Topic: Plane Geometry – Division of a Line

Lesson Objectives:

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

- **Bisect a line** (divide into two equal parts)
- **Trisect a line** (divide into three equal parts)
- **Divide a line into any number of equal or unequal parts**
- Understand how to **divide a line in a specific ratio**

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1. Introduction to Plane Geometry

Plane Geometry deals with **flat (2D) shapes and constructions**, such as:

- **Lines**
- **Circles**
- **Angles**
- **Polygons**

Learning to **divide lines accurately** is a **basic geometric skill** needed for technical drawing, engineering, and design.

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2. Why Do We Divide Lines?

- To create **accurate drawings**
- To set out **dimensions proportionally**
- To construct **shapes like triangles, squares, hexagons**
- For **scaling drawings** or creating **layouts**

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3. Methods of Dividing a Line

a) Bisecting a Line (Dividing into Two Equal Parts)

Definition:

Bisecting a line means **dividing it into two equal halves**.

Materials Needed:

- **Compass**
- **Ruler**
- **Pencil**
- **T-square and Set Square (optional for positioning)**

Steps to Bisect a Line:

1. Draw a **straight line AB** using a ruler.
2. Place the **compass point on A**, and draw an **arc above and below the line**.
3. Without changing the compass width, place the **compass point on B**, and draw **another set of arcs** to cross the first set.
4. Mark the **points of intersection** of the arcs as **P and Q**.
5. Draw a **straight line connecting P and Q**.
6. This line **intersects AB at point M**, which is the **midpoint (bisector)**.

Result:

Line AB is now divided into **two equal parts**: AM = MB.

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b) Trisecting a Line (Dividing into Three Equal Parts)

Definition:

Trisecting a line means dividing it into **three equal sections**.

Steps to Trisect a Line:

1. Draw the **given line AB**.
2. From point A, use a **set square or protractor** to draw a **slanted line AC** at any convenient angle.
3. Use a **compass** to step off **three equal arcs** along AC from A to C.
4. Join point C to point B.
5. Use a **set square parallel to CB** to draw lines from the **division points on AC** to the line AB.
6. These lines will **divide AB into three equal parts**.

Result:

AB is now divided into **three equal parts**.

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c) Dividing a Line into Any Number of Equal Parts

You can use the **same method as trisecting**, but adjust the number of arcs:

Example: To divide AB into 5 equal parts

1. Draw line AB.
2. From A, draw a **slanting line AC** at any angle.
3. Use the compass to mark **5 equal spaces** along AC.
4. Join the last point (E) to B.
5. Draw **lines parallel to EB** from each marked point on AC to AB.
6. These lines will **divide AB into 5 equal segments**.

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d) Dividing a Line into a Specific Ratio

Definition:

To divide a line into a **given ratio** (e.g., 2:3), you split the line so the parts are **proportional**, not necessarily equal.

Steps to Divide AB in a 2:3 Ratio:

1. Draw AB.
2. From point A, draw a **slanting line AC**.
3. Use the compass to mark **5 equal divisions** along AC because 2 + 3 = 5.
4. Join the last division point (E) to B.
5. Draw a **parallel line** from the 2nd division point to AB.
6. This will **cut AB in the ratio 2:3**.

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4. Importance of Dividing Lines Correctly

Reason	Importance
Accuracy	Ensures correct scaling and layout
Proportion	Helps in geometric constructions
Professional Presentation	Neat and precise drawings
Real-life Applications	Used in construction, manufacturing, and engineering

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5. Tools Required

Tool	Purpose
Compass	For arcs and equal steps
Ruler	For straight lines
Set Square/Protractor	For angles
T-square	For horizontal lines
Pencil (2H or H)	For light and precise drawing

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6. Summary of Key Techniques

Method	Purpose
Bisecting a line	Divide into 2 equal parts
Trisecting a line	Divide into 3 equal parts
Dividing into n parts	Use compass stepping method
Dividing in ratio	Use slanting lines and parallel construction

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7. Practical Applications

- Drawing **scales**
- Constructing **geometric shapes**
- Designing **architectural and mechanical parts**
- **Woodworking, metalwork, and construction layout**