CHAPTER – 14

CONSTRUCTIONS OF QUADRILATERALS

Exercise 14.1

1. Construct a quadrilateral PQRS where PQ = 4.5 cm, QR = 6 cm, RS = 5.5 cm, PS = 5 cm and PR = 6.5 cm.

Solution:

Steps of Construction:

(i) Construct a line segment PR = 6.5 cm.

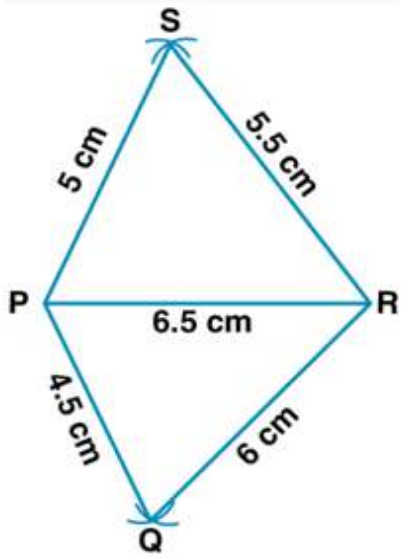
(ii) Taking P as centre and 4.5 cm radius and R as centre and 6 cm radius construct arcs which intersect each other at Q.

(iii) Now join PQ and QR.

(iv) Taking P as centre and 5 cm radius and R as centre and 5.5 cm radius, construct arcs which intersect each other at S.

(v) Join PS and SR.

Hence, PQRS is the required quadrilateral.



2. Construct a quadrilateral ABCD in which AB = 3.5 cm, BC = 5 cm, CD = 5.6 cm, DA = 4 cm, BD = 5.4 cm.

Solution:

Steps of Construction:

(i) Construct a line segment AB = 3.5 cm.

(ii) Taking A as centre and 4 cm radius construct and arc and with B as centre and 5.4 cm construct an arc which meets the previous arc at the point D.

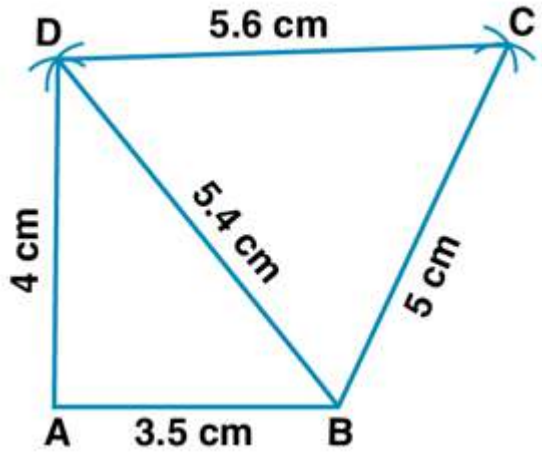
Now join AD and BD.

(iii) Taking B as centre and 5 cm radius, construct an arc

Taking D as centre and 5.6 cm radius, construct an arc which meets the previous arc at the point C.

(iv) Join BC and CD.

Hence, ABCD is the required quadrilateral.



3. Construct a quadrilateral PQRS in which PQ = 3 cm, QR = 2.5 cm, PS = 3.5 cm, PR = 4 cm and QS = 5 cm.

Solution:

Steps of Construction:

(i) Construct PQ = 3 cm.

(ii) Taking P as centre and 4 cm radius, construct an arc

Taking Q as centre and 2.5 cm radius, construct an arc which meets the previous arc at R

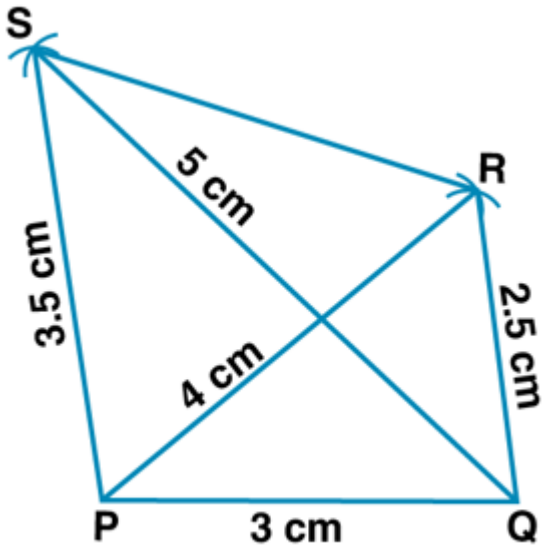
Now join PQ and QR

(iii) Taking P as centre and 3.5 cm radius, construct an arc

Taking Q as centre and 5 cm radius, construct an arc which meets the previous arc at S.

(iv) Join PS, QS and SR.

Therefore, PQRS is the required quadrilateral.



4. Construct a quadrilateral ABCD such that BC = 5 cm, AD = 5.5 cm, CD = 4.5 cm, AC = 7 cm and BC = 5.5 cm.

Solution:

Steps of Construction:

(i) Construct a line segment CD = 4.5 cm.

(ii) Taking C as centre and 5.5 cm radius and taking D as centre and 7 cm radius construct arcs which intersect each other at B.

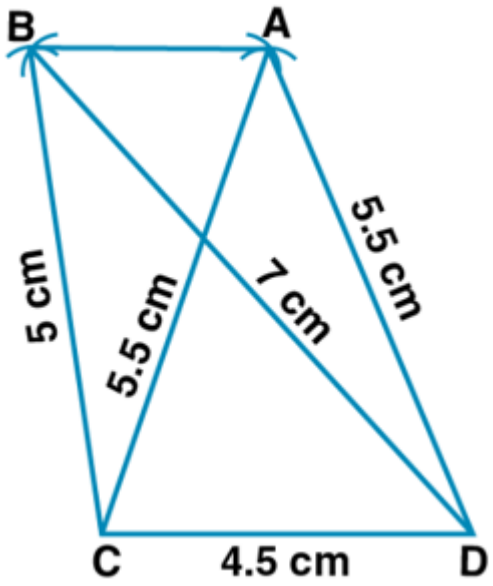
(iii) Join BC and BD.

(iv) Taking C as centre and 5.5 cm radius and taking D as centre and 5.5 cm radius, construct arcs which intersect each other at A.

(v) Now join AC and AD.

(vi) Join AB.

Therefore, ABCD is the required quadrilateral.



5. Construct a quadrilateral ABCD given that BC = 6 cm, CD = 4 cm, $\angle B = 45^0$, $\angle C = 90^0$ and $\angle D = 120^0$.

Solution:

Steps of Construction:

(i) Construct BC = 6 cm.

