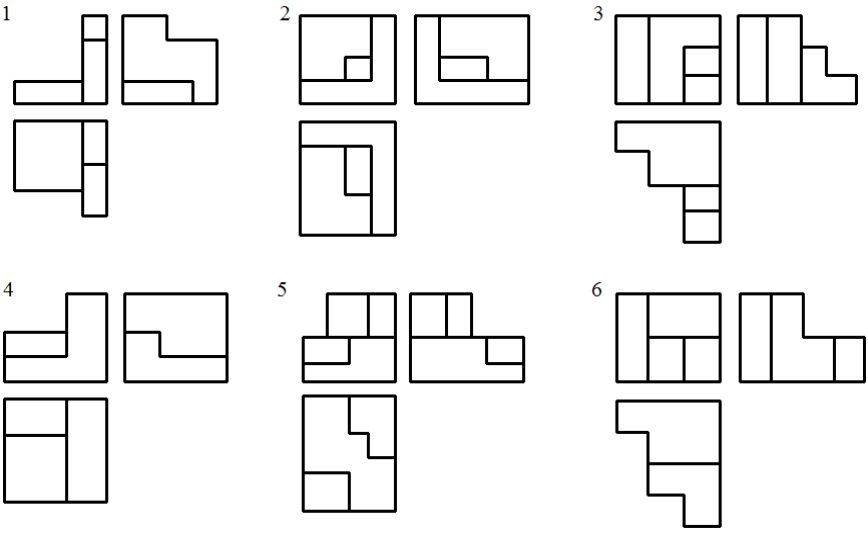


Solution for exercise 6.1

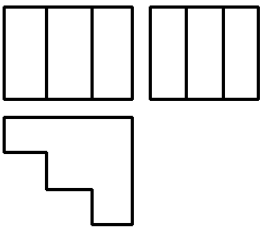




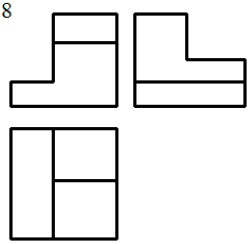
Solution for exercise 6.2



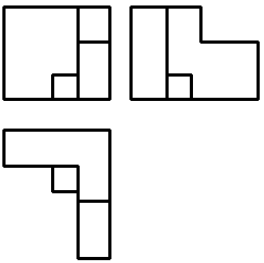
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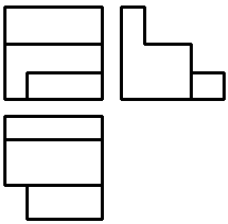
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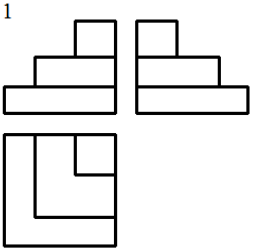
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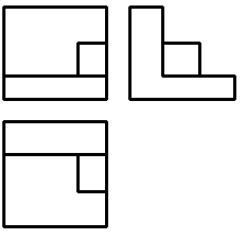
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Solution for exercise 2

