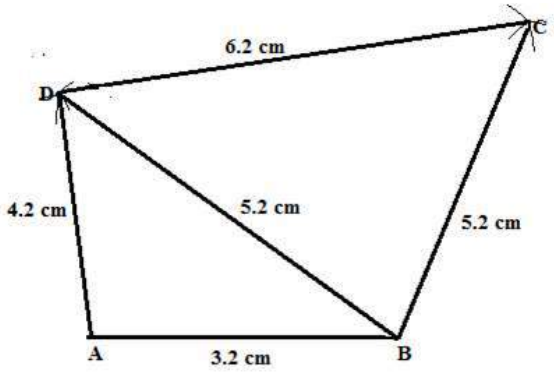
EXERCISE 15 PAGE: 190

Construct a quadrilateral ABCD, when:

1. AB=3.2 cm, BC = 5.2cm, CD = 6.2cm, DA = 4.2cm and BD = 5.2 cm

Solution:



Steps:

(i) Draw $AB = 3.2cm$.

(ii) With A as a centre draw an arc at D and with B as a centre and radius 5.2 cm draw an arc at D.

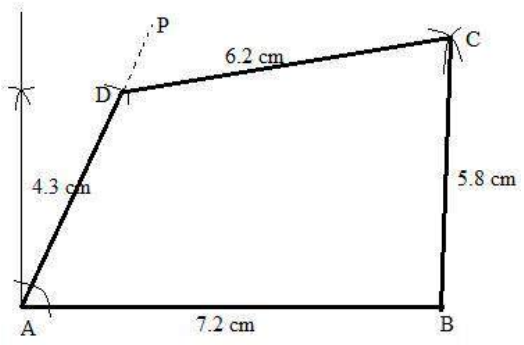
(iii)join AD and DB.

(iv)With D and b as a centre taking radius 6.2 cm and 5.2 cm draw arc at C. Now join BC and DC.

ABCD is the required quadrilateral.

2. AB=7.2 cm, BC = 5.8cm, CD = 6.3cm, DA = 4.3cm and angle A = 75^0.

Solution



Steps:

(i) Draw $AB = 7.2cm$.

(ii) Through A draw AP such that $\angle A = 75^\circ$.

(iii)From AP cut $AD = 4.3cm$.

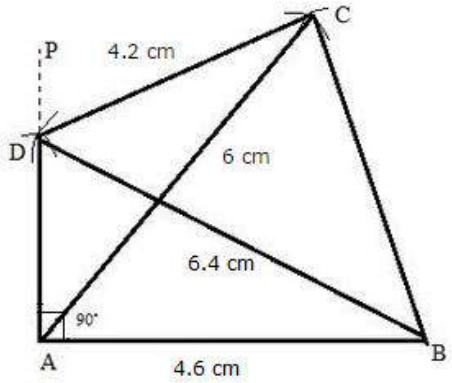
(iv)With D and B as centre and radii 6.2 cm and 5.8 cm respectively, draw arcs cutting each other at C.

(v) Join DC and BC.

ABCD is the required quadrilateral.

3. Angle A= 90^0, AB = 4.6cm, BD = 6.4cm, AC = 6.0cm and CD = 4.2 cm

Solution



Steps:

(i) Draw AB = 4.6 cm

(ii) Through A, draw AP such that Angle A = 90°.

(iii)With B as a centre and radii 6.4 cm draw an arc at D on AP.

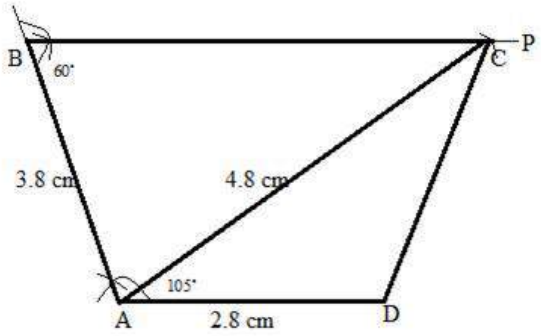
(iv)With D and A as a centre and radii 4.2 cm and 6 cm draw arc cutting each other at C.

(v) Now join BD, AC and CB.

ABCD is the required quadrilateral.

4. AB=3.8 cm, AC = 4.8cm, AD = 2.8cm, angle A = 105^0 and angle B = 60^0

Solution



Steps:

(i) Draw $AD = 2.8cm$.

(ii) Draw $AB = 3.8cm$ and $\angle A = 105^\circ$.

(iii)Draw BP such that $\angle B = 60^\circ$.

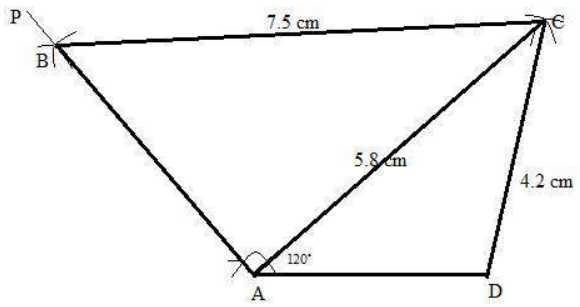
(iv)With A as a centre and radii 4.8 cm draw an arc cutting BP at C.

(v) Join AC, AD.

ABCD is the required quadrilateral.

5. BC=7.5 cm, AC = 5.8cm, AD = 3.6 cm, CD = 4.2cm and angle A = 120^0

Solution



Steps:

(i) Draw $AD = 3.6cm$.

(ii) draw AP such that $\angle A = 120^{\circ}$.

(iii)With A and D as a centre and radii 5.8 cm and 4.2 cm draw arcs cutting each other at C.

(iv)Now join AC and CD.

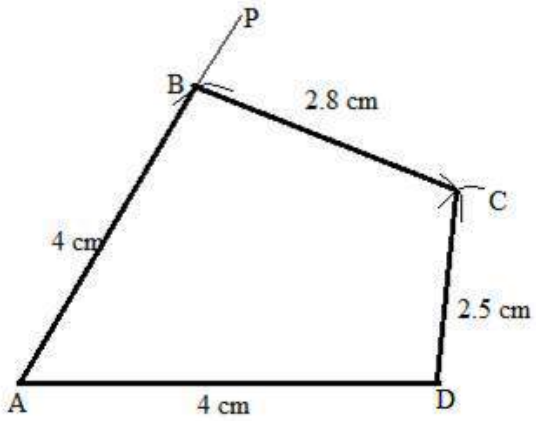
(v) Now with C as centre and radii 7.5 cm draw an arc at B on AP.

