UNIT 8 Practical Geometry

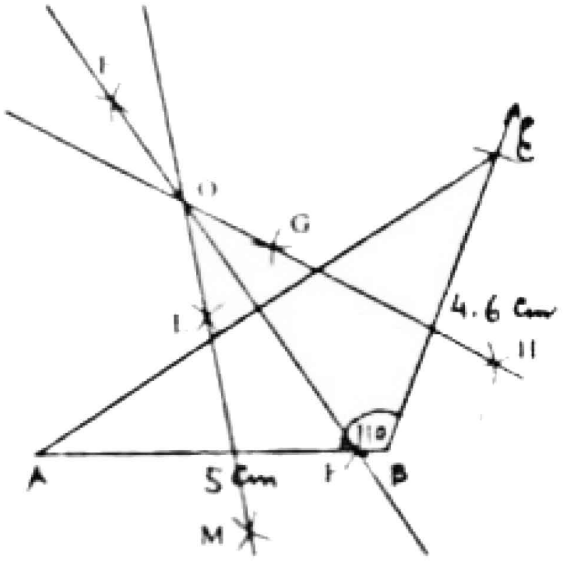
- **Construction of a Triangle**
- **Construction of a Quadrilateral**
- **Tangent to a Circle**

After completing of this unit, the students will be able to:

- construct a triangle having:
  - Two sides and the included angle.
  - One side and two of the angles.
  - Two of its sides and angle opposite to one of them with all the three possibilities).
- Draw:
  - Angle bisectors.
  - Altitudes.
  - Medians of a given triangle and verify their concourrency.
- Construct a rectangle when:
  - Two sides are given.
  - Diagonal and one side are given.
- Construct a square when its diagonal is given.
- Construct a parallelogram when two adjacent sides and the angle included between them is given.
- locate the centre of given circle.
- draw a circle passing through three given non-collinear points.
- draw a tangent to a given circle from a point P when P lies.
  - On the circumference,
  - Outside the circle.
- Draw:
  - Direct common tangent or external tangent.
  - Transverse common tangent or internal tangent to two equal circles.
- Draw a tangent to:
  - Two unequal touching circles.
  - Two unequal intersecting circles.

Q.2. Construct a ABC in which $m\overline{BC} = 4.6cm$, $\angle B = 110^{\circ}$ and $m\overline{AB} = 5cm$. Draw the perpendicular bisectors of its sides.

Sol.



Steps of Construction:

(i) Draw a line segment $\overline{AB} = 5cm$

(ii) At point B, draw an angle 110° with the help of compasses

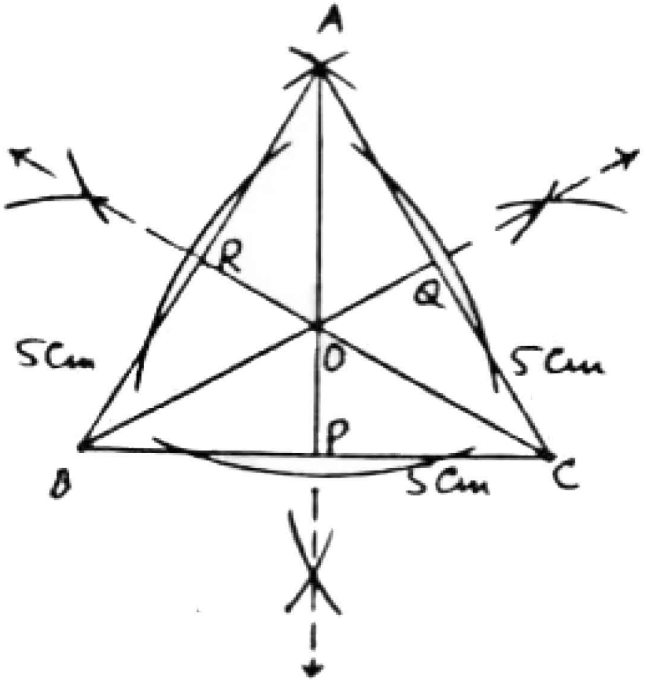
(iii) Cut $m\overline{BC} = 4.6cm$ at $\overline{BP}$

(iv) Join "C" with A. ABC is the required triangle.

(v) Draw perpendiculars LF, GH and LM of the sides $\overline{AB}$, $\overline{BC}$ and $\overline{AC}$ respectively. They meet each other at point "O".

Q.3. **Draw a equilateal Δ ABC in which $m\overline{AB} = m\overline{BC} = m\overline{AC} = 5cm$. Draw its altitudes and measure their lengths are they equal?**

Sol.



Steps of Construction:

(i) Draw a line segment $m\overline{BC} = 5cm$.

(ii) Draw arcs of radius 5cm with taking centre B and C, which intersect eachother at A.

(iii) Join A with B and C.

ABC is the required equilateral.

(iv) $AB \perp BC$, $BQ \perp CA$ and $AB \perp CR$

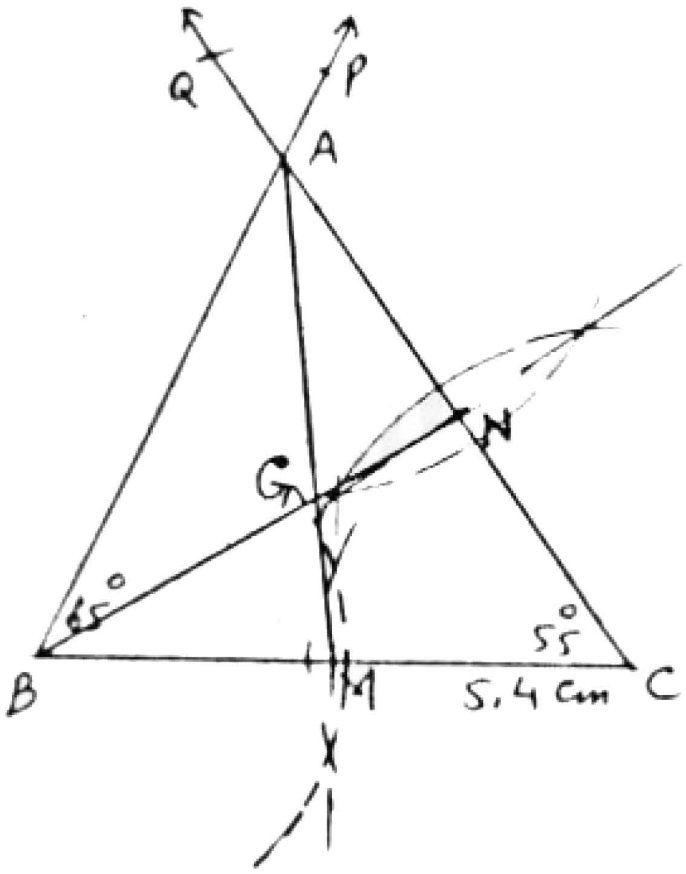
And

(v) $m\overline{AP} = m\overline{BC} = m\overline{CR} = 4.2cm$

All the altitudes are equal in lengths.