(ii) At the point B, draw $\angle CBP = 45^0$.

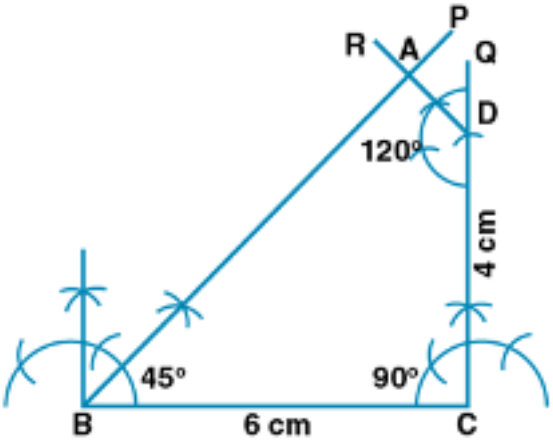
(iii) At the point C, draw $\angle BCQ = 90^0$.

(iv) Cut off CD = 4 cm from CQ.

(v) At the point D, draw $\angle CDR = 120^0$.

(iv) Let BP and DR meet at the point A.

Therefore, ABCD is the required quadrilateral.



6. Construct a quadrilateral PQRS where PQ = 4 cm, QR = 6 cm, $\angle P = 60^0$, $\angle Q = 90^0$ and $\angle R = 120^0$.

Solution:

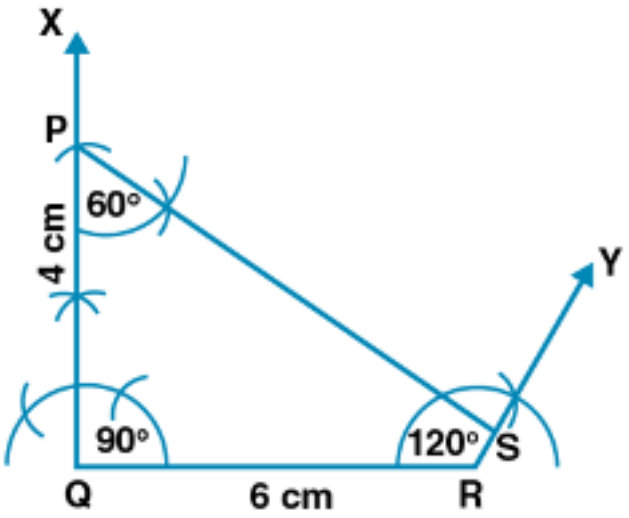
Steps of Construction:

(i) Construct a line segment QR = 6 cm.

(ii) At the point Q, construct a ray QX making an angle of 90^0 and cut off QP = 4 cm.

(iii) At the point P, construct a ray making an angle of 60^0 and at R, a ray making an angle 120^0 which meets each other at the point S.

Therefore, PQRS is the required quadrilateral.



7. Construct a quadrilateral ABCD such that AB = 5 cm, BC = 4.2 cm, AD = 3.5 cm, ∠A = 90^0 and ∠B = 60^0.

Solution:

Steps of Construction:

(i) Construct AB = 5 cm.

(ii) At the point A, construct ∠A = 90^0.

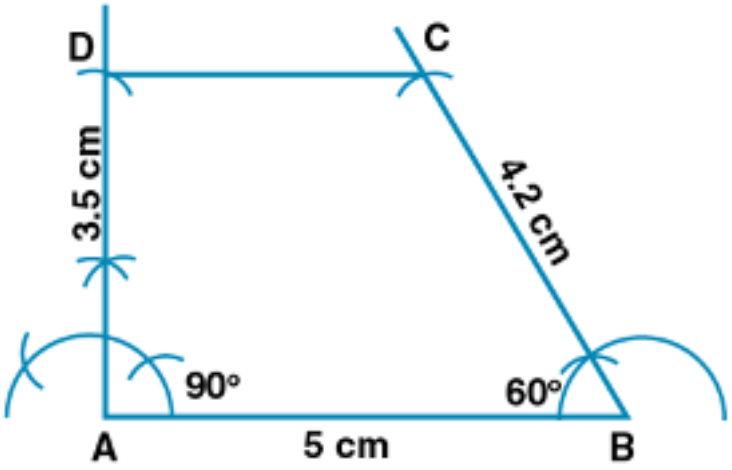
(iii) At the point B, construct ∠B = 60^0.

(iv) Taking B as centre and radius 4.2 cm cut off ∠B at C.

(v) Taking A as centre and radius 3.5 cm cut off ∠A at D.

(vi) Now join CD.

Therefore, ABCD is the required quadrilateral.



8. Construct a quadrilateral PQRS where PQ = 4 cm, QR = 5 cm, RS = 4.5 cm, $\angle Q = 60^0$ and $\angle R = 90^0$.

Solution:

Steps of Construction:

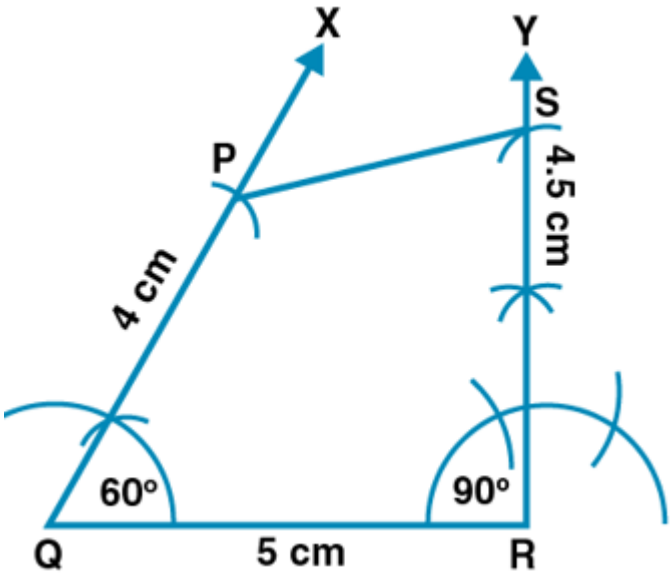
(i) Construct a line segment QR = 5 cm.

(ii) At the point Q, construct a ray QX making an angle of 60^0 and cut off QP = 4 cm.

(iii) At the point R, construct a ray RY making an angle of 90^0 and cut off RS = 4.5 cm.

(iv) Now join PS.

Therefore, PQRS is the required quadrilateral.