(vi)Now join CB.

ABCD is the required quadrilateral.

6. AD=AB = 4cm, BC = 2.8 cm, CD= 2.5cm and angle BAD = 45^0

Solution



Steps:

(i) Draw $AD = 4cm$.

(ii) Draw AP such that $\angle A = 45^{\circ}$.

(iii)With A as a centre with radii 4 cm draw an arc at B on AP.

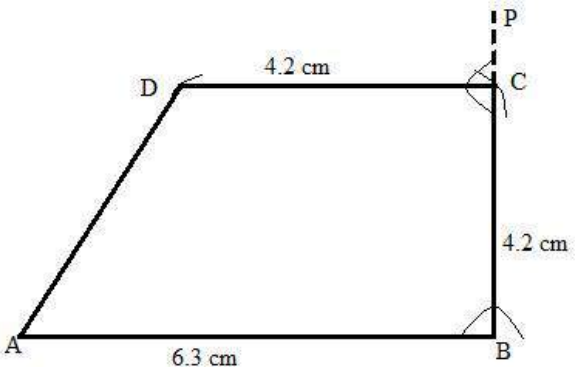
(iv)Now taking B and D as a centre and radii 2.8 cm and 2.8 cm draw arcs cutting each other at C.

(v) Now join BC and CD.

ABCD is the required quadrilateral.

7. AB= 6.3cm, BC=CD=4.2cm and $\angle ABC = \angle BCD = 90^0$.

Solution



Steps:

(i) Draw $AB = 6.3cm$.

(ii) Draw BP such that $\angle ABP = 90^{\circ}$.

(iii)With B as a centre and radii 4.2 cm draw an arc AP at C.

(iv)With C as a centre draw a line CD with radii 4.2cm draw a line such that $\angle BCD = 90^{\circ}$.

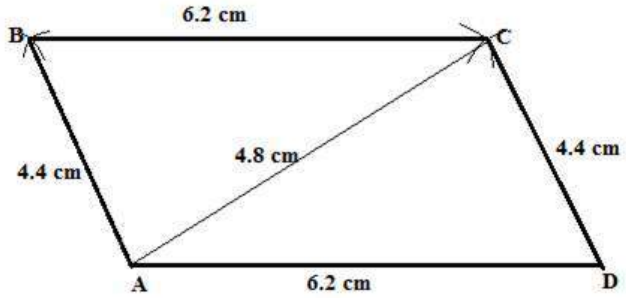
(v) Now join AD

ABCD is the required quadrilateral.

Construct a parallelogram ABCD, when:

8. AB=4.4cm, AD=6.2cm and AC=4.8cm.

Solution



Steps:

(i) Draw $AD = 6.2cm$.

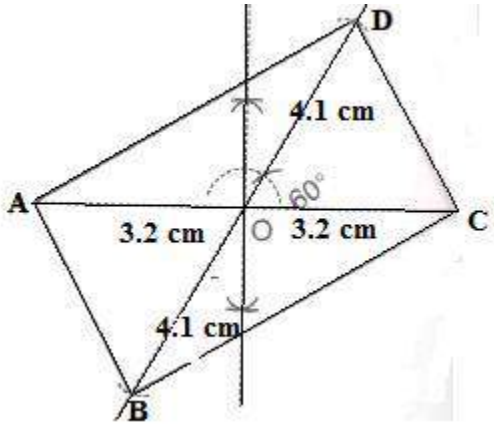
(ii) Draw triangle ACD.

(iii)Then draw triangle ABC.

ABCD is the required parallelogram.

9. Diagonal AC=6.4cm, diagonal BD=8.2cm and angle between the diagonals=60^0.

Solution



Steps:

(i) Draw $AC = 6.4cm.$

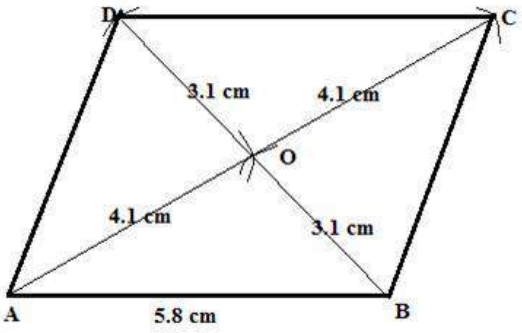
(ii) Draw line BOD such that $\angle DOC = 60^{\circ}$ and $OB = OD = \frac{1}{2}BD = \frac{1}{2} \times 8.2 = 4.1cm.$

(iii)Join AB, BC, CD and DA.

ABCD is the required parallelogram.

10. AB=5.8cm, diagonal AC = 8.2cm and diagonal BD=6.2 cm.

Solution



Steps:

(i) Since diagonal of a parallelogram bisect each other, construct OAB such that ;

$$OA = \frac{1}{2}AC = \frac{1}{2} \times 8.2cm = 4.1cm$$

$$OB = \frac{1}{2}BD = \frac{1}{2} \times 6.2cm = 3.1cm$$

And $AB = 5.8cm.$

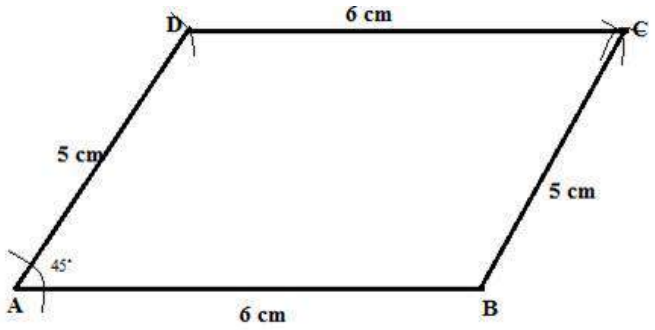
(ii) 2. Produce AO up to C, such that $OC = OA = 4.1cm$ and BO upto D, such that $DO = OB = 3.1cm$.

(iii) 3. Join AD, DC and CB.

ABCD is the required parallelogram.

11. AB=6.0 cm, AD=5.0cm and $\angle A = 45^{0}$.

Solution



Steps:

(i) Draw $AB = 6cm$.