Q.4. Construct a ΔABC in which $m\overline{BC} = 5.4cm$, $\angle B = 65^{\circ}$ and $m\angle C = 55^{\circ}$. Find the centroid of the triangle.

Sol.



Steps of Construction:

(i) Draw a line segment $\overline{BC}$ 5.4cm.

(ii) Now draw an angle of 65° at point B & 55° at point C. $\overrightarrow{BP}$ and $\overrightarrow{CQ}$ intersect eachother at point A.

(iii) ABC is the required triangle.

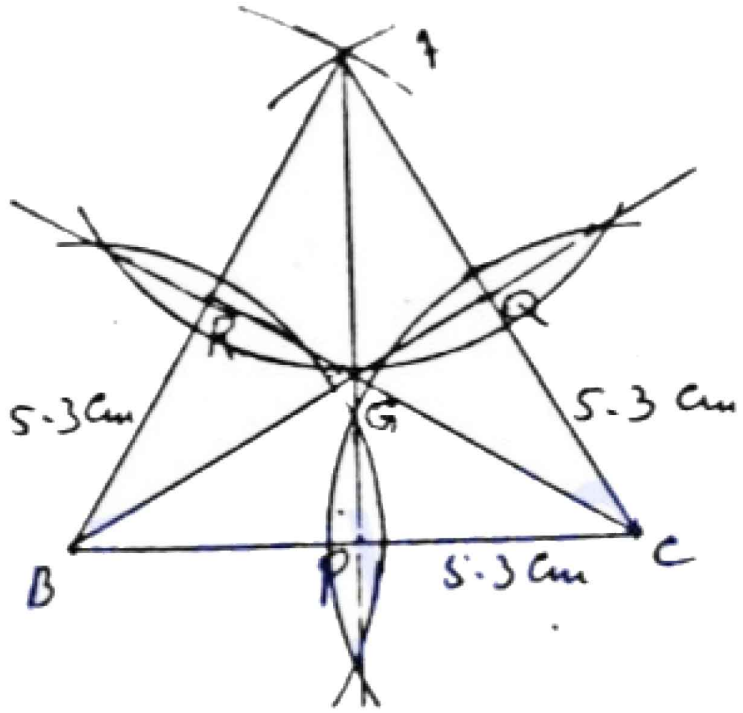
(iv) M and N are the mid points of $\overline{BC}$ and $\overline{AC}$.

(v) $\overline{AM}$ and $\overline{BN}$ are the medians which intersect eachother at point G.

Thus point "G" is the required centroid of triangle.

Q.5. **Draw an equilateral triangle each of whose sides is 5.3cm. Draw its medians. Are they equal?**

Sol.



Steps of Construction:

(i) Draw a line segment $\overline{BC}$ 5.3cm.

(ii) Taking B and C as centre draw two arcs which intersect eachother at point A.

(iii) Join point A with B and C.

ABC is the required equilateral.

(iv) Draw medians of sides $\overline{AB}$, $\overline{CA}$, $\overline{BC}$ at points P, Q & R.

(v) Join A with P, B with Q and C with R.

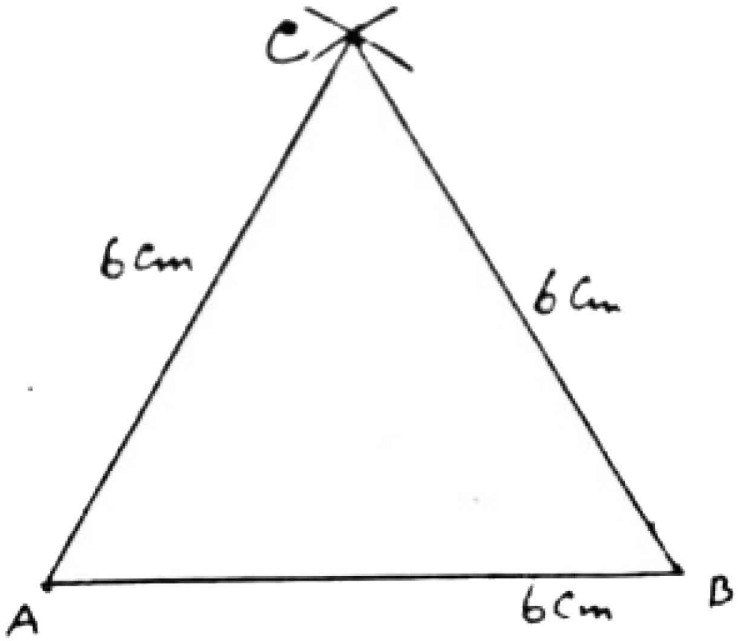
AP, BQ, CR are the required medians.

(vi) $m\overline{AP} = m\overline{BQ} = m\overline{CR} = 4.5cm$

So that the medians are equal in lengths.

Q.6. Draw an equilateral triangle with length of each side 6cm.

Sol.



Steps of Construction:

(i) Draw a line segment $\overline{AB}$ = 6cm

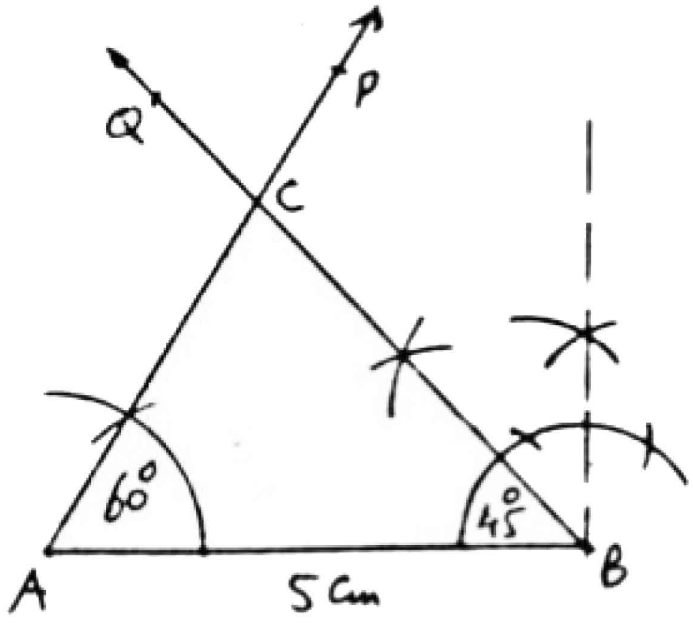
(ii) Taking A and B as centre draw two arcs of radius 6cm each. They intersect eachother at point C.

(iii) Join point C with A and B.

ABC is the required equilateral

Q.7. Construct a triangle ABC with base length 5cm and the angles at both ends of the base are 45^{O} and 60^{O} respectively.

Sol.



Steps of Construction:

(i) Draw a line segment $\overline{AB}$ = 5cm.

(ii) Draw m$\angle BAP\ 60^{0}$ at point A.