9. Construct a quadrilateral BEST where BE = 3.8 cm, ES = 3.4 cm, ST = 4.5 cm, TB = 5 cm and ∠E = 80^0.

Solution:

Steps of Construction:

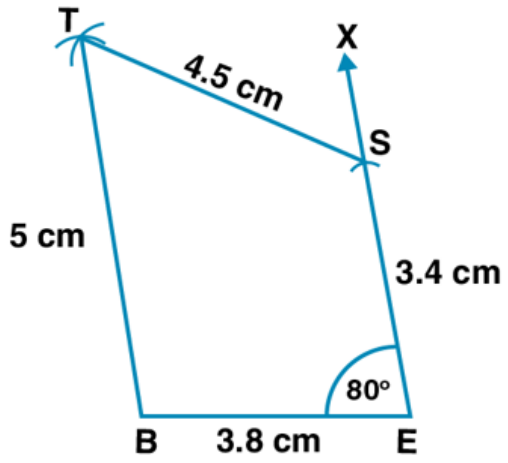
(i) Construct a line segment BE = 3.8 cm.

(ii) At the point E, construct a ray EX making an angle of 80^0 and cut off ES = 3.4 cm.

(iii) Taking B as centre and 5 cm radius and S as centre and 4.5 cm radius, construct arcs which intersect each other at T.

(iv) Now join TB and TS.

Therefore, BEST is the required quadrilateral.



10. Construct a quadrilateral ABCD where AB = 4.5 cm, BC = 4 cm, CD = 3.9 cm, AD = 3.2 cm and $\angle B = 60^0$.

Solution:

Steps of Construction:

(i) Construct AB = 4.5 cm.

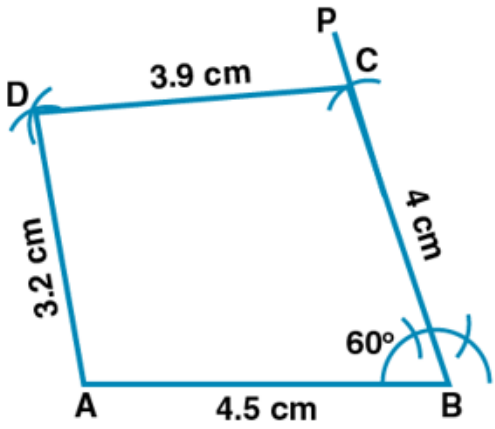
(ii) At point B, construct $\angle ABP = 60^0$.

(iii) Cut off $\angle BC$ = 4 cm from BP.

(iv) Taking C as centre and radius 3.9 cm construct an arc.

(v) Taking A as centre and radius 3.2 cm construct an arc which meets the previous arc at D.

(vi) Now join AD and CD.



Exercise 14.2

1. Construct a parallelogram ABCD such that AB = 5 cm, BC = 3.2 cm and $\angle B = 120^0$.

Solution:

Steps of Construction:

(i) Construct AB = 5 cm.

(ii) At point B, draw angle 120^0.

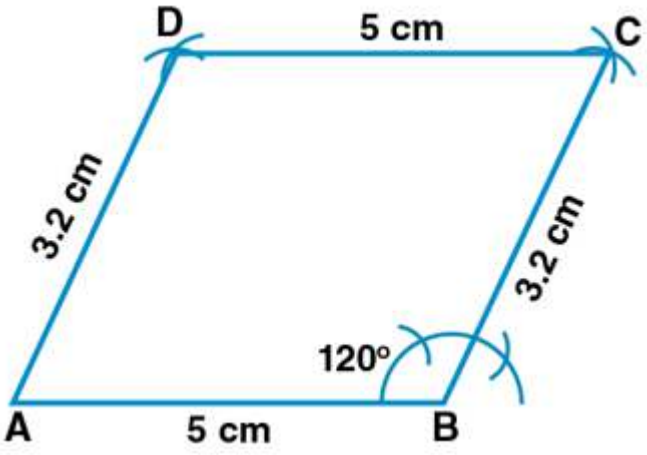
(iii) Taking B as centre and radius 3.2 cm cut off $\angle B$ at C.

(iv) Taking C as centre and radius AB construct an arc.

(v) Taking A as centre and radius 3.2 cm, construct an arc which meets the previous arc at D.

(vi) Now join AD and CD.

Therefore, ABCD is the required parallelogram.



2. Construct a parallelogram ABCD such that AB = 4.8 cm, BC = 4 cm and diagonal BD = 5.4 cm.

Solution:

Steps of Construction:

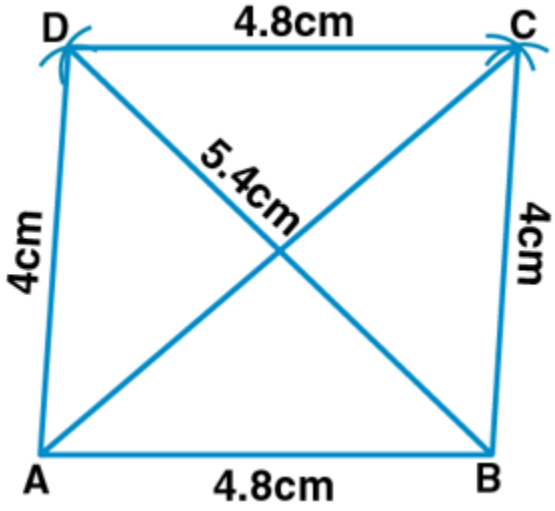
(i) Draw a triangle ABCD.

(ii) Taking B as centre and radius 4 cm, construct an arc.

(iii) Taking D as centre and radius 4.8 cm, construct an arc which meets the previous arc at C.

(iv) Now join CD, BC and AC.

Therefore, ABCD is the required parallelogram.



3. Construct a parallelogram ABCD such that BC = 4.5 cm, BD = 4 cm and AC = 5.6 cm.

Solution:

Steps of Construction:

(i) Draw a triangle BOC with BC = 4.5 cm

Here

$BO = \frac{1}{2} \times 4 = 2$ cm

OC = $\frac{1}{2}$ AC

= $\frac{1}{2}$ × 5.6

= 2.8 cm

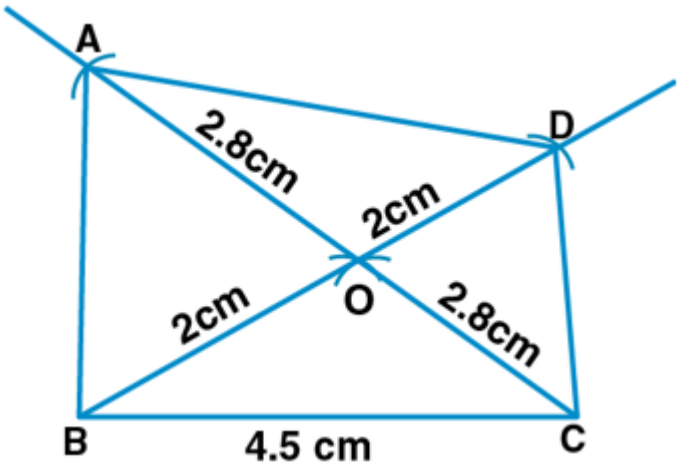
We know that the diagonals of parallelogram bisect each other.