(ii) Draw AD with radii 5 cm with an angle of 45°.

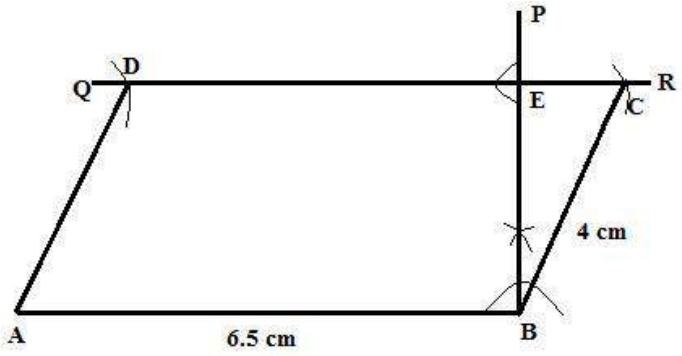
(iii)With D and B as a centre and radii 6 cm and 5cm draw arcs cutting each other at C.

(iv)Now join DC and BC.

ABCD is the required parallelogram.

12. Base AB=6.5 cm, BC = 4cm and the attitude corresponding to AB = 3.1cm.

Solution



Steps:

(i) Draw $AB = 6.5cm$.

(ii) At B, draw $BP \perp AB$.

(iii)From BP cut $BE = 3.1cm$.

(iv)Through E draw perpendicular to BP to get QR parallel to AB.

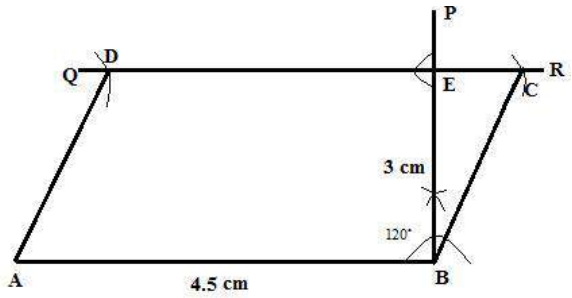
(v) With B as a centre and radius $= AC = 4cm$,draw an arc which cuts QR at C.

(vi)With A as a centre and radius $= AD = 4cm$,draw an arc which cuts QR at D.

ABCD is the required parallelogram.

13. AB = 4.5 cm, ∠B= 120^0 and the distance between AB and DC = 3.0cm

Solution



Steps:

(i) Draw $AB = 4.5cm$.

(ii) At B, draw $BP \perp AB$.

(iii)From BP cut $BE = 3cm$.

(iv)Through E draw perpendicular to BP to get QR parallel to AB.

(v) With B as a centre draw an arc which cuts QR at C.

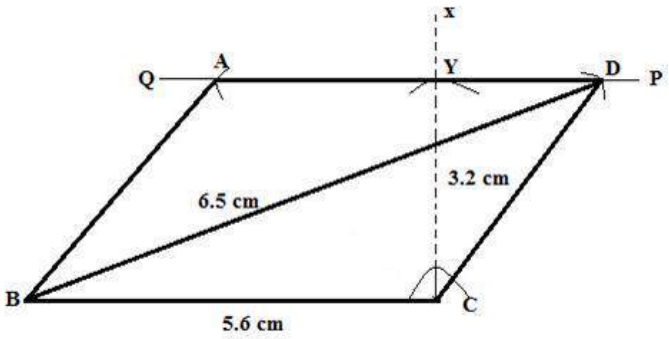
(vi)With A as a centre draw an arc which cuts QR at D.

(vii) Now join Ad and BC.

ABCD is the required parallelogram.

14. Base BC=5.6cm, diagonal BD=6.5 cm and altitude=3.2cm.

Solution



Steps:

(i) Draw $BC = 5.6cm$.

(ii) At C, draw CX perpendicular to BC.

(iii)with C as a centre and taking radius 3.2 cm draw an arc to cut CX at Y.

(iv)Through Y draw a straight line PQ parallel to BC.

(v) With B as a centre and radius 6.5 cm draw an arc to meet PQ at D.

(vi)With D as a centre and radius equal to 5.6 cm , draw an arc to meet PQ at A.

(vii) Join BA,BD and CD.

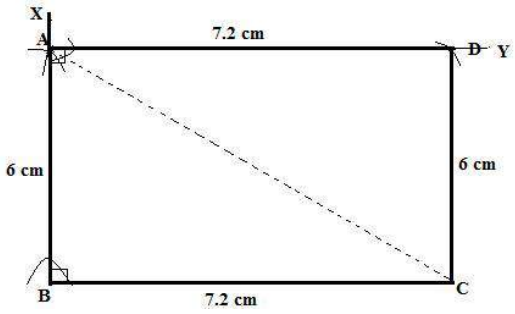
ABCD is the required parallelogram.

Construct a rectangle ABCD, when:

15. Its sides are 6.0 cm and 7.2 cm.

Solution

Since each angle of a rectangle is 90° and opposite sides are equal. Therefore,



Steps:

(i) Draw $BC = 7.2cm$.

(ii) with B as a centre draw a line BX taking as a 90°.

(iii)Now taking radius 6 cm draw an arc at A.

(iv)From point A draw a line AY parallel to BC.

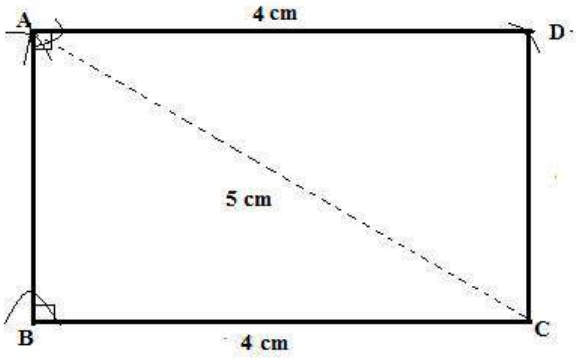
(v) With A as a centre taking radius 7.2 cm draw an arc at D.

(vi)Now join CD.

ABCD is the required rectangle.

16. One side = 4cm and one diagonal is 5cm. Measure the length of other side.

Solution



Steps:

(i) Draw $BC = 4cm$.

(ii) With C as a centre and radius 5 cm draw an arc at A.

(iii)Now join AB and AC.