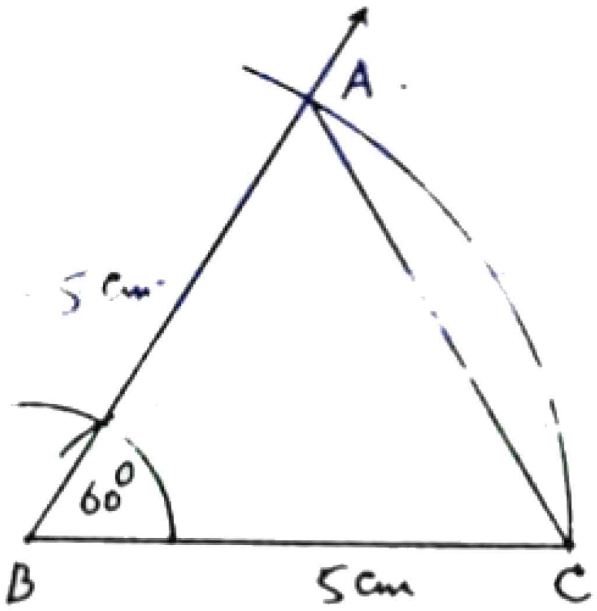
(iii) Draw an angle $m\angle ABQ = 45^{0}$ at point B.

(iv) $\overrightarrow{AP}$ and $\overrightarrow{BQ}$ intersect eachother at point C.

ABC is the required triangle.

Q.8. Draw an isosceles triangle with length of the equal sides 5cm and the angle included between them is 60^{O}.

Sol.



Steps of Construction:

(i) Draw a line segment $\overline{BC}$ = 5cm.

(ii) At point B, draw $m\angle ABC = 60^{0}$ using compasses.

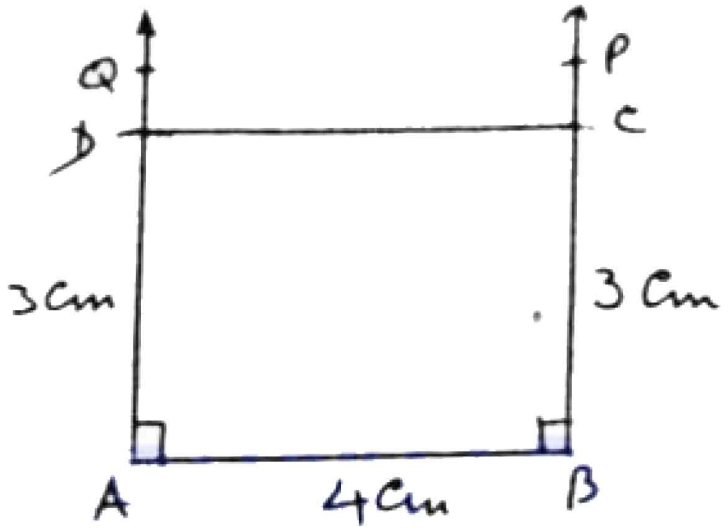
(iii) Cut $m\overline{BA} = 5cm$.

(iv) Join point A with C.

ABC is the required isosceles.

Q.9. **Construct a rectangle whose adjacent sides are 4cm and 3cm.**

Sol.



Steps of Construction:

(i) Draw a line segment $\overline{AB} = 4cm$.

(ii) At points A and B, draw right angles with the help of compasses.

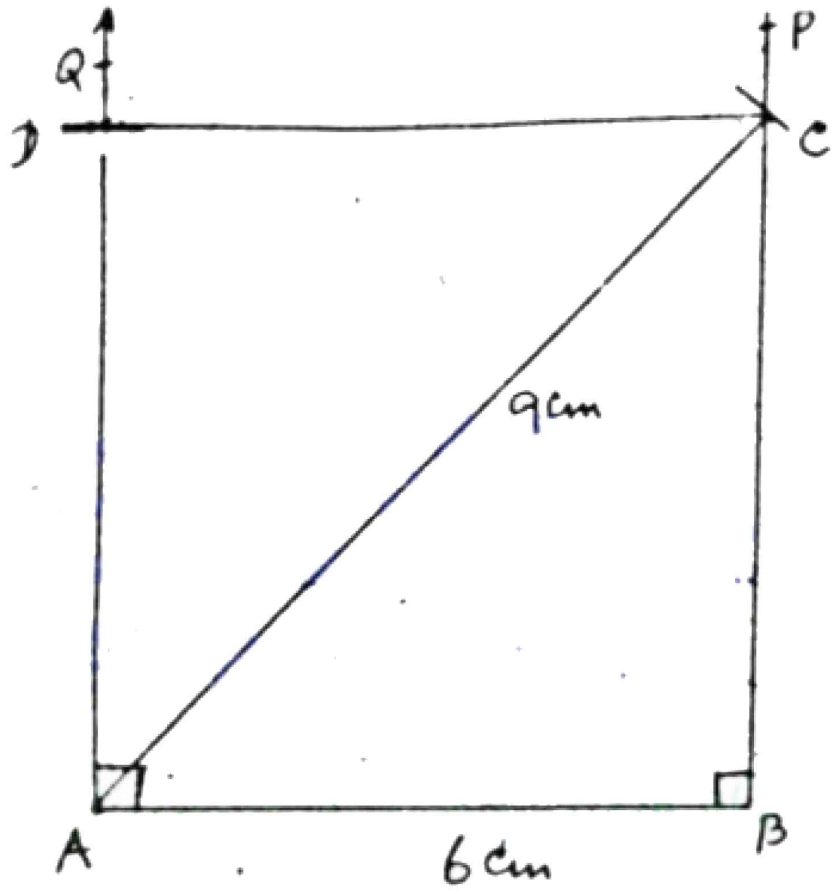
(iii) Cut $m\overline{AD} = m\overline{BC} = 3cm$.

(iv) Join point C with D.

ABCD is the required rectangle.

Q.10. Construct a rectangle whose one side is 6cm and an adjacent diagonal of 9cm.

Sol.



Steps of Construction:

(i) Draw a line segment $\overline{AB} = 6cm$.

(ii) Draw right angle at points A and B.

(iii) Taking centre as A draw on arc of radius 9cm which intersect BP at C.