(ii) Produce OC to point A such that OC = OA.

(iii) Produce BO to point D such that OD = OB.

(iv) Now join AD.

Therefore, ABCD is the required parallelogram.



4. Construct a parallelogram ABCD such that AC = 6 cm, BD = 4.6 cm and angle between them is 45^0.

Solution:

Steps of Construction:

(i) Construct AO = $\frac{1}{2}$ AC = 3 cm and produce AO to C such that OC = OA.

(ii) At the point O, draw ∠COP = 45^0.

(iii) From OP

Cut OD = $\frac{1}{2}$ BD

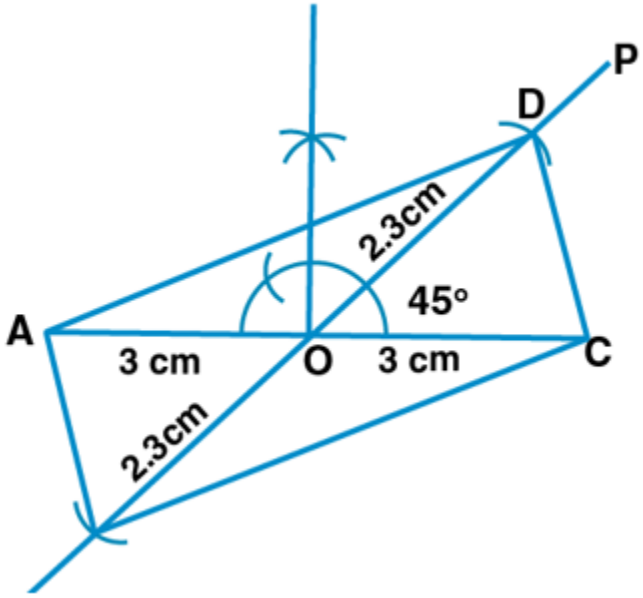
= $\frac{1}{2}$ × 4.6

= 2.3 cm

(iv) Produce OD to OB such that OB = OD.

(v) Now join AB, BC, CD and DA.

Therefore, ABCD is the required parallelogram.



5. Construct a rectangle whose adjacent sides are 5.6 cm and 4 cm.

Solution:

Steps of Construction:

(i) Construct AB = 5.6 cm.

(ii) At the point B, draw ∠ABP = 90^0.

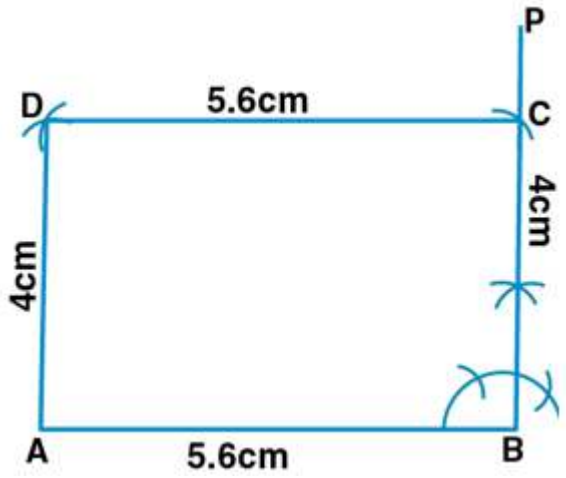
(iii) Cut off BC = 4 cm from BP.

(iv) Taking C as centre and 5.6 cm radius, construct an arc.

(v) Taking A as centre and 4 cm radius, construct an arc which meets the previous arc at point D.

(vi) Now join AD and CD.

Therefore, ABCD is the required rectangle.



6. Construct a rectangle such that one side is 5 cm and one diagonal is 6.8 cm.

Solution:

Steps of Construction:

(i) Construct AB = 5 cm.

(ii) At the point A, draw $\angle BAP = 90^0$.

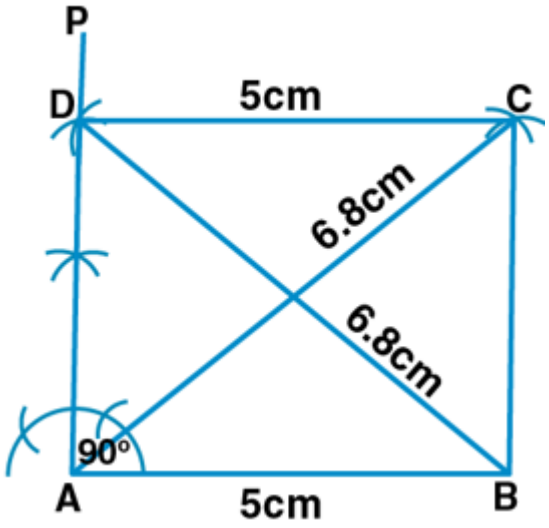
(iii) Taking B as centre and 6.8 cm radius, construct an arc which meets AP at D.

(iv) Taking A as centre and 6.8 cm radius, construct an arc.

(v) Taking D as centre and 5 cm radius, construct an arc which meets the previous arc at C.

(vi) Now join BC and CD.

Therefore, ABCD is the required rectangle.



7. Construct a rectangle ABCD such that AB = 4 cm and ∠BAC = 60^0.

Solution:

Steps of Construction:

(i) Construct AB = 4 cm.

(ii) At the point B, construct ∠ABP = 90^0.

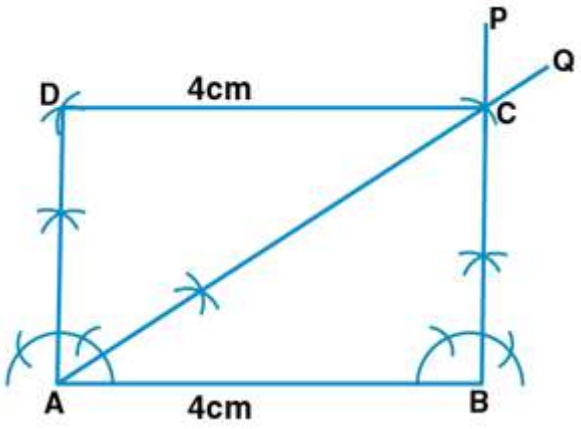
(iii) At the point A, draw ∠BAQ = 30^0. Let AQ meet BP at the point D.

