Chapter 4: Practical Geometry

Geometry is all around us! From buildings to art, everything follows geometric principles. In this chapter, we'll learn how to construct different types of quadrilaterals using given measurements.

1. Basic Tools for Constructions

Before starting, make sure you have:

- A ruler
- A compass
- A protractor
- A sharp pencil
- An eraser

2. Constructing a Quadrilateral

A quadrilateral has **four sides** and **four angles**. To construct one, we need some given measurements.

Types of Quadrilateral Constructions:

1. **When four sides and one diagonal are given**
2. **When two diagonals and three sides are given**
3. **When three sides and two included angles are given**
4. **When two adjacent sides and three angles are given**

Case 1: When Four Sides and One Diagonal are Given

Example: Construct quadrilateral ABCD where AB = 5 cm, BC = 6 cm, CD = 4 cm, DA = 7 cm, and diagonal AC = 8 cm.

Steps to Construct:

1. Draw the base **AB = 5 cm** using a ruler.
2. With **A as the center**, draw an arc of **8 cm** using a compass.
3. With **B as the center**, draw an arc of **6 cm** to intersect the previous arc at **C**.
4. With **C as the center**, draw an arc of **4 cm**.
5. With **A as the center**, draw an arc of **7 cm** to intersect the previous arc at **D**.
6. Join **C to D** and **D to A**.
7. Quadrilateral **ABCD** is now complete!

(Diagram will be added for better clarity.)

Case 2: When Two Diagonals and Three Sides are Given

Example: Construct quadrilateral PQRS where PQ = 4 cm, QR = 5 cm, RS = 6 cm, diagonal PR = 7 cm, and diagonal QS = 8 cm.

Steps to Construct:

1. Draw the base **PQ = 4 cm**.
2. Draw **diagonal PR = 7 cm** from P.
3. Draw an arc **QR = 5 cm** from Q and another arc **RS = 6 cm** from R.
4. Locate **S** where the arcs intersect.
5. Draw **diagonal QS = 8 cm** to complete the quadrilateral.

(Diagram will be added for better clarity.)

Case 3: When Three Sides and Two Included Angles are Given

Example: Construct quadrilateral DEFG where DE = 5 cm, EF = 6 cm, FG = 7 cm, angle DEF = 60°, and angle EFG = 75°.

Steps to Construct:

1. Draw the base **DE = 5 cm**.
2. Use a protractor to draw **∠DEF = 60°** and extend the line.
3. Measure and mark **EF = 6 cm** along the extended line.

4. At **F**, use a protractor to draw **∠EFG = 75°** and extend the line.
5. Measure and mark **FG = 7 cm**.
6. Connect **G to D** to complete the quadrilateral.

Case 4: When Two Adjacent Sides and Three Angles are Given

Example: Construct quadrilateral HIJK where HI = 4 cm, IJ = 5 cm, ∠HIJ = 50°, ∠IJK = 90°, and ∠JKH = 110°.

Steps to Construct:

1. Draw the base **HI = 4 cm**.
2. Use a protractor to draw **∠HIJ = 50°** and extend the line.
3. Measure and mark **IJ = 5 cm** along the extended line.
4. At **J**, draw **∠IJK = 90°** and extend the line.
5. At **K**, draw **∠JKH = 110°**.
6. Connect **H to K** to complete the quadrilateral.

Important Points to Remember

- Always use a **sharp pencil** for accurate constructions.
- Measure angles carefully with a **protractor**.
- Keep your **compass firm** to avoid errors in arcs.
- A quadrilateral is only possible if the given measurements satisfy the **triangle inequality theorem** for diagonals.

Practice Questions

1. Construct a quadrilateral ABCD where AB = 6 cm, BC = 5 cm, CD = 4 cm, DA = 7 cm, and diagonal BD = 9 cm.
2. Construct a quadrilateral PQRS where PQ = 4.5 cm, QR = 6 cm, RS = 5 cm, SP = 4 cm, and diagonal PR = 7.5 cm.
3. Construct a quadrilateral LMNO where LM = 7 cm, MN = 5 cm, NO = 6 cm, ∠LMN = 70°, and ∠MNO = 80°.

4. Construct a quadrilateral WXYZ where WX = 5 cm, XY = 6 cm, ∠WXY = 60°, ∠XYZ = 90°, and ∠YZW = 100°.

Conclusion

With these construction methods, you can draw any quadrilateral using different given conditions. Keep practicing for accuracy!