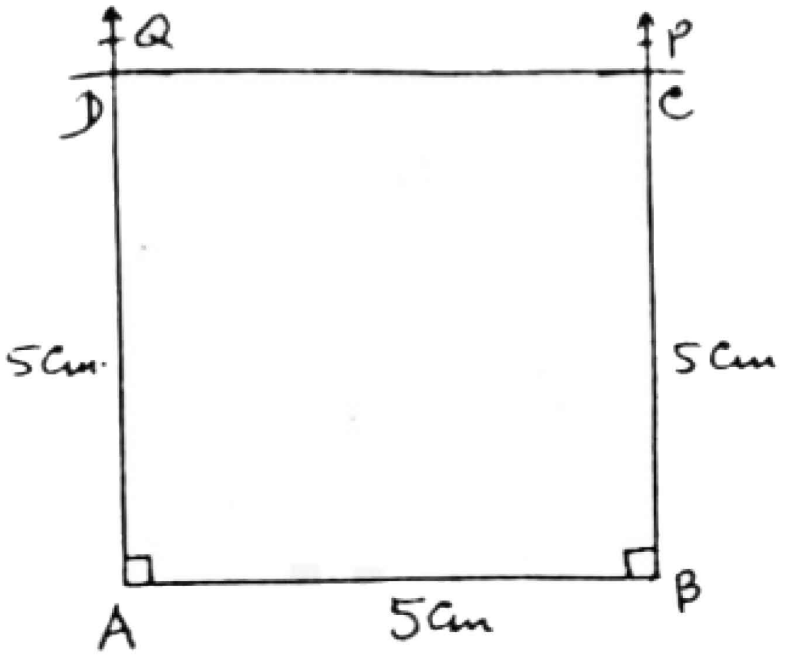
(iv) Cut $m\overline{BC}$, $m\overline{AD}$ at $\overline{AQ}$.

(v) Join point C with D.

$ABCD$ is the required rectangle.

Q.11. Construct a square whose one side is 5cm.

Sol.



Steps of Construction:

(i) Draw a line segment $\overline{AB} = 5cm$.

(ii) At points A and B, draw right angle with the help of compasses.

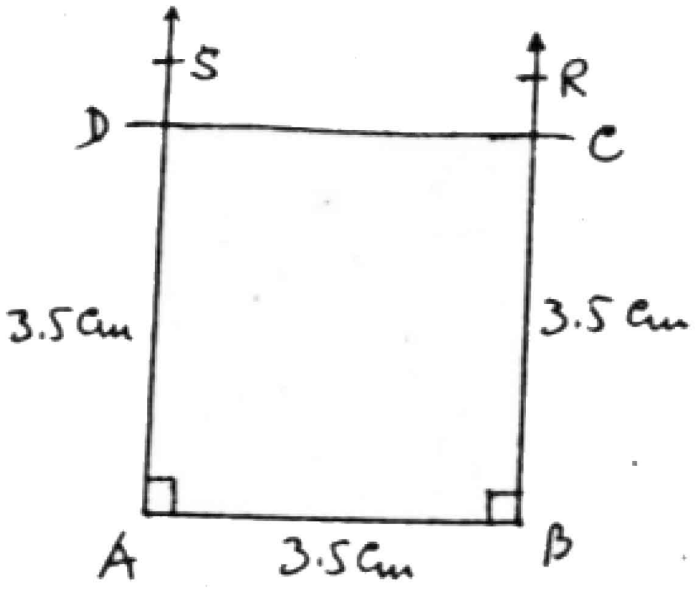
(iii) Cut $m\overline{BC} = m\overline{AD} = 5cm$ at $\overrightarrow{AQ}$ and $\overrightarrow{BP}$.

(iv) Join C with D

$ABCD$ is the required square.

Q.12. Construct a square whose one side is 3.5cm.

Sol.



Steps of Construction:

(i) Draw a line segment $\overline{AB} = 3.5cm$.

(ii) At points A and B, draw right angle with the help of compasses.

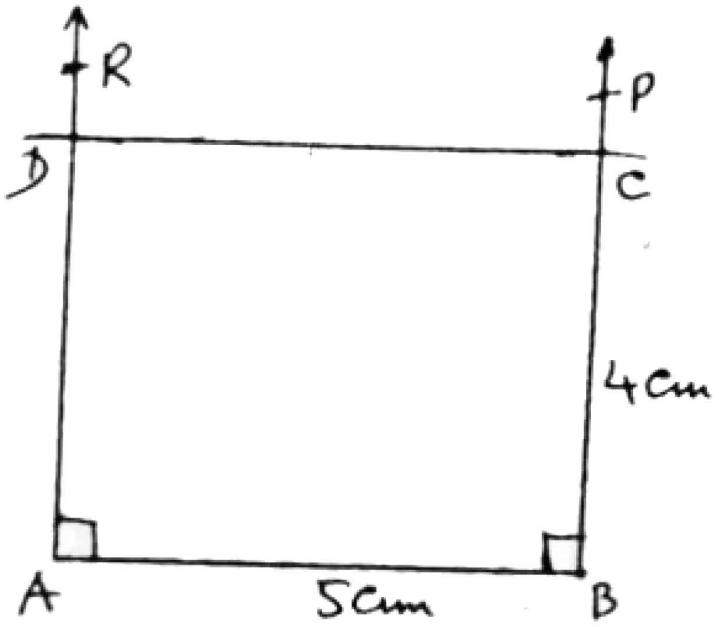
(iii) Cut $m\overline{BC} = m\overline{AD} = 3.5cm$ at $\overline{AQ}$ and $\overline{BR}$.

(iv) Join C with D.

$ABCD$ is the required square.

Q.13. Construct a rectangle whose two adjacent sides measure 5cm and 4cm and their included angle is 90^0.

Sol.



Steps of Construction:

(i) Draw a line segment $\overline{AB} = 5cm$.

(ii) At point A, draw right angle with the help of compasses.

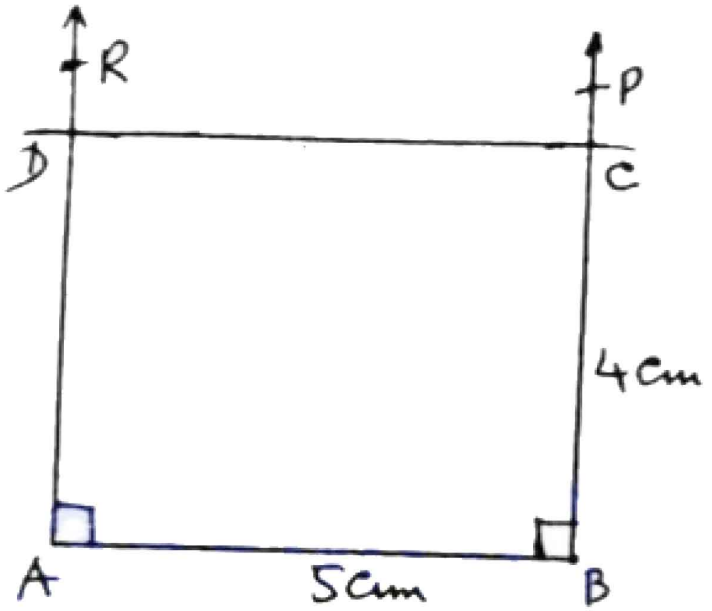
(iii) Cut $m\overline{BC} = m\overline{AD} = 4cm$ at $\overline{AR}$ and $\overline{BP}$.

(iv) Join C with D.

$ABCD$ is the required rectangle.

Q.13. Construct a rectangle whose two adjacent sides measure 5cm and 4cm and their included angle is 90°.

Sol.



Steps of Construction:

(i) Draw a line segment $\overline{AB} = 5cm$.

(ii) At point A, draw right angle with the help of compasses.