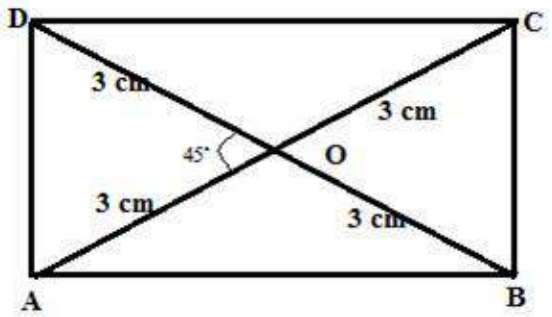
(iv)With A as a centre draw an arc at D.

(v) Now join AD and CD.

ABCD is the required rectangle.

17. One diagonal = 6.0cm and the acute angle between the diagonals = 45^0.

Solution



Steps:

(i) Draw $AC = 6cm$.
(ii) Draw right triangle ACB.
(iii)Draw right triangle ADB.
(iv)Join DC.
ABCD is the required rectangle.

18. Area = 24 cm^2 and base=4.8cm.

Solution

Given that the base = 4.8 cm^2 and Area = $24\,cm^2$

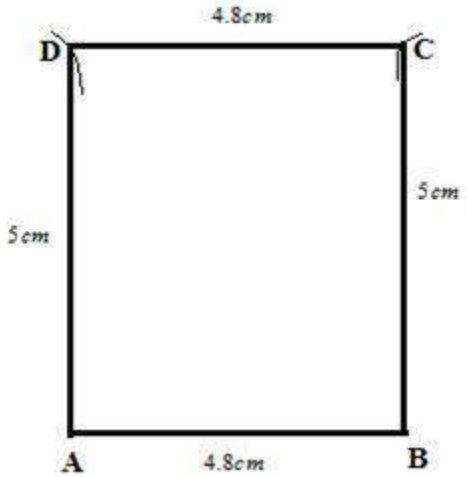
We know that area of rectangle $= base \times Height$.

Therefore,

24 = 4.8 x height

Height= 5

With $base = 4.8cm^2$ and height $5cm^2$, the rectangle is shown below:



Steps:

(i) Draw base $AB = 4.8cm^2$.

(ii) With A and B as a centre draw an arcs taking radius $5cm^2$ at D and C.
(iii)Now join AD,BC and DC.
ABCD is the required rectangle.

19. Area= 36 cm^2 and height = 4.5cm.

Solution

Given that the height = 4.5 cm and Area = $36cm^2$

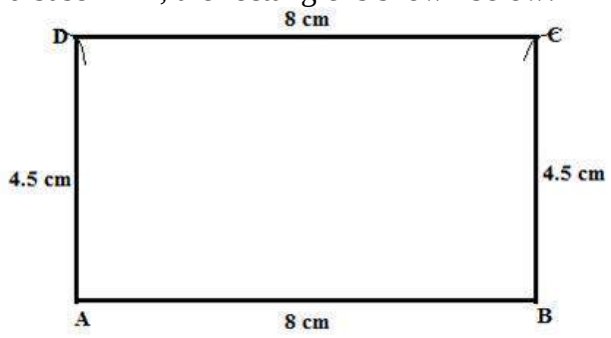
We know that area of rectangle $= base \times Height$.

Therefore,

36= base x 4.5

Base= 8 cm

With $height = 4.5$ and base $8cm$, the rectangle is shown below:



Steps:

(i) Draw base $AB = 8cm$.

(ii) With A and B as a centre draw an arcs taking radius $4.5cm$ at D and C.

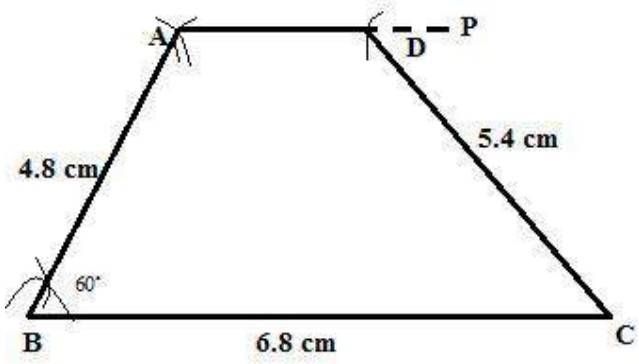
(iii)Now join AD,BC and DC.

ABCD is the required rectangle.

Construct a trapezium ABCD, when:

20. AB= 4.8cm, BC= 6.8cm, CD=5.4cm, angle B=60^0 and AD||BC.

Solution



Steps:

(i) Draw $BC = 6.8cm$.

(ii) With B as a centre and radii 4.8 cm draw an arc at A such that $\angle B = 60^\circ$.

(iii)From point A draw a line AP such that $AP \parallel BC$.

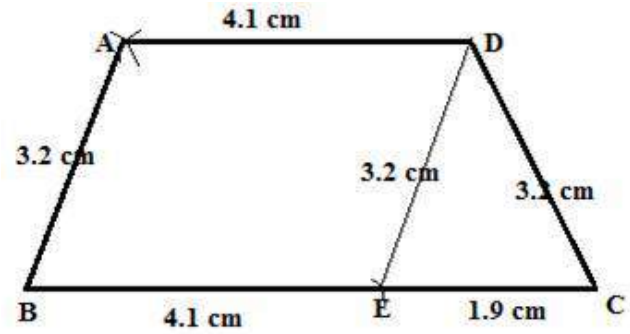
(iv)With C as a centre and radii 5.4 cm draw an arc at D on the line AP.

(v) Now join AB,CD.

ABCD is the required trapezium.

21. AB=CD=3.2 cm, BC = 6.0cm, AD=4.4cm and AD||BC.

Solution



Steps:

(i) Draw $BC = 6cm$.

(ii) 2. From BC cut $BE = AD = 4.1cm$.

(iii)3. Draw triangle DEC such that
$DE = AB = 3.2cm$ and $CD = 3.2cm$.