(iv) Taking D as centre and 4 cm radius construct an arc.

(v) Taking A as centre and BD as radius, construct an arc which meets the previous arc at the point C.

(vi) Now join AC and CD.

Therefore, ABCD is the required rectangle.



8. Construct a rectangle such that one diagonal is 6.6 cm and angle between two diagonals is 120^0.

Solution:

Steps of Construction:

(i) Construct AO = ½ AC = (½ × 6.6) cm and produce AO to C such that OC = OA = 3.3 cm.

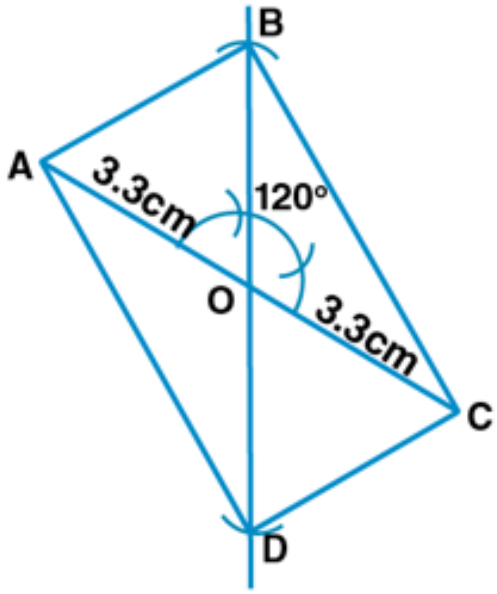
(ii) At the point O, draw ∠COB = 120^0.

(iii) Cut off OB = ½ AC = 3.3 cm from OB.

(iv) Produce BO to D such that OB = OD = 3.3 cm.

(v) Now join AB, BC, CD and DA.

Therefore, ABCD is the required rectangle.



9. Construct a rhombus whose one side is 5 cm and one angle is 45^0.

Solution:

Steps of Construction:

(i) Construct AB = 5 cm.

(ii) At the point A, draw $\angle BAP = 45^0$.

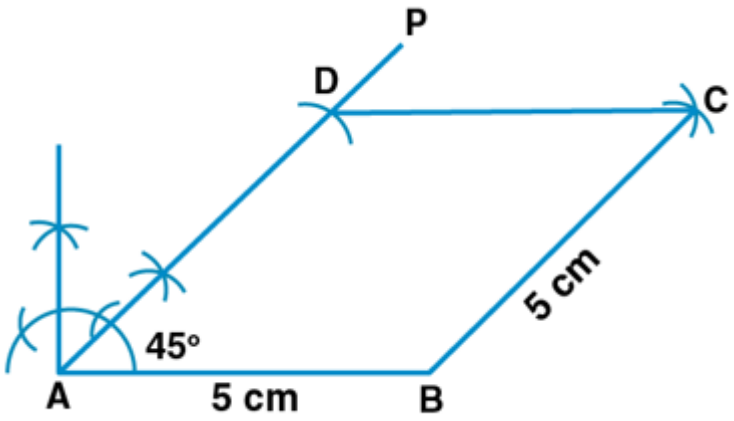
(iii) Cut off AD = 5 cm from AP.

(iv) Taking B as centre and 5 cm radius, construct an arc.

(v) Taking D as centre and 5 cm radius, construct an arc which meets the previous arc at the point C.

(vi) Now join BC and CD.

Therefore, ABCD is the required rhombus.



10. Construct a rhombus whose one side is 4.5 cm and one diagonal is 5 cm.

Solution:

Steps of Construction:

(i) Construct AB = 4.5 cm.

(ii) Taking A as centre and 4.5 cm radius, construct an arc.

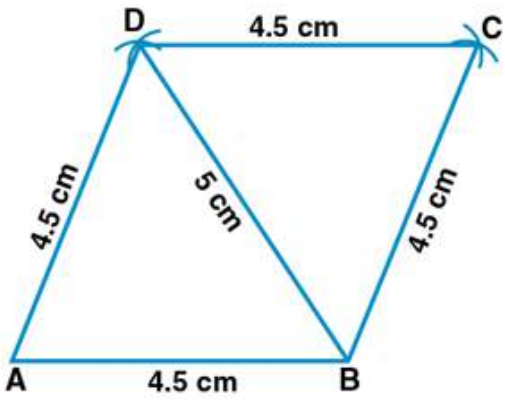
(iii) Taking B as centre and 5 cm radius, construct an arc which meets the previous arc at D.

(iv) Taking B as centre and 4.5 cm radius, construct an arc.

(v) Taking D as centre and 4.5 cm radius, construct an arc which meets the previous arc at point C.

(vi) Now join AD, BC and CD.

Therefore, ABCD is the required rhombus.



11. Construct a rhombus whose diagonals are 6.8 cm and 5.2 cm.

Solution:

Steps of Construction:

(i) Construct AC = 6.8 cm.

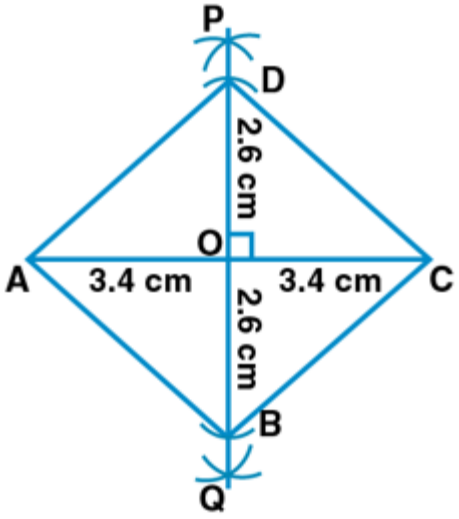
(ii) Construct one bisector PQ of AC to meet it at the point O.

(iii) From POQ, cut off OB and OD such that

OB = OD = ½ BD = ½ × 5.2 = 2.6 cm

(iv) Now join AB, BC, CD and DA.

Therefore, ABCD is the required rhombus.



12. Construct a square whose one side is 4.3 cm.

Solution:

Steps of Construction:

(i) Construct BC = 4.3 cm.

(ii) At the point B, draw $\angle CBP = 90^0$.