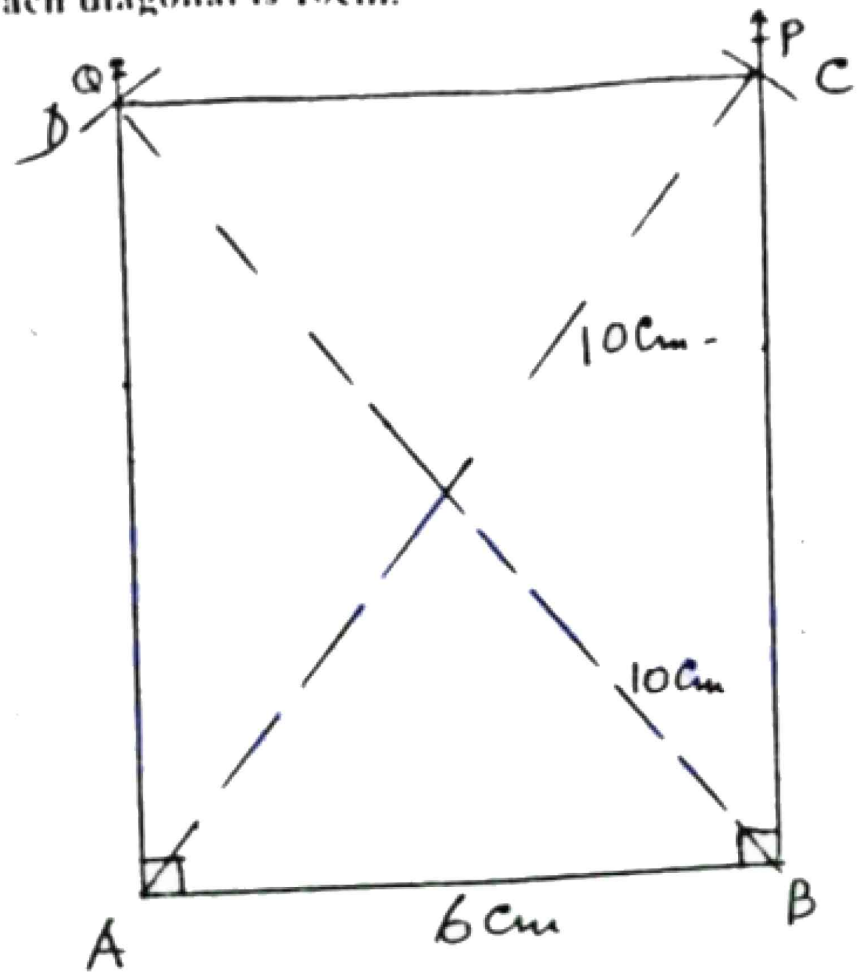
(iii) Cut $m\overline{BC} = m\overline{AD} = 4cm$ at $\overrightarrow{AR}$ and $\overrightarrow{BP}$.

(iv) Join C with D.

$ABCD$ is the required rectangle.

Q.14. Draw a rectangle whose one side is 8cm and the length of each diagonal is 10cm.

Sol.



Steps of Construction:

(i) Draw a line segment $\overline{AB} = 6cm$.

(ii) At point A and B, draw right angle with the help of compasses.

(iii) Draw an arc of radius 10cm with taking centre point "A" which intersect $\overline{BP}$ at point C.

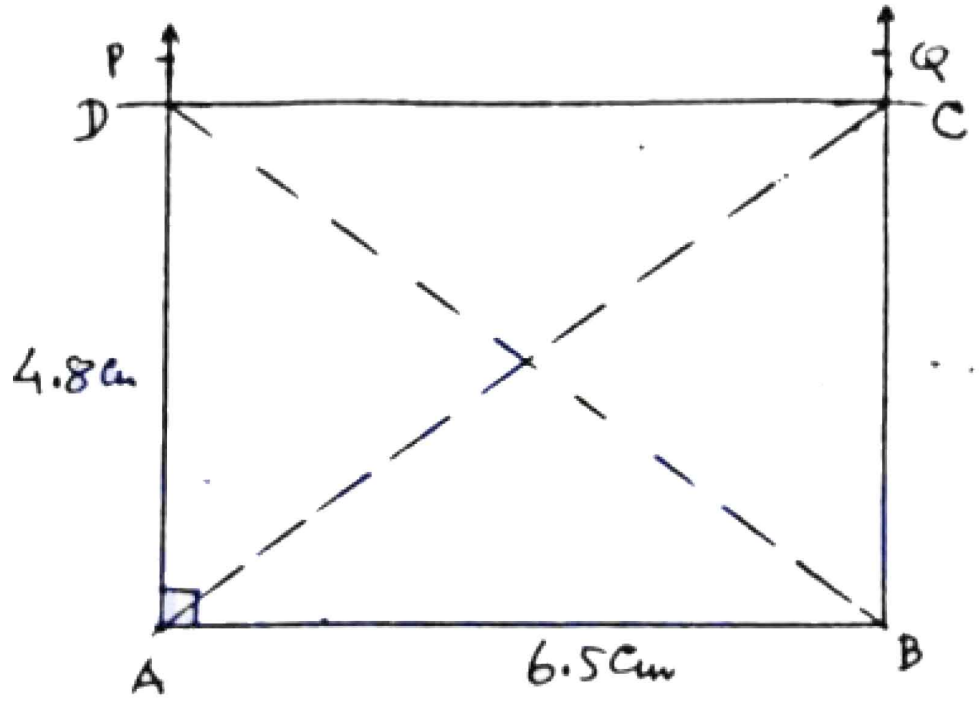
(iv) Now, draw an arc of radius cm again with taking centre at point B. Which intersect $\overline{AQ}$ at point D.

(v) Joint point C with D.

$ABCD$ is the required rectangle.

Q.15. Draw a rectangle ABCD in which $m\overline{AB} = 6.5$ cm and $m\overline{AD} = 4.8$ cm and $m\angle BAD = 90^\circ$. Measure its diagonals.

Sol.



$m\overline{AC} = m\overline{BD} = 8.1cm$

Steps of Construction:

(i) Draw a line segment $\overline{AB} = 6.5$cm.

(ii) At point A and B, draw right angle with the help of compasses.

(iii) Intersect $m\overline{BC} = m\overline{AD} = 4.8cm$ at $\overrightarrow{AP}$ and $\overrightarrow{BQ}$.

(iv) Join C with D.