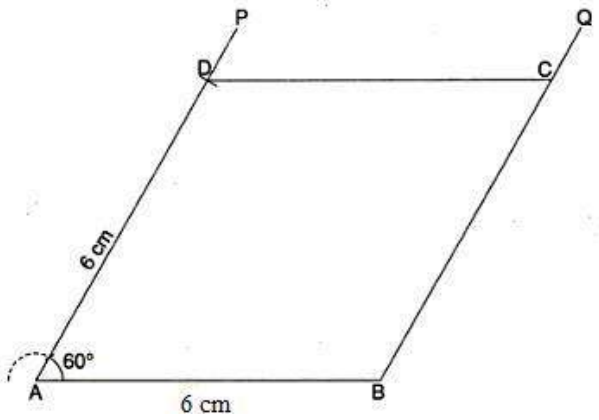
(iv)4. Taking B and D as a centre and radii 3.2 cm and 4.1 cm respectively, draw arcs cutting each other at A.

(v) 5. Join AB and AD.
ABCD is the required trapezium.

Construct a rhombus ABCD, when:

22. Its one side=6cm and $\angle A = 60^0$.

Solution



Steps:

(i) Draw a line $AB = 6cm$.

(ii) At A, we construct $\angle BAP = 60^\circ$.

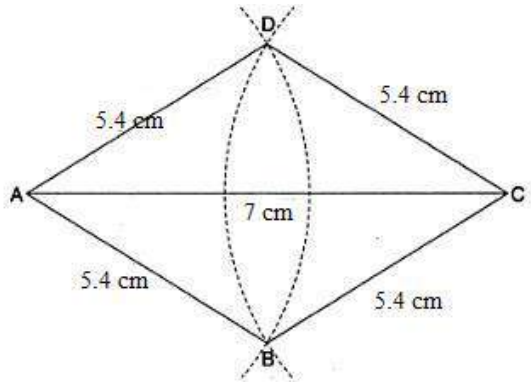
(iii)From AP, we cut at D taking $AD = 6cm$.

(iv)Through B, we draw $BQ \parallel AD$.

(v) Through D, we draw $DC \parallel AB$ to cut BQ at C.
ABCD is the required rhombus.

23. One side=5.4cm and one diagonal is 7.0cm.

Solution



Steps:

(i) We construct the segment $AC = 7cm$.

(ii) With A as a centre and radius 5.4 cm , we draw an arc extending on both sides of AC.

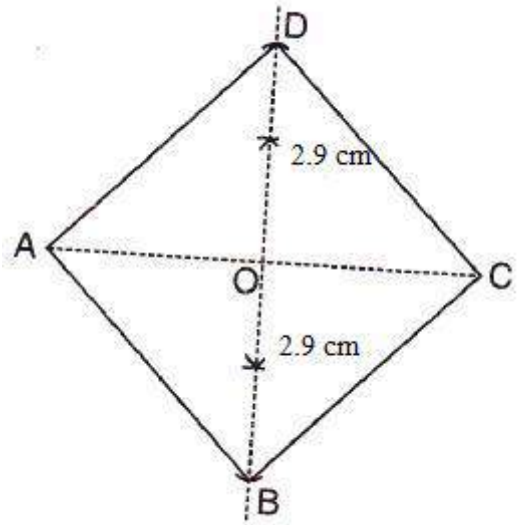
(iii)With C as centre and same radius as in step 2, we draw an arc extending on both sides of AC to cut the first arc at B and D.

(iv)Join AB, BC, CD and DA.

ABCD is the required rhombus.

24. Diagonal AC = 6.3cm and diagonal BD=5.8cm.

Solution



Steps:

(i) Draw $AC = 6.3cm$.

(ii) Draw perpendicular bisector to AC which cuts AC at O.

(iii)From this perpendicular cut OD and OB such that,

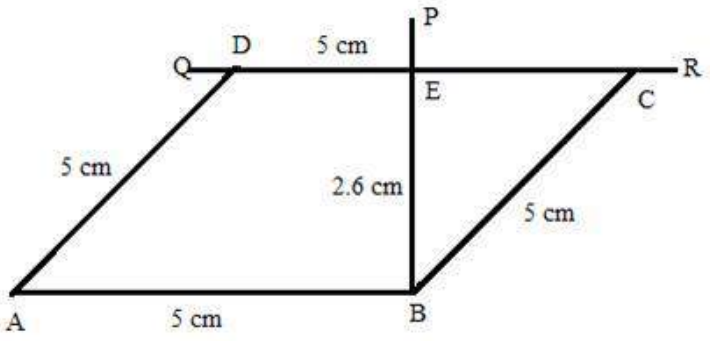
$$OD = OB = \frac{1}{2}BD = \frac{1}{2}\times 5.8 = 2.9cm.$$

(iv)Join AB,BC,CD and DA.

ABCD is the required rhombus.

25. One side= 5.0 cm and height=2.6 cm.

Solution



Steps:

(i) Draw $AB = 5\,cm$.

(ii) At B, draw $BP \perp AB$.

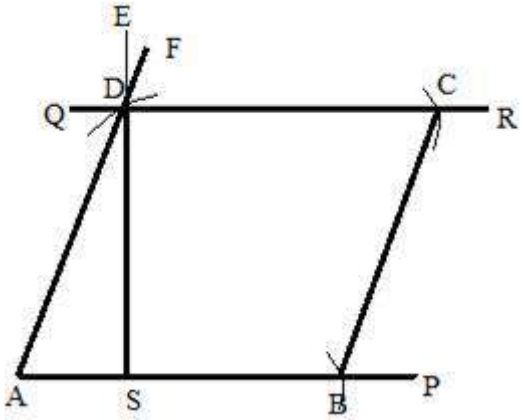
(iii)From BP, cut $BE = 2.6cm = \text{height}$.

(iv)Through E draw perpendicular to CP to get QR parallel to AB.

(v) With A and B as a centre and radii 5 cm draw arcs cutting QR at D and C.
ABCD is the required rhombus.

26. $\angle A = 60^0$ and height = 2.6cm.

Solution



Steps:

(i) Draw a line AP.

(ii) Now draw a line AF such that $\angle A = 60^\circ$.

(iii)At S draw a perpendicular SE of length 3 cm such that it cut at AF at D.

(iv)Through D draw a line QR parallel to AP.

