UNIT 5

GEOMETRIC CONSTRUCTION

Total Periods: 12

Unit Outcome

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

- ✓ understand different types of plane geometry and their basic elements.
- ✓ construct different types of geometric figures.
- ✓ apply methods and rules of construction for different types of geometric shapes.

Unit Overview

Knowledge of the principles of geometric construction and its applications are essential to technical drawing students, because if you assume your students as a draftsman or engineer, they must be able to "construct" or draw any of the various types of lines. In a line drawing, a line may be a straight line, a circle, an arc of a circle or a fillet, a circular curve, a noncircular curve, or a combination of these basic types of lines.

The students must also be able to construct line drawings at specified angles to each other, various plane figures, and other graphic

representations consisting exclusively of lines. This unit provides information that will aid the students in drawing different types of geometric constructions.

Lesson 5.1 *Construction of Points, lines and angles*

Number of Period: 3

(1 period theory and 2 periods for practice)

Learning Competencies

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

- Explain different types of geometrical elements;
- construct different types of lines;
- perform steps of bisect and trisecting straight line;
- divide a line in to any number of equal parts without ruler;
- construct angles with different methods;
- perform steps of bisect and trisecting an angle;
- divide an angle in to any number of equal parts;
- transfer by coping angles for different places;

Planning ahead

Prepare the class equipping with materials used to construct geometric figures. Supply the class with drawings that show geometric constructions easily Make a further reading on points and lines too.

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

Hints for Teaching

The lesson main objective is help students to identify the principles of constructing geometric figures and develop skill the use drawing instruments.

Discussion

1. You can start the class by inviting students to explain what geometry is and use the textbook in text questions like what angles are and how they are formed.
2. Discuss and demonstrate by drawing the way of indicating a point, construction of lines and angles in technical drawing on black board. Have students take notes from the demonstration.
3. Allow students to practice on activities and check points 5.1 and 5.2.

Lesson 5.2 *Construction of Polygons*

Number of Period: 3

(1 period theory and 2 periods for practice)

Learning Competencies

At the end of the lesson, students will be able to:

- define polygon in their own words;
- differentiate regular and irregular polygons;
- construct triangles with different methods;
- define quadrilateral in their own words;
- construct different types of quadrilateral;
- draw regular polygons using their specific method;
- construct any type of regular polygon using general methods;

Planning a Head

Prepare the class equipping with materials used to construct geometric figures. Prepare different objects that can explain polygons with different sides. You can also use a chart showing different polygons with their respective names. Make a further reading on polygons too.

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 main objective is help students to identify the principles of constructing geometric figures and develop skill the use drawing instruments.

Show to students' objects or different polygons with different sides, and then.

Discussion

1. Start the lesson by asking students from the textbook.
2. Discuss and demonstrate by showing the method of construction of polygon on black board. Have students take notes from the demonstration.
3. Activate students to construct various types of triangles and other polygons from the textbook check points.

Lesson 5.3 *Construction of circles and tangents*

Number of Period: 3

(1 period theory and 2 periods for practice)

Learning Outcomes

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

- define circle in their own words;
- construct circles using three points in space;
- define tangency and tangent point;
- construct tangent line and tangent curves to join circles and arcs;
- apply different tangency concepts to real object drawing;

Planning ahead

Organize your class equipping with circular objects and other aids that can demonstrate circles and tangents.

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

Hints for Teaching

The lesson main objective is help students to identify the principles of constructing geometric figures and develop skill the use drawing instruments.

Discussion

1. Start the lesson by asking students from the textbook about circle and tangents.
2. Discuss and demonstrate by showing the method of construction of circle and tangents on black board. Have students take notes from the demonstration.
3. Activate students to construct various types of circle and tangents from the textbook check points.

Lesson 5.4 *Construction of Ellipses*

Number of Periods: 3

(1 period theory and 2 periods for practice)

Learning Outcomes

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

- differentiate an Ellipse from other curved planes;
- construct an ellipse using different methods.

Planning ahead

Prepare different objects with elliptical shapes. You can also use drawings of different ellipses.

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

Hints for Teaching

The lesson main objective is help students to identify the principles of constructing geometric figures and develop skill the use drawing instruments.

Discussion

1. Start the lesson by asking students from the textbook about Ellipse and show objects with elliptical shape. Motivate students to compare and contrast ellipse with that of circle.
2. Discuss and demonstrate by showing the method of construction of ellipse on black board. Have students take notes from the demonstration.
3. Activate students to construct various types of ellipse from the textbook check points.