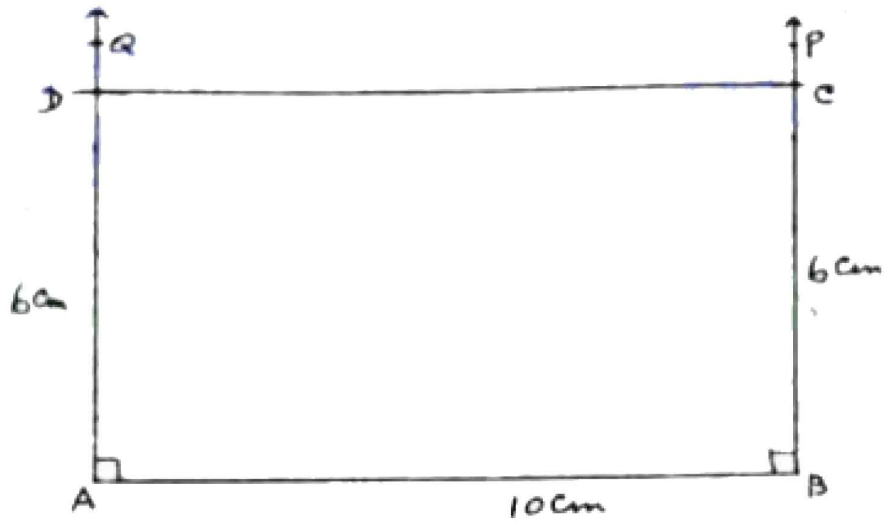
(v) $ABCD$ is the required rectangle.

Q.16. Name the following quadrilaterals when:

	Questions	Answers
(i)	The diagonals are equal and the adjacent sides are unequal.	Rectangle
(ii)	The diagonals are equal and the adjacent sides are equal.	Square
(iii)	All the sides are equal and one angle is 90°.	Square
(iv)	All the angles are equal and the adjacent sides are unequal	Rectangle

Q.17. Construct a rectangle with sides 10*cm* and 6*cm*.

Sol.



Steps of Construction:

(i) Draw a line segment $\overline{AB} = 10cm$.

(ii) At point A and B, draw right angle with the help of compasses/

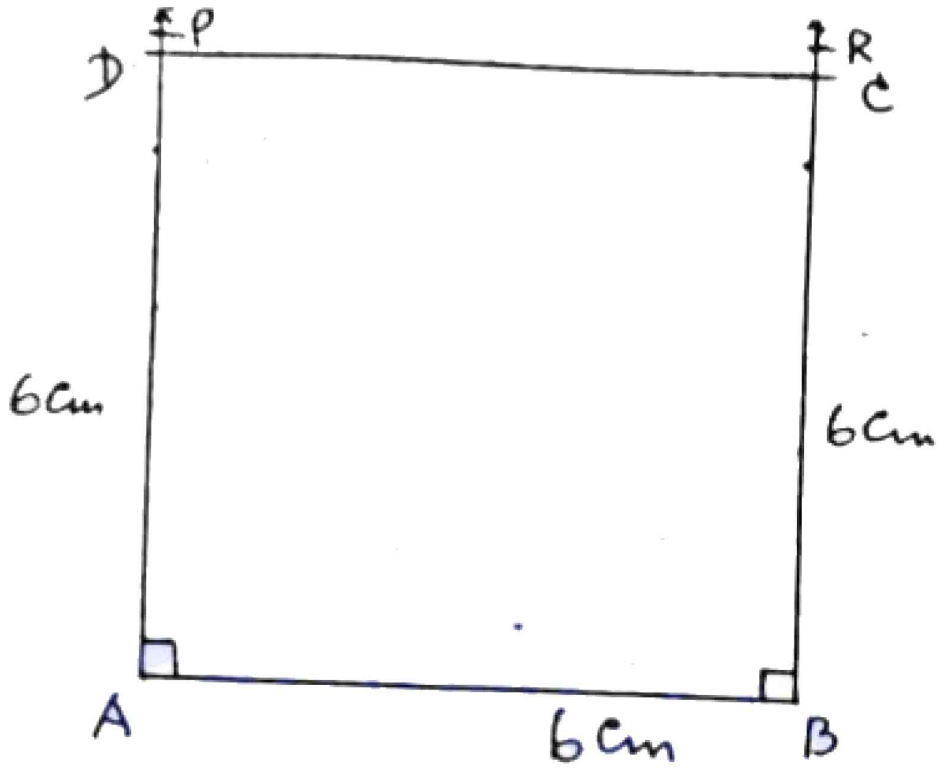
(iii) Intersect $m\overline{BC} = m\overline{AD} = 6cm$ at $\overrightarrow{AQ}$ and $\overrightarrow{BP}$.

(iv) Join C with D.

$ABCD$ is the required rectangle.

Q.18. Construct a square with side of length 6cm.

Sol.



Steps of Construction:

(i) Draw a line segment $\overline{AB}$ = 6cm.

(ii) Points A and B, draw right angle with the help of compasses.

(iii) Cut $\overline{AP} = \overline{BR}$ = 6cm at $\overline{AD}$ and $\overline{BC}$.

(iv) Join C with D.

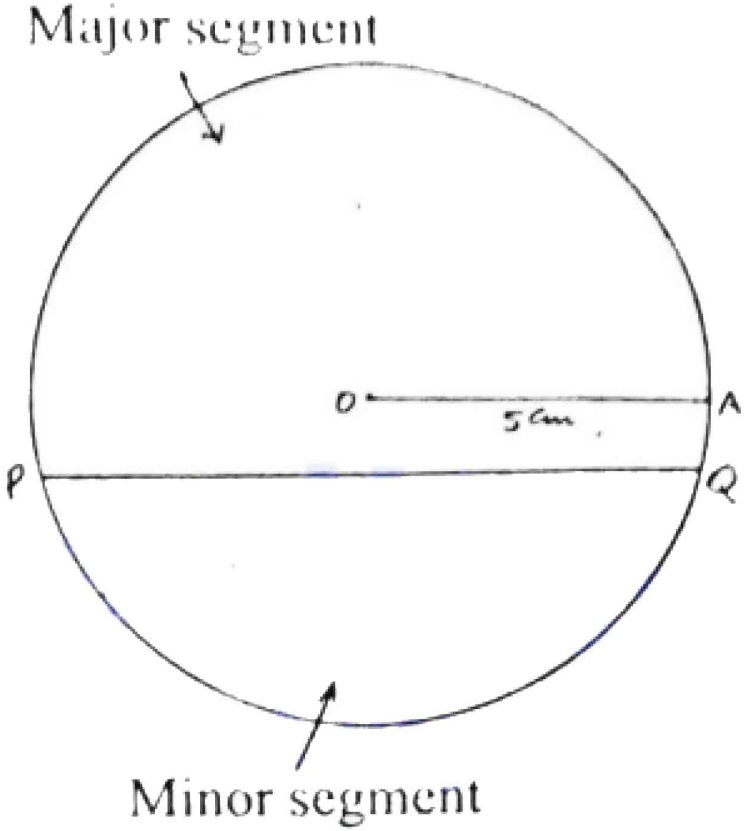
$ABCD$ is the required square.

Q.19. Name the following triangles.

Questions	Answers
(i) With all the three sides equal in length.	Equilateral triangle
(ii) With two sides equal in length.	Isosceles triangle
(iii) None of the sides is equal to the other.	Scalene triangle

Q.20. Draw a circle with centre O and radius $5cm$. Explain the steps necessary to draw a segment of the circle.

Sol.