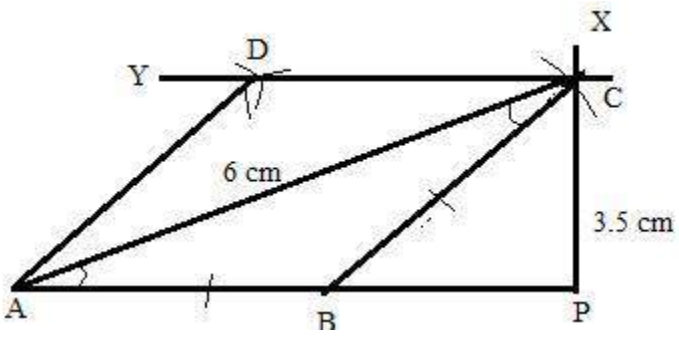
(v) Now taking the radius same as AD draw an arc at B on AP.

(vi)Now through and B taking radius same as AD and AB draw arcs cutting each other at C.

(vii) Now join BC.
ABCD is the required rhombus.

27. Diagonal AC=6.0cm and height=3.5cm.

Solution



Steps:

(i) draw a line AP.

(ii) now draw $AC = 6cm$ and $CP = 3.5cm$.

(iii)Now draw a line BC such that $AB = BC$.

(iv)Now at C draw a line CY parallel to AP.

(v) At point C and A, taking radius same as AB draw arcs cutting each other at D.

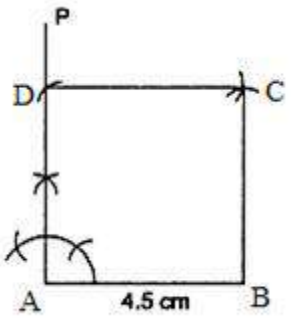
(vi)Now join AD.

ABCD is the required rhombus.

Construct a square ABCD, when:

28. One side = 4.5cm.

Solution



Steps:

(i) Draw a line segment $AB = 4.5cm$.

(ii) Draw $AP \perp AB$.

(iii)From AP cut off $AD = 4.5cm$.

(iv)With B as a centre and radius 4.5 cm draw an arc.

(v) With D as centre and radius 4.5 cm draw another arc cutting the former arc at C.

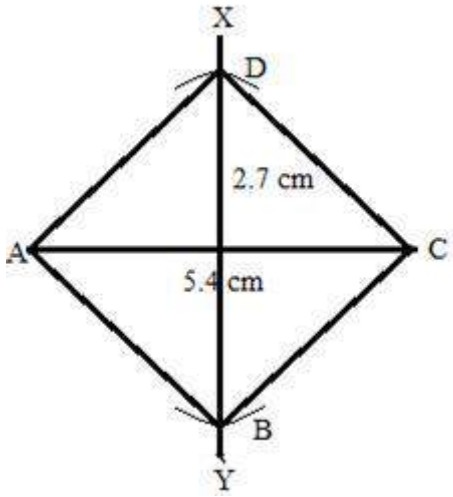
(vi)Join BC and CD.

ABCD is the required square.

29. One diagonal = 5.4 cm.

Solution

We know that the diagonals of a square are equal and bisect each other at right angles.



Steps:

(i) Draw $AC = 5.4cm.$

(ii) Draw the right bisector *XY* of AC, meeting AC at O.

(iii)From O, set off $OB = \frac{1}{2}(5.4) = 2.7cm$ along OY and $OD = 3.1cm$ along OX.

(iv)Join AB, BC, CD and DA.

ABCD is the required square.

30. Perimeter = 24cm.

Solution

The perimeter of a square

$P = 4a$

Where *a* is the length of each side.

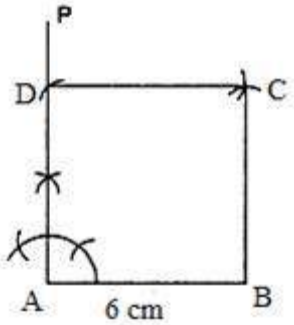
We have Perimeter = 24 cm.

Therefore,

$24 = 4a$

$a = 6$

Therefore the sides of the squares are of length 6 cm.



Steps:

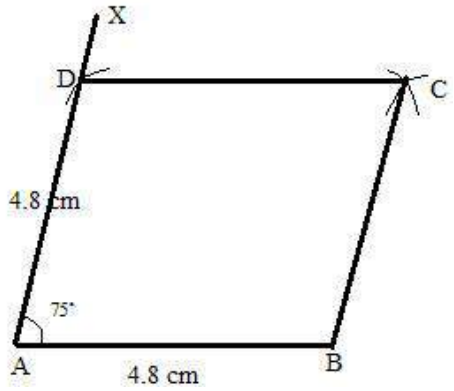
(i) Draw a line segment $AB = 6cm.$

(ii) Draw $AP \perp AB$.

(iii)From AP cut off $AD = 6cm$.
(iv)With B as a centre and radius 6 cm draw an arc.
(v) With D as centre and radius 6 cm draw another arc cutting the former arc at C.
(vi)Join BC and CD.
ABCD is the required square.

31. Construct a rhombus, having given one= 4.8cm and one angle=75^0.

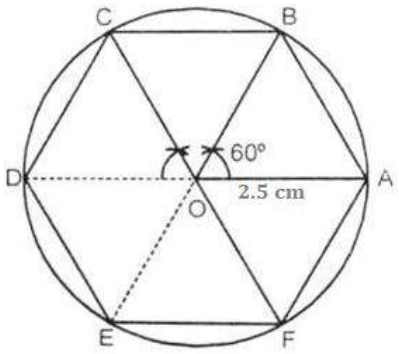
Solution



Steps:
(i) Draw a line $AB = 4.8cm$.
(ii) At A Draw AX such that $\angle BAX = 75^\circ$.
(iii)With A as a centre and measurement equal to AB cut off an arc at D on AX.
(iv)Using same radius taking D and B as centers cut off arcs, which will intersect at C.
(v) Join CD and CB.
ABCD is the required rhombus.

32. Construct a regular hexagon of side
(i) 2.5 cm
(ii) 3.2 cm.

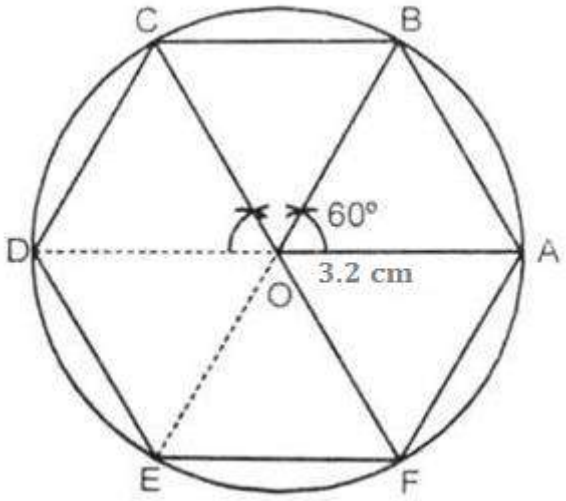
Solution:
(i) 2.5cm



Steps of constructions:
(i) Draw a circle of radius 2.5 cm with center O.