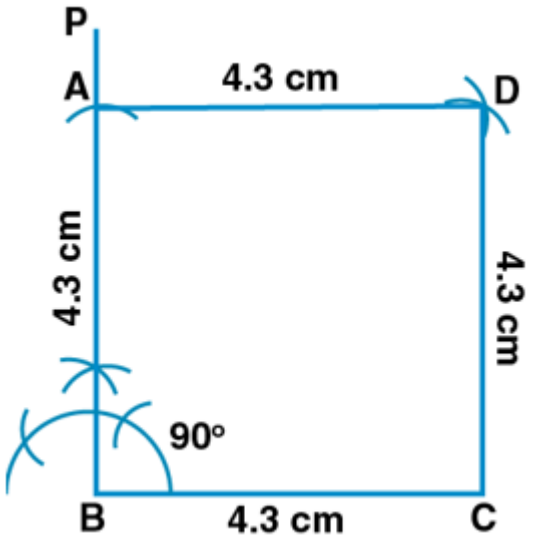
(iii) Cut off BA = 4.3 cm from BP.

(iv) Taking C as centre and 4.3 cm radius, construct an arc.

(v) Taking A as centre and 4.3 cm radius, construct an arc which meets the previous arc at D.

(vi) Now join AD and CD.

Therefore, ABCD is the required square.



13. Construct a square whose one diagonal is 6.2 cm.

Solution:

Steps of Construction:

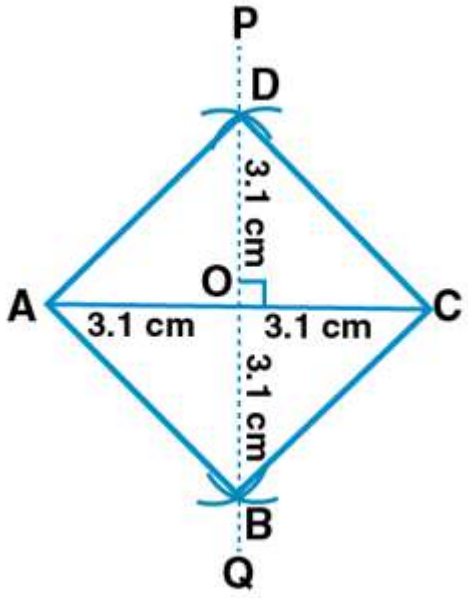
(i) Construct AC = 6.2 cm.

(ii) Construct a perpendicular bisector PQ of AC to meet it at point O.

(iii) From POQ, cut off OB = OD = $\frac{1}{2}$ AC = 3.1 cm.

(iv) Now join AB, BC, CD and DA.

Therefore, ABCD is the required square.



Higher Order Thinking Skills (Hots)

Question 1: Construct a trapezium ABCD in which AB = 7 cm, BC = 4 cm, CD = 3 cm, ∠B = 60° and AB || DC.

Solution:

Steps of construction :

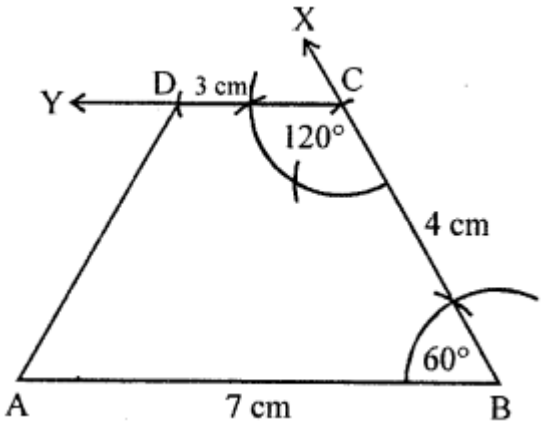
(i) Draw a line segment AB = 7 cm.

(ii) At B, draw a ray BX making an angle of 60°
and cut off BC = 4 cm.

(iii) At C draw a line CY parallel to AB
making an angle of 120° and cut off CD = 3 cm.

(iv) Join AD.

ABCD is the required trapezium.



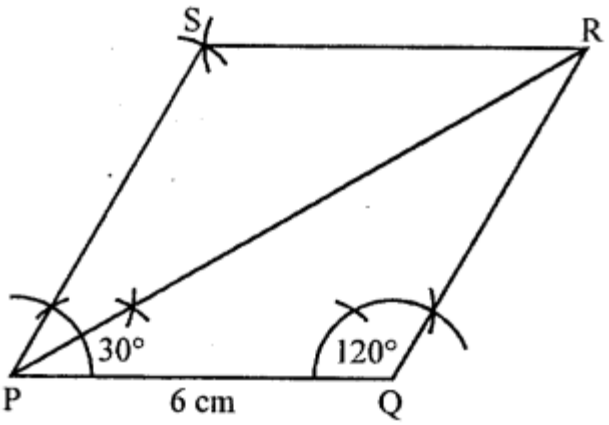
Question 2: Construct a parallelogram PQRS in which PQ = 6 cm, ∠Q = 120° and ∠RPQ = 30°.

Solution:

Steps of construction :

(i) Draw a line segment PQ = 6 cm.

(ii) At P, draw a ray making an angle of 30° and at Q
a ray making an angle of 120° intersecting each other at R.



(iii) With centre P and radius QR and with centre R
and radius equal to PQ, draw arcs intersecting each other at S.
(iv) Join SP and SR.
PQRS is a required parallelogram.

Question 3: Construct a rectangle ABCD in which diagonal AC = 7 cm and the diagonals BD and AC intersect at O such that ∠BOC = 45°.

Solution:

Steps of construction :

(i) Draw AO = $\frac{1}{2}$AC = $\left(\frac{1}{2} \times 7\right)$ cm = 3·5 cm and produce AO to C such that OC = OA = 3·5 cm.

(ii) At O, construct ∠COP = 45°.

(iii) From OP, cut off OD = $\frac{1}{2}$AC = 3·5 cm.
produce DO to B such that OB = OD = 3·5 cm.

(iv) Join AB, BC, CD, DA. Then ABCD is the required rectangle.

Check Your Progress

Question 1: Construct a quadrilateral ABCD such that AB = 4·5 cm, BC = 4 cm, CD = 3·9 cm, AD = 3·2 cm and ∠B = 60°.

Solution:

Steps of construction :

(i) Draw AB = 4·5 cm.

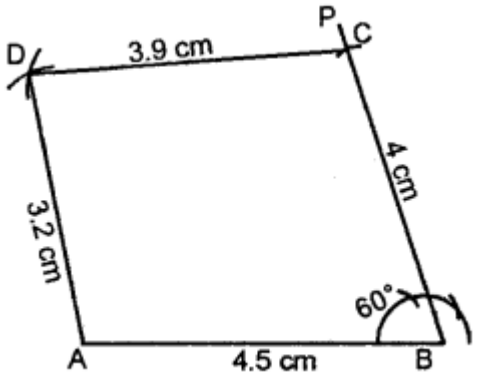
(ii) At B, construct ∠ABP = 60°.