Steps of Construction:

(i) Take any point O.

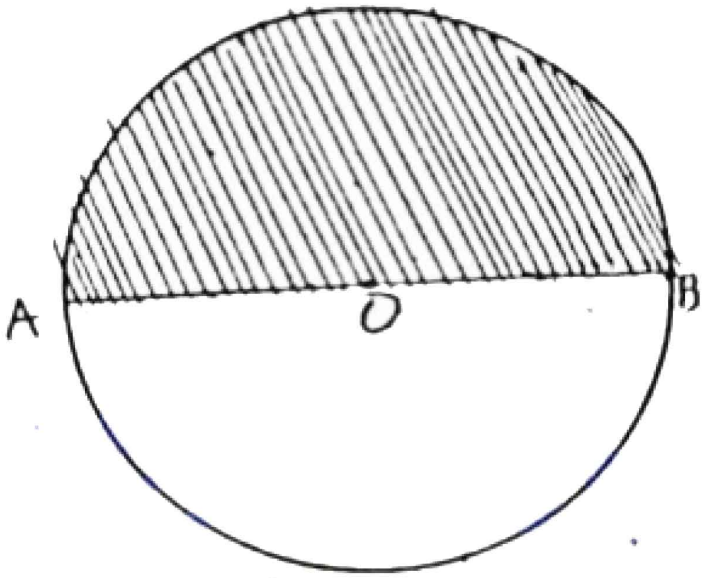
(ii) Taking centre with "O", draw an arc of radius 5cm.

(iii) Now, take any diameter $\overline{PQ}$.

Conclusions: $\overline{PQ}$ has divided the circle into two parts. The major segment part and minor segment part.

Q.21. Draw a circle with center O and any radius. Draw the diameter AB and shade one semicircular region.

Sol.



Steps of Construction:

(i) Take any point O.

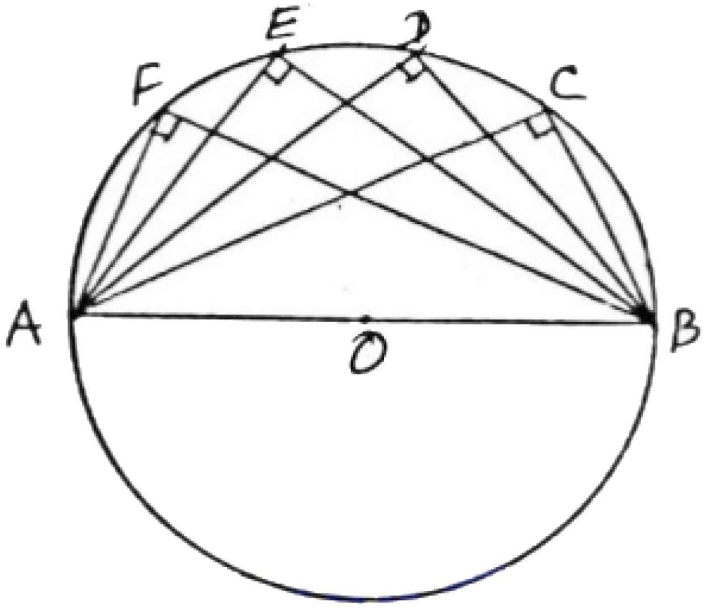
(ii) With taking "O" as centre, draw a circle with suitable radius.

(iii) Draw $\overline{AOB}$ as diameter.

Conclusion: The circle has divided into two parts. Now, shaded the half part.

Q.22. Show four angles in a semi-circular region of question 21.

Sol.



Steps of Construction:

(i) Draw a circle with suitable radius and marks its centre as "O".

(ii) Draw a diameter $\overline{AOB}$.

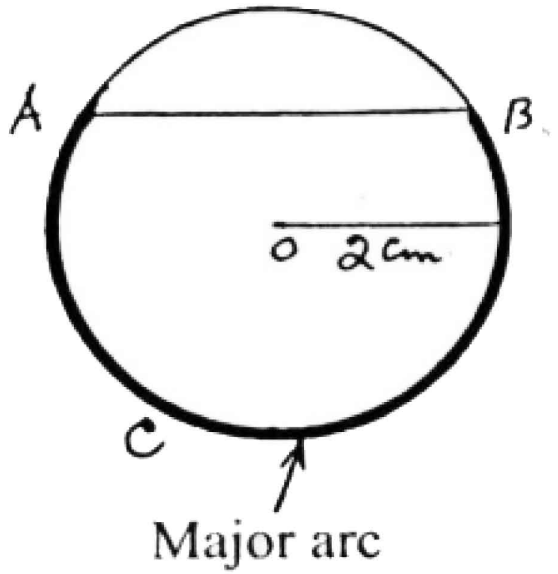
(iii) Take a point C, D, E, F at half curved area.

(iv) Join these points with A and B.

Conclusion: $\angle ACB, \angle ADB, \angle AEB, \angle AFB$ are the required four angles.

Q.23. Draw a circle of radius 2*cm* with center *O*. Draw a chrod and shade the portion showing major arc.

Sol.



Steps of Construction:

(i) Take any point *O*.

(ii) With taking "*O*" as centre, draw a circle with radius 2cm.

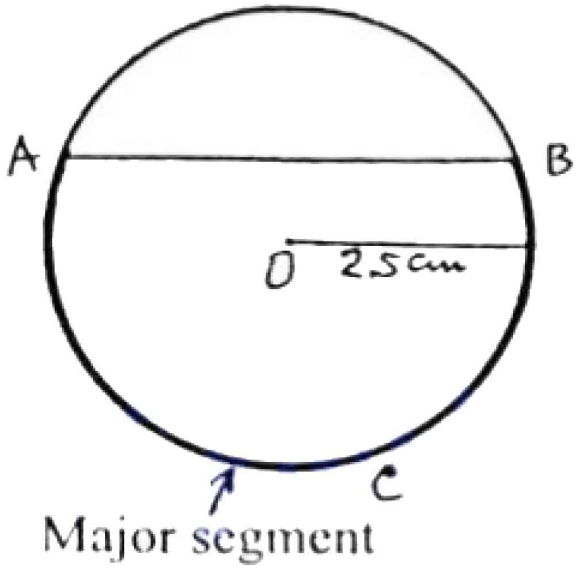
(iii) Take $\overline{AB}$ as chord.

Thus, $\overset{\frown}{ACB}$ is the major arc.

(iv) In figure $\overset{\frown}{ACB}$ (major arc) is quite prominent.

Q.24. Draw a circle of radius 2.5cm with center at *O*. Draw a chrod and shade the portion showing the minor arc of the circle.

Sol.



Steps of Construction:

(i) Take any point "*O*".