(ii) Since $\frac{360°}{6} = 60°$, draw radii OA and OB, such that $\angle AOB = 60°$.
(iii) Cut off arcs BC, CD, DE, EF and each equal to arc AB on given circle.
(iv) Join AB, BC, CD, DE, EF and FA to get required regular hexagon ABCDEF in a given circle.

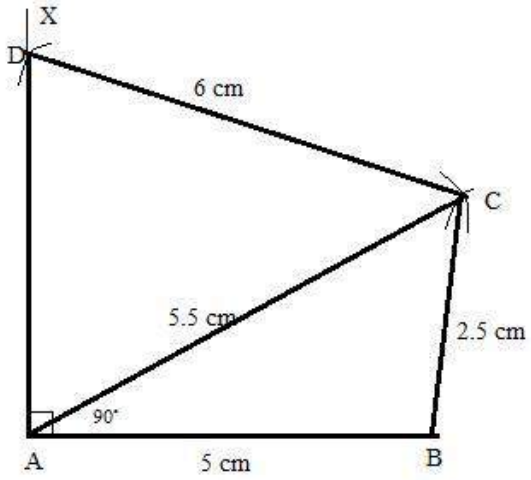
(ii) 3.2 cm



Steps of constructions:
(i) Draw a circle of radius 3.2 cm with center O.
(ii) Since $\frac{360°}{6} = 60°$, draw radii OA and OB, such that $\angle AOB = 60°$.
(iii) Cut off arcs BC, CD, DE, EF and each equal to arc AB on given circle.
(iv) Join AB, BC, CD, DE, EF and FA to get required regular hexagon ABCDEF in a given circle.

33. Using ruler and compass only, construct the quadrilateral ABCD, having given AB=5cm, BC=2.5cm, CD=6cm, angle BAD=90^0 and the diagonal AC=5.5cm.

Solution



Steps:

(i) draw $AB = 5cm$.

(ii) Now draw $\angle XAB$ such that it is 90°.

(iii)Taking A and B as a centre and radius 2.5 cm and 5.5 cm draw arcs cuts off at C.

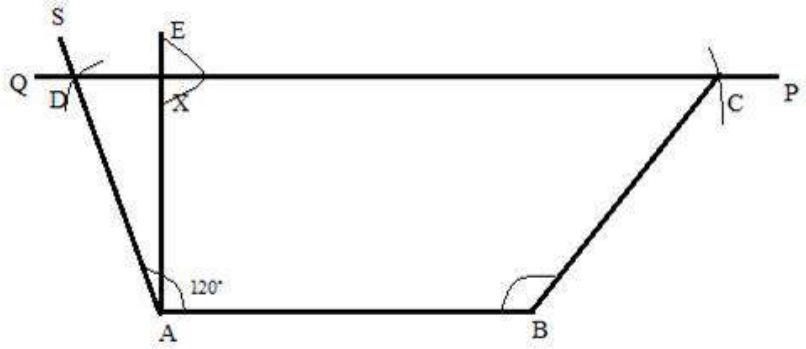
(iv)Now join BC and AC.

(v) Taking C as a centre and radius 6 cm draw arcs at D on AX.

ABCD is the required quadrilateral.

34. Using ruler and compasses only, construct a trapezium ABCD, in which the parallel sides AB and DC are 3.3 cm apart; AB=4.5cm, angle A = 120^0, BC=3.6cm and angle B is obtuse.

Solution



Steps:

(i) Draw $AB = 4.5cm$.

(ii) now draw $\angle BAS = 120^{\circ}$ and draw $EA \perp AB$ such that $AX = 3.3cm$.

(iii)Through *X* draw draw a line QR which is parallel to AB which cuts AS at D.

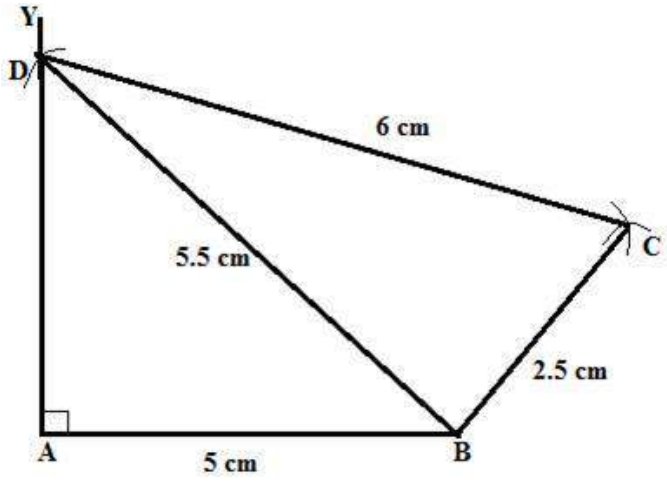
(iv)Through B draw an arc taking radius 3.6 cm at C on PQ.

(v) Join CB.

ABCD is the required trapezium.

35. Using ruler and compasses only, construct the quadrilateral ABCD, having given AB=5cm, BC=2.5cm, CD=6cm, ∠BAD=90^0 and diagonal BD=5.5cm.

Solution



Steps:

(i) Draw AB=5cm.

(ii) From A draw a line AY such that $\angle A = 90^{\circ}$.

(iii)Taking B as a centre with radius 5.5 cm draw an arc at D on AY.

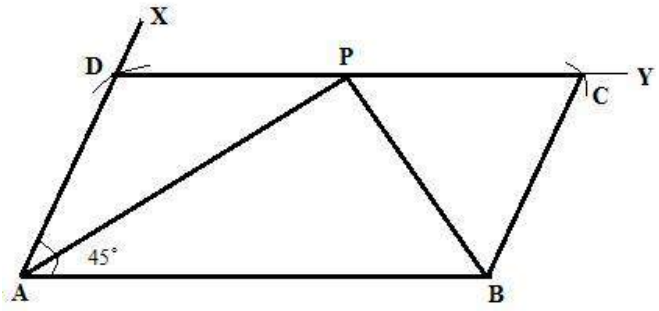
(iv)With D and B as centre and radii 6 cm and 2.5 cm draw arcs cutting each other at C.