Lesson Guide

Periods	Lesson title	Starter activity	Main activities	Concluding activities
3	4.1 Construction of Points, lines and angles	• Ask students to illustrate the uses of construction of simple geometrical figures and shapes	• Demonstrate how to bisect a line, an angle and trisect a given line, how to divide a line into number of equal parts, and how to bisect lines and angles • Let the students to practice on activity 5.1 and check points 5.1 ,5.2& 5.3.	• Students give feedback about today's lessons. (Teacher acts as facilitator.) • Give home work to do exercises from the textbook
3	4.2 Construction of polygons	• Ask the in text question from the textbook about characteristics of polygon to students.	• Demonstrate construction of polygons and let students practice on check points 5.4, 5.5 &5.6	• Give home work to do exercises from the textbook

3	4.3 Construction of Circles and Tangents	• Ask the in text question from the textbook about circles and tangents. • Using charts, guide students to discuss the parts and properties of a circle and tangent and the relationships among them	• Demonstrate the different construction of circles and tangent • Let the students to practice on activity 5.2 and check points 5.7, 5.8 & 5.9 • Students to construct plane figures involving blending of lines and arcs such as spanners, anchors and openers.	• Students give feedback about today's lessons. (Teacher acts as facilitator.) • Give home work to do exercises from the textbook
3	4.4 Construction of Ellipse	• Assist students to define ellipse, and discuss its properties using chart.	• Demonstrate the different methods of construction Ellipse. • Let the students to practice on activity 5.3 and check points 5.10	• 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:

- trisect a given line with 60° set square correctly.
- construct specific given triangles.
- construct various types of angles.
- construct angles using scales of chord.
- trisect given angles correctly using drawing instruments.
- construct specific regular polygons.
- indicate point of contact on their drawn figures.
- explain the practical applications of tangency.
- explain the principles of blending of arcs.
- construct the ellipse using different methods.

Method

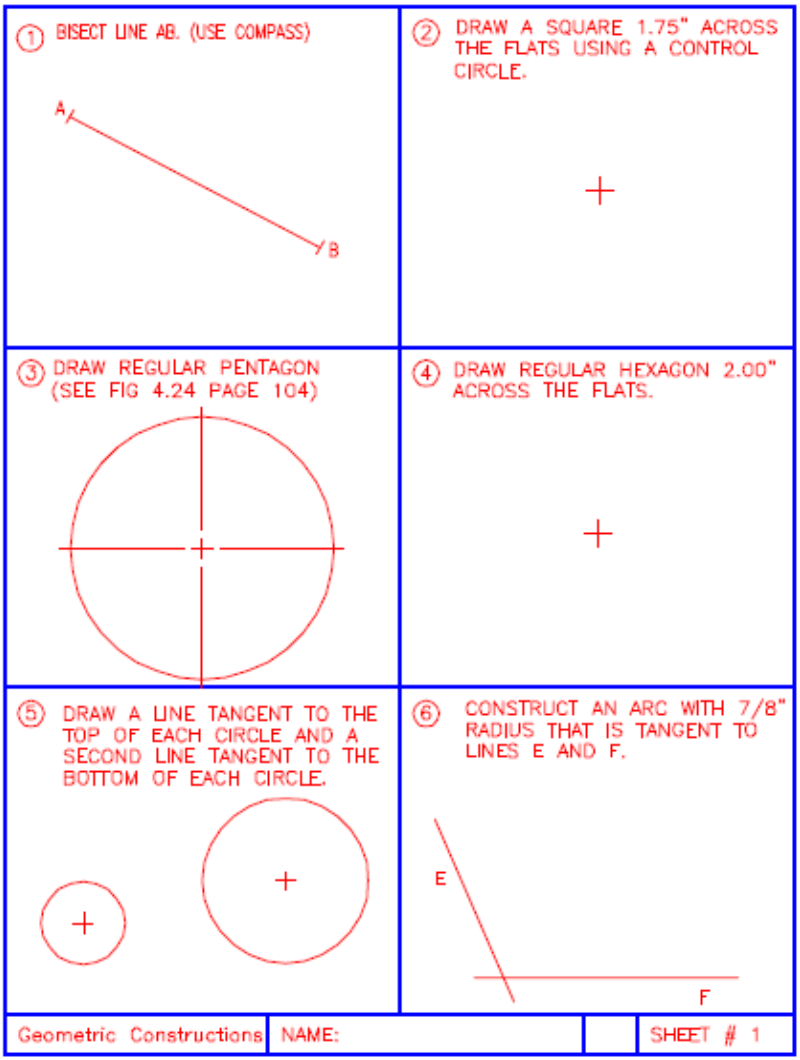
- Presentation (lecture)
- Demonstration
- Group discussion (6-8 students per a group)