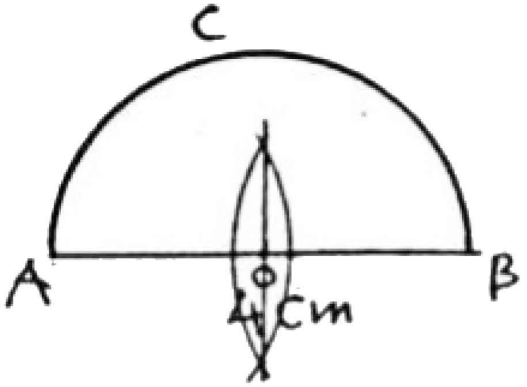
(ii) With taking "*O*" as centre, draw a circle with radius 2.5cm

(iii) Draw $\overline{AB}$ as chord.

(iv) The major arc $\overset{\frown}{ACB}$ is quite prominent in the figure.

Q.25. Draw a semi-circle with diameter 4cm and center at *O*.

Sol.



Steps of Construction:

(i) Draw a line segment $\overline{AB} = 4cm$.

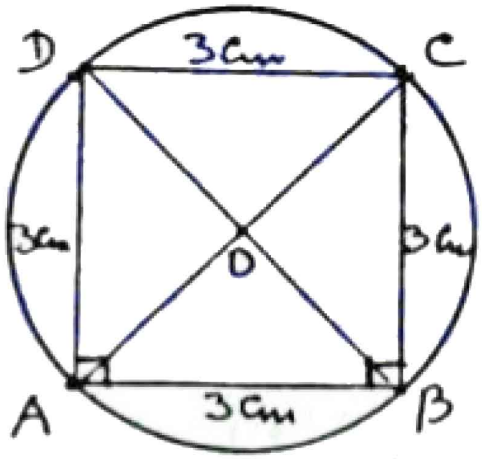
(ii) Now take "O" as centre, draw a semi-circle with radius $m\overline{AO}$ or $m\overline{OB}$.

(iii) With taking "O" as centre $m\overline{OA}$ or $m\overline{OB}$.

(iv) ACB is the required semi-circle.

Q.26. Draw a circle passing through the vertices of a square of side 3cm.

Sol.



Steps of Construction:

(i) Draw a line segment $\overline{AB}$ = 3cm.

(ii) At points A and B, draw right angles at each ($\because \quad m\overline{AD} = m\overline{BC} = 3cm$)

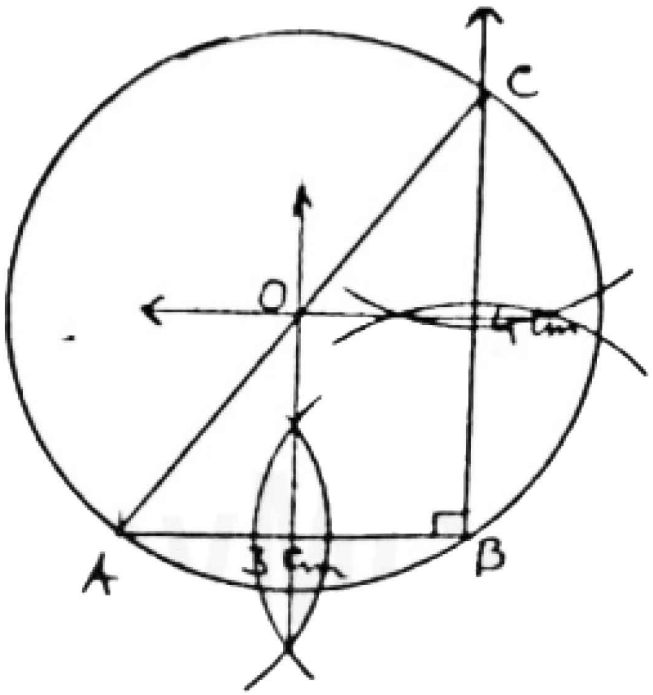
(iii) Join C with D.

(iv) Draw two diagonals $\overline{AC}$ and $\overline{BD}$ which intersect eachother at O.

(v) Taking "O" as centre, draw a circle with radius $m\overline{OB}$ or $m\overline{OA}$ or $m\overline{OC}$ or $m\overline{OD}$.

Q.27. In a right triangle ABC, $m\overline{AB} = 3cm$ and $m\overline{BC} = 4cm$ with right angle at B. Draw a circle through A, B and C.

Sol.



Steps of Construction:

(i) Draw a line segment $\overline{AB} = 3cm$.

(ii) At point B, draw right angle with the help of compasses.

(iii) Cut $m\overline{BC} = 4cm$.

(iv) Join C with A.

ABC is the required triangle.

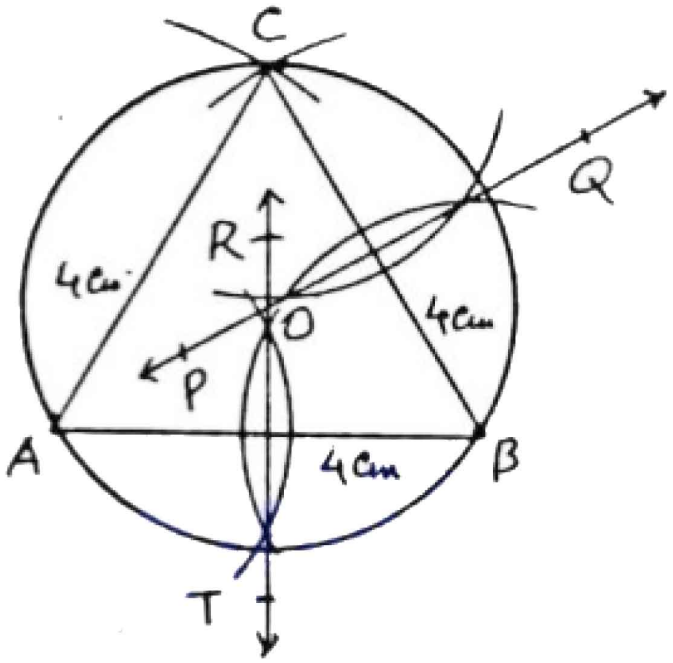
(v) Now, draw perpendicular bisector of sides $\overline{AB}$ and $\overline{BC}$ which cut eachother at point "O".

(vi) With taking "O" as centre draw a circle with radius $m\overline{OB}$ or $m\overline{OC}$ or $m\overline{OA}$ respectively.

Conclusion: The circle is passing through the vertices (A, B and C)

Q.28. Draw a circle passing through the three vertices of an equilateral triangle with length of each side $4cm$.

Sol.



Steps of Construction:

(i) Draw a line segment $\overline{AB} = 4cm$.

(ii) Taking A and B as centre, draw two arcs of radius 4 cm each. They intersect eachother at point "C".

(iii) Join C with points A and B.
ABC is the equilateral triangle.

(iv) Now, draw a perpendicular bisectors $\overline{RT}$ and $\overline{PQ}$ of sides $\overline{AB}$ and $\overline{BC}$ respectively.
They meet eachother at point "O".

(v) With taking "O" as centre, draw a circle with radius $m\overline{OC}$ or $m\overline{OA}$ or $m\overline{OB}$ respectively.

Conclusion: The circle is passing through the vertices (A, B, C) of triangle.