(iii) From BP, cut off BC = 4 cm.

(iv) With C as centre, and 3·9 cm as radius draw an arc.

(v) With A as centre and 3·2 cm as radius,
draw an arc to meet the previous arc at D.

(vi) Join AD and CD.



Question 2: Construct a quadrilateral ABCD such that AB = 5 cm, BC = 4·2 cm, AD = 3·5 cm, ∠A = 90°, ∠B = 60°.

Solution:

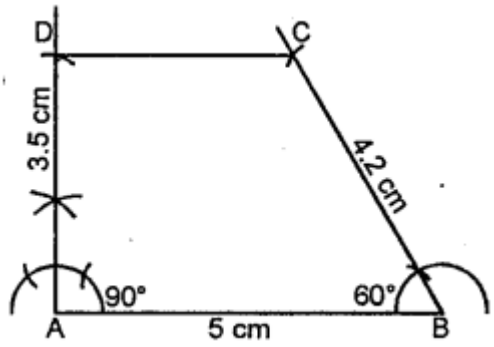
Steps of construction :

(i) Draw AB = 5 cm.

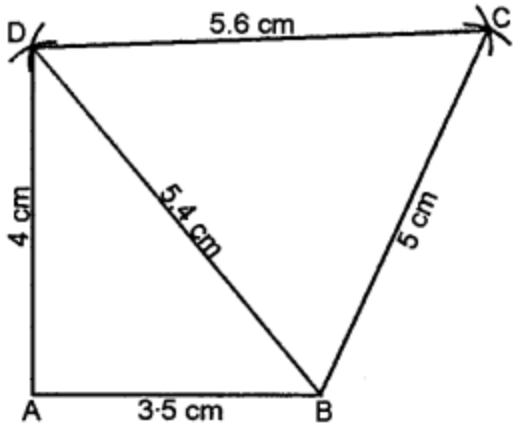
(ii) At A, construct angle = 90°

(iii) At Ef' construct angle = 60°

(iv) With B as centre and 4·2 cm as radius,
draw an arc and mark it as C.
(v) With A as centre and 3·5 cm as radius,
drawn an arc and mark it as D.
(vi) Join CD. Then ABCD is the required quadrilateral.



Question 3: Construct a quadrilateral ABCD in which AB 3·5 cm, BC = 5 cm, CD = 5·6 cm, DA = 4 cm and BD = 5·4 cm
Solution:
Steps of construction :
(i) Draw AB = 3·5 cm.
(ii) With A as centre and radius = 4 cm,
draw an arc and with B as centre and radius = 5·4 cm
draw an arc to meet the previous arc at D. Join AD and BD.
(iii) With B as centre and radius = 5 cm, draw an arc.
With D as centre and radius = 5·6 cm,
draw an arc to meet the previous arc at C.
(iv) Join BC and CD, then ABCD is the required quadrilateral.



Question 4: Construct a quadrilateral PQRS in which PQ = 3 cm, QR = 2·5 cm, PS = 3·5 cm, PR = 4 cm and QS = 5 cm.

Solution:

Steps of construction :

(i) Draw a line PQ = 3 cm.

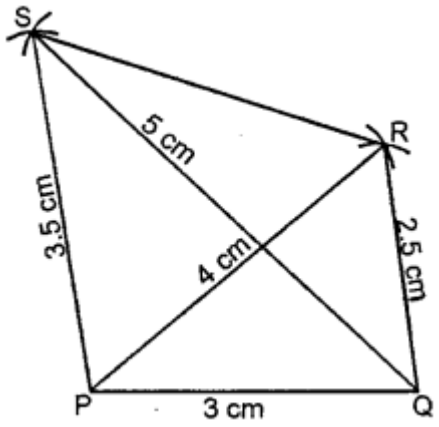
(ii) With P as centre and 3.5 cm as radius,
draw an arc and with Q as centre and 5 cm as radius,
draw an arc to meet the previous arc at S.

(iii) Join PS and QS.

(iv) With Q as centre and radius = 2.5 cm,
draw an arc and with P as centre and radius = 4 cm,
draw an arc to meet the previous arc at R.

(v) Join PR and QR.

(vi) Join RS, then PQRS is the required quadrilateral.



Question 5: Construct a quadrilateral ABCD given that BC = 6 cm, CD = 4 cm, ∠B = 45°, ∠C = 90° and ∠D = 120°.

Solution:

Steps of construction :

(i) Draw BC = 6 cm.

(ii) At B, construct ∠CBP = 45°.

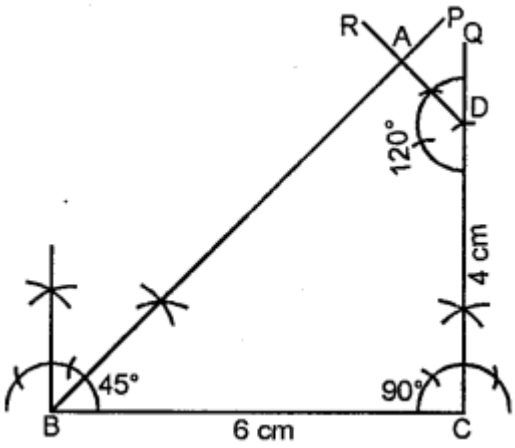
(iii) At C, construct ∠BCQ = 90°

(iv) From CQ, cut off CD = 4 cm.

(v) At D, construct ∠CDR = 120°.

(vi) Let BP and DR meet at A.

Then ABCD is the required quadrilateral.



Question 6: Construct a parallelogram ABCD in which AB = 5.2 cm, AC = 6.5 cm and BD = 7.8 cm.

Solution:

Steps of construction :

(i) Draw a line segment AB = 5.2 cm.

(ii) With centre A and radius $\frac{6.5}{2}$ cm = 3.25 cm

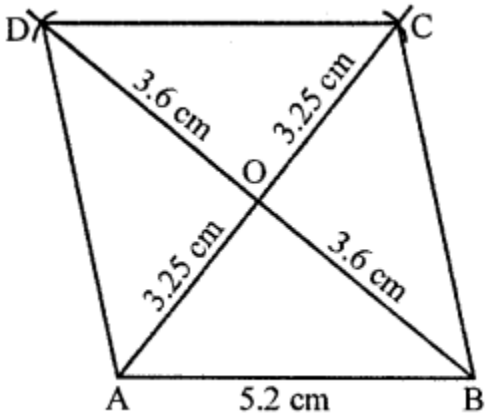
and with centre B and radius $\frac{7.2}{2}$ = 3.6 cm,

draw arcs intersecting each other at O.