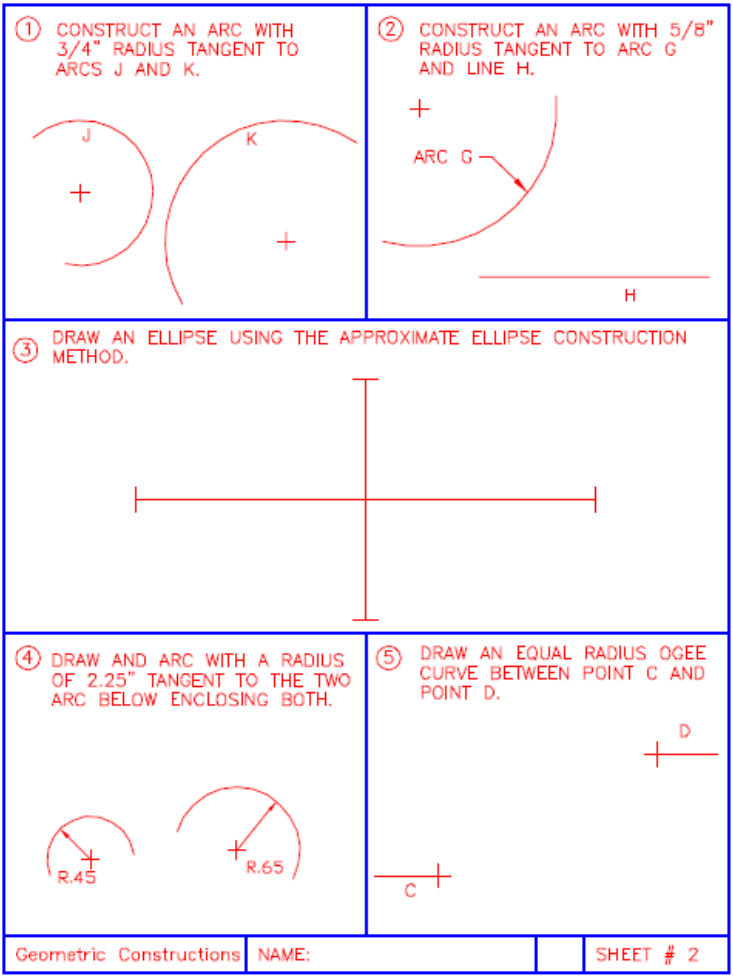
Assessments

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.


1 BISECT LINE AB. (USE COMPASS)
A
B
2 DRAW A SQUARE 1.75" ACROSS THE FLATS USING A CONTROL CIRCLE.
3 DRAW REGULAR PENTAGON (SEE FIG 4.24 PAGE 104)
4 DRAW REGULAR HEXAGON 2.00" ACROSS THE FLATS.
5 DRAW A LINE TANGENT TO THE TOP OF EACH CIRCLE AND A SECOND LINE TANGENT TO THE BOTTOM OF EACH CIRCLE.
6 CONSTRUCT AN ARC WITH 7/8" RADIUS THAT IS TANGENT TO LINES E AND F.
E
F
Geometric Constructions
NAME:
SHEET # 1


1 CONSTRUCT AN ARC WITH 3/4" RADIUS TANGENT TO ARCS J AND K.
J
K
2 CONSTRUCT AN ARC WITH 5/8" RADIUS TANGENT TO ARC G AND LINE H.
ARC G
H
3 DRAW AN ELLIPSE USING THE APPROXIMATE ELLIPSE CONSTRUCTION METHOD.
4 DRAW AND ARC WITH A RADIUS OF 2.25" TANGENT TO THE TWO ARC BELOW ENCLOSING BOTH.
R.45
R.65
5 DRAW AN EQUAL RADIUS OGEE CURVE BETWEEN POINT C AND POINT D.
D
C
Geometric Constructions
NAME:
SHEET # 2