**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!