8. Quadrilateral Constructions and Types

- A unique quadrilateral can be constructed, if any five measurements of the quadrilateral are given.
- **Construction of a quadrilateral when four sides and a diagonal are given:**

  Example:

  Construct a quadrilateral WXYZ, where WX = 4.5 cm, XY = 5 cm, YZ = 5.5 cm, ZW = 3 cm, and WY = 6 cm.

  Solution:

  Step 1:

  Draw a line WY of length 6 cm. Draw an arc of radius 4.5 cm with W as centre and another arc of length 5 cm with Y as centre. The intersection of the two arcs will be the point, X.

  Join WX and XY.

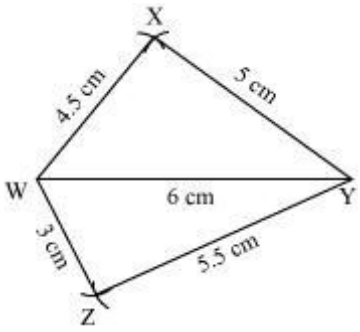
  Step 2:

  The point, Z, will be on the opposite side of point X with respect to WY.

  Draw an arc of length 3 cm taking W as centre and another arc of length 5.5 cm taking Y as centre. The intersection of these arcs will be the point, Z.

  Join WZ and YZ.

  WXYZ is the required quadrilateral.



- **Construction of a quadrilateral when two diagonals and three sides are given**

  Example:

  Construct a quadrilateral PQRS, where PR = 7 cm, QS = 8 cm, PQ = 5 cm, QR = 5 cm, and PS = 5.5 cm.

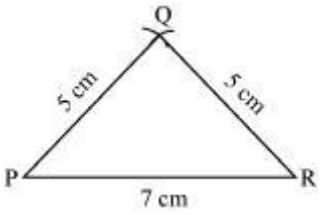
  Solution:

  The steps of constructing quadrilateral PQRS are as follows:

  Step 1:

  Draw a line PR of length 7 cm. Draw an arc of radius 5 cm taking P as centre and an arc of radius 5 cm taking R as centre. The point of intersection of these two arcs will be the point, Q.

Join PQ and RQ.

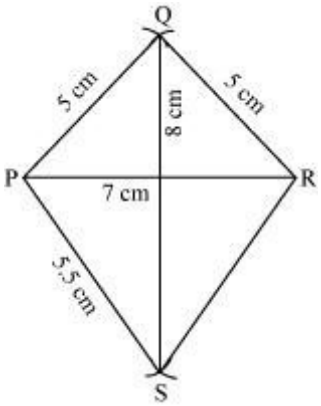


Step 2:

With Q as centre, draw an arc of radius 8 cm. The point, S, will lie on this arc.

Then, taking P as centre, draw an arc of radius 5.5 cm. The intersection point of the two arcs will be the point, S.

Join PS and RS.



PQRS is the required quadrilateral.

- **Construction of a quadrilateral when two adjacent sides and three angles are given:**

  Example:

  Construct a quadrilateral ABCD, where AB = 6 cm, AD = 4 cm, ∠A = 90°, ∠B = 105°, and ∠D = 60°.

  Solution:

  Step 1:

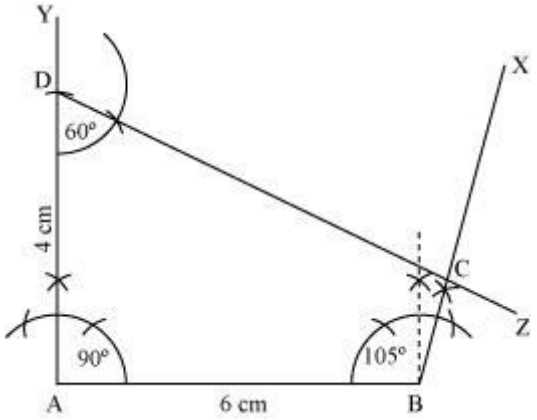
  Draw a line segment AB of length 6 cm. Make ∠ABX = 105° at B and ∠BAY = 90° at A.

  Step 2:

  With A as centre, draw an arc of radius 4 cm to cut the ray AY at point D. At D, draw∠ADZ = 60°.

  The point of intersection of the rays, BX and DZ, will be the point, C.

  ABCD is the required quadrilateral.



- **Construction of a quadrilateral when three sides and two included angles are given**

  Example:

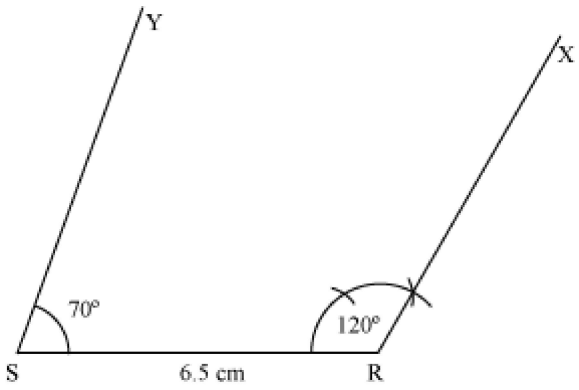
  Construct a quadrilateral PQRS with SR = 6.5 cm, PS = 5 cm, QR = 3 cm, ∠R = 120°, and ∠S = 70°.

  Solution:

  The steps of construction are as follows:

  Step 1:

  Draw SR = 6.5 cm. Draw ∠SRX = 120° at R and ∠RSY = 70° at S.

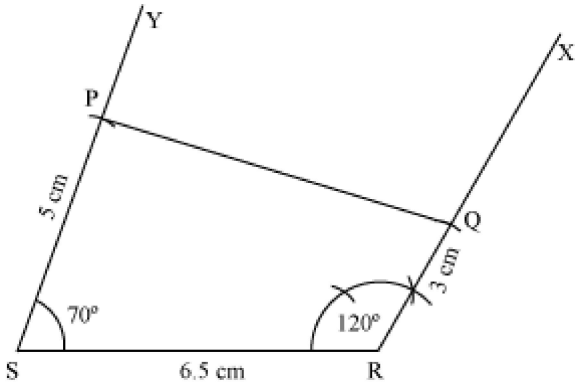


  Step 2:

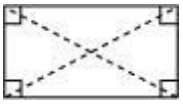
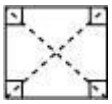
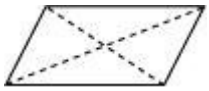
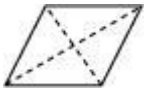
  With S as centre, draw an arc of radius 5 cm intersecting SY at P.

  With R as centre, draw an arc of radius 3 cm intersecting RX at Q.

  Join PQ to obtain the required quadrilateral PQRS.



- Quadrilaterals are classified according to their properties.

Name of the quadrilateral	Figure	Properties
Rectangle		1. Opposite sides are equal. 2. Each angle is 90°. 3. Diagonals are equal. 4. Opposite sides are parallel.
Square		1. All sides are equal. 2. Each angle is 90°. 3. Diagonals are equal. 4. Opposite sides are parallel.
Parallelogram		1. Opposite sides are parallel. 2. Opposite sides are equal. 3. Diagonals are not equal.
Rhombus		1. Opposite sides are parallel. 2. All sides are equal. 3. Diagonals may or may not be equal.
Trapezium		1. One pair of opposite sides is parallel.

- A parallelogram is a rhombus if all sides are equal.
- A parallelogram is a rectangle if all angles are 90°.
- A parallelogram is a square if all sides are equal and all angles are 90°.
- A rhombus is a square if all angles are 90°.
- A Rectangle is a square if all sides are equal.