(v) Join DC and BC.

ABCD is the required quadrilateral.

36. Using ruler and compasses only, construct a parallelogram ABCD using the following data: AB=6cm, AD=3cm and ∠DAB=45^0. If the bisector of ∠DAB meets DC at P, prove that ∠APB is a right angle.

Solution



Steps:

(i) Draw AB=6cm.

(ii) With A as a centre draw a line AX such that $\angle BAX = 45^{\circ}$.

(iii)With A as a centre and radii 3 cm draw an arc on AD.

(iv)Now with D and B as a centre and radii 6 cm and 3 cm draw arcs cutting each other at C.

(v) Join DC and BC.

ABCD is the required parallelogram.

Here

$\angle PAB = \angle APD$ [Alternate angles]

$\angle CPB = \angle PBA$ [Alternate angles]

Now,

$\angle DPA + \angle APB + \angle CPB = 180^{\circ}$ …… (i)

Also, considering $\triangle APB$,

$\angle PAB + \angle PBA + \angle APB = 180^{\circ}$ …… (ii)

Therefore, from (i) and (ii)

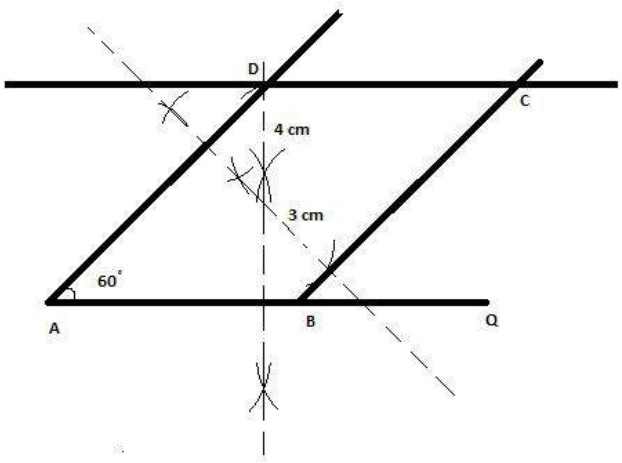
$\angle APB = 90^{\circ}$

Hence proved.

37. The perpendicular distances between the pair of opposite sides of a parallelogram are 3cm and 4cm, and one of its angles measures 60^0. Using ruler and compasses only, construct the

parallelogram.

Solution



Steps:

(i) Draw a base line AQ.

(ii) From A take some random distance in compass and draw one are below and above the line. Now without changing the distance in compass draw one are below and above the line. These arcs intersect each other above and below the line. Draw the line passing through these intersecting points, you will get a perpendicular to the line AQ.

(iii)3 Take distance of 4 cm in compass and mark an arc on the perpendicular above the line. Draw a line parallel to line AQ passing through this arc.

(iv)From point A measure an angle of 60 degree and draw the line which intersect above drawn line at some point label it as D.

(v) Using the procedure given in step 2 again draw a perpendicular to line AD.

(vi)Take distance of 3 cm in compass and mark an arc on the perpendicular above the line. Draw a line parallel to line AD passing through this arc which intersect the line AQ at some point label it as B and to other line at point C.
ABCD is the required parallelogram.

38. Draw a parallelogram ABCD with the following data:
AB=6cm, AD=5cm and $\angle DAB=45^0$. Let AC and DB meet in O and let E be the mid-point of BC. Join OE. Prove that:

(i) OE||AB

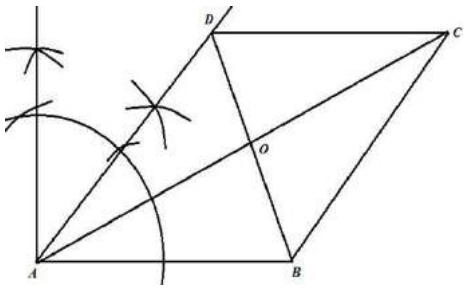
(ii) OE= $\frac{1}{2}$AB.

Solution

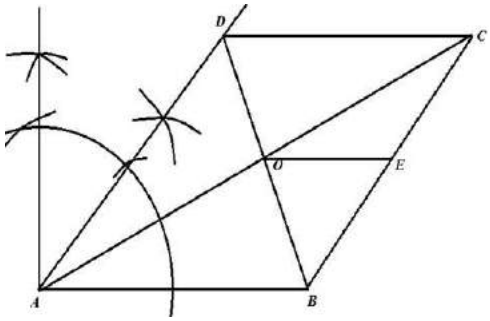
Steps:

(i) First draw a line *AB* of measure 6cm. Then draw an angle of measure 45^0 at point *A* such that $\angle DAB = 45^0$ and *AD* = 5cm.

(ii) Now draw a line *CD* parallel to the line *AB* of measure 6cm. Then join *BC* to construct the parallelogram as shown below:



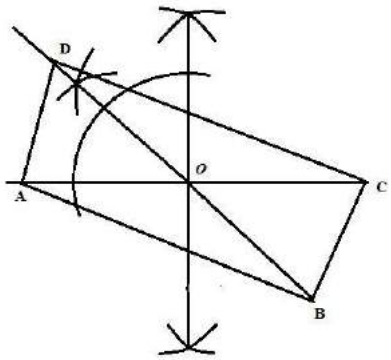
(iii)Now it is given that *E* is the midpoint of *BC*. We join *OE*. Now we are to prove that *OE* || *AB* and $OE = \frac{1}{2} AB$.



(iv)Since *O* is the midpoint of *AC* and *E* is the midpoint of *BC*, therefore the line is parallel to *AB* and $OE = \frac{1}{2} AB$

39. Using ruler and compasses only, construct a rectangle each of whose diagonals measure 6 cm and the diagonals intersect at an angle of 45^0.

Solution



Steps:

(i) First draw a line *AC* of measure 6cm.

(ii) Then draw the perpendicular bisector of *AC* through *O*.

(iii)At *O* draw an angle of measure 45^0. Then produce *OD* of measure 3cm and *OB* of measure 3cm each.

(iv)Now join *AD*, *AB*, *BC* and *CD* to form the rectangle.