(iii) Join AO and BO and produce them such that OC = AO and OD = BO.

(iv) Join DA, DC, and CB.

ABCD is the required parallelogram.



Question 7: Construct a parallelogram ABCD in which diagonal AC = 4 cm, diagonal BD = 6 cm and angle between diagonals is 75°.

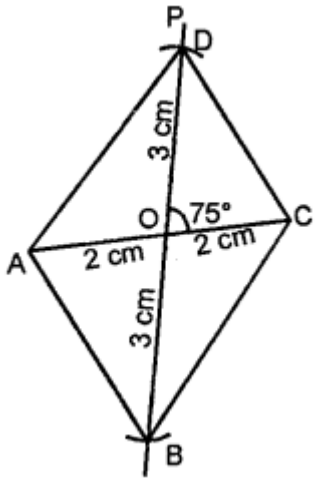
Solution:

Steps of construction :

(i) Draw AO = $\frac{1}{2}$ AC = $\frac{1}{2}$ (4 cm) = 2 cm and produce AO to C

such that OC = OA.

(ii) At O, construct ∠COP = 75°.



(iii) From OP, cut OD = $\frac{1}{2}$ BD = $\frac{1}{2}$ (6 cm) = 3 cm.
produce OD to B such that OB = OD.

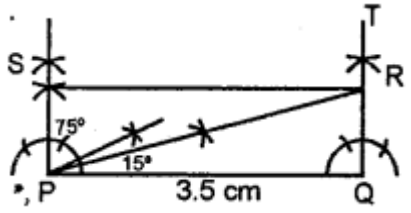
(iv) Join AB, BC, CD and DA, then ABCD is the required parallelogram.

Question 8: Construct a rectangle PQRS such that PQ = 3·5 cm and ∠RPS = 75°.

Solution:

Steps of construction :

(i) Draw PQ = 3·5 cm.
(ii) At Q, draw ∠PQT = 90°.
(iii) At P, draw angle of 15° which meet QT at R.
(iv) With R as centre and PQ as radius draw an arc.
(v) With P as centre and QR as radius cut the previous arc at S.
Join PS and RS. Then PQRS is the required rectangle.



Question 9: Construct a rectangle whose one diagonal is 6-8 cm and an angle between two diagonals is 105°.

Solution:

Steps of construction :

(i) Draw AO = $\frac{1}{2}$ AC = $\frac{1}{2}$ (6.8 cm) = 3·4 cm and produce AO to C such that OC = OA = 3·4 cm.

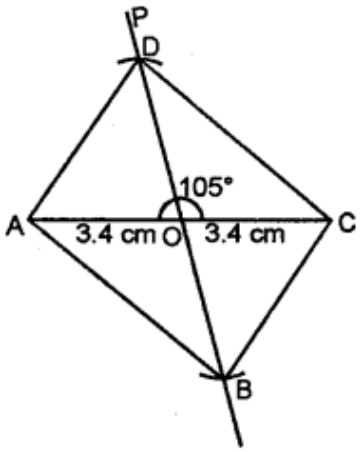
(ii) At O, construct ∠COP = 105°.

(iii) From OP, cut off OD = $\frac{1}{2}$ AC = $\frac{1}{2}$ × 6·8 = 3·4 cm.

[Because both the diagonals of rectangle are equal]

(iv) Produce OD to B such that OB = OD = 3·4 cm.

(v) Join AB, BC, CD and DA. Then ABCD is the required rectangle.



Question 10: Construct a rhombus BEST such that BE = 4.5 cm, ET = 6 cm.

Solution:

Steps of construction :

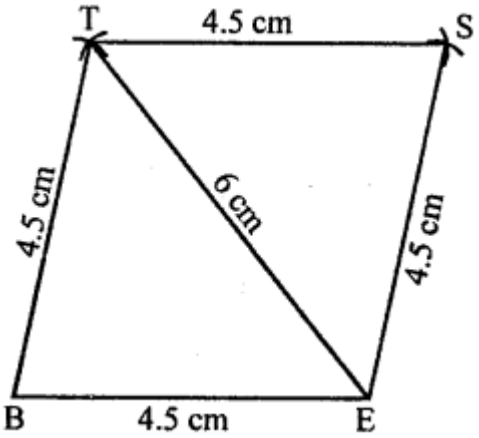
(i) Draw a line segment BE = 4.5 cm.

(ii) With centre B and radius 4.5 cm
and with centre E and with radius 6 cm
draw arcs intersecting each other at T.

(iii) Join TB and TE.

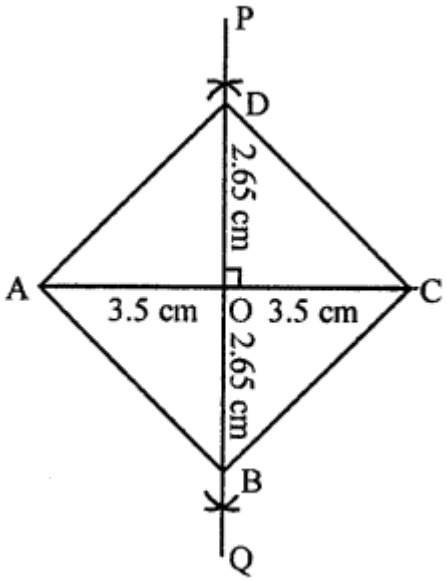
(iv) Again with centres E and T,
and radius 4.5 cm from both points,

draw arcs intersecting each other at S.
(v) Join ST and SE.
BEST is the required rhombus.



Question 11: Construct a rhombus whose diagonals are 7 cm and 5·3 cm.

Solution:
Steps of construction :
(i) Draw AC = 7 cm.
(ii) Draw ⊥ bisector PQ of AC to meet it at O.
(iii) From POQ, cut off OB and OD such that OB = OD = $\frac{1}{2}$ BD = $\frac{5.3}{2}$ = 2·65 cm
(iv) Join AB, BC, CD and DA. Then ABCD is the required rhombus.



Question 12: Construct a square whose one diagonal is 5·8 cm.
Solution:
Steps of construction :
(i) Draw AC 5·8 cm.
(ii) Draw perpendicular bisector PQ of AC to meet it at O.
(iii) From POQ, cut off OB = OD such that OB = OD = $\frac{1}{2}$AC = $\frac{1}{2}$ × 5·8 = 2·9 cm.
(iv) Join AB, BC, CD and DA. Then ABCD is the required square.