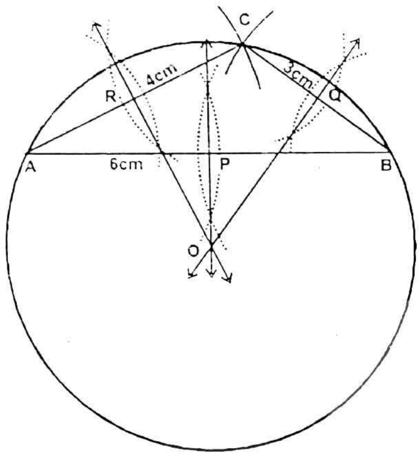
EXERCISE 13.2

Q. 1 Circumscribe a circle about a triangle ABC with sides $|\overline{AB}| = 6cm$, $|\overline{BC}| = 3cm$ and $|\overline{CA}| = 4cm$. Also measure its circum radius.

Solution:

Data: $|\overline{AB}| = 6cm$, $|\overline{BC}| = 3cm$, $|\overline{CA}| = 4cm$



Steps of construction:

i. We construct triangle ABC according to given condition.

ii. We draw right bisectors $\overleftrightarrow{OP}, \overleftrightarrow{OQ}$ and $\overleftrightarrow{OR}$ of sides $\overline{AB}$, $\overline{BC}$ and $\overline{CA}$ respectively, concurrent at point 'O'.

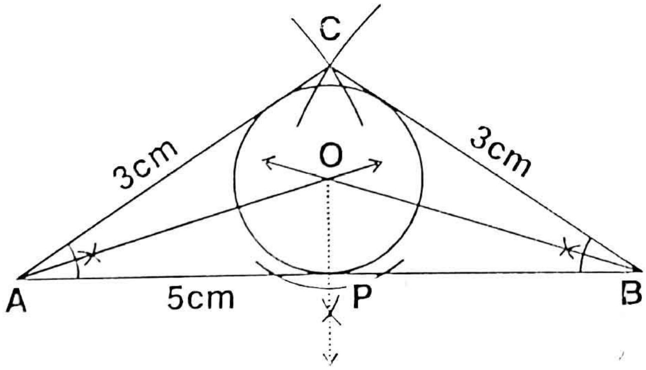
iii. Taking 'O' as centre and radius equal to $m\overline{OA}$ or $m\overline{OB}$ or $m\overline{OC}$, we draw a circle passing through the vertices A, B and C.

iv. This is the required circum circle, whose radius is measured to be 3.3 cm.

Q. 2 Inscribe a circle in a triangle ABC with side $|\overline{AB}| = 5cm$, $|\overline{BC}| = 3cm$ and $|\overline{CA}| = 3cm$. Also measure its in-radius.

Solution:

Data: $|\overline{AB}| = 5cm$, $|\overline{AB}| = 5cm$, $|\overline{CA}| = 3cm$



Steps of construction:

i. We construct triangle ABC according to given condition.

ii. We draw bisectors of $\angle A$ and $\angle B$ intersecting each other at point 'O'.

iii. From point O, we draw $\overrightarrow{OP}$ perpendicular to $\overline{AB}$.

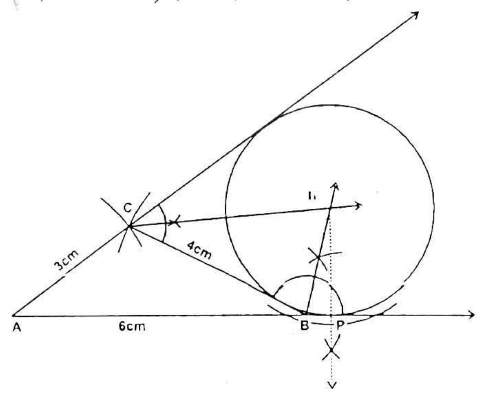
iv. Taking 'O' as centre and radius equal to $m\overline{OP}$, we draw a circle, touching three sides of triangle internally.

v. This is the required in-circle whose radius is measured to be 0.8 cm.

Q. 3 Escribe a circle opposite to vertex A to a triangle ABC with sides $|AB| = 6cm$, $|BC| = 4cm$ and $|CA| = 3cm$. Find its radius also.

Solution:

Data: $|AB| = 6cm$, $|BC| = 4cm$, $|CA| = 3cm$



Steps of construction:

i. We construct a triangle ABC according to given condition.

ii. We produce the sides $\overline{AB}$ and $\overline{AC}$ beyond B and C respectively.

iii. We draw, bisectors of exterior angles at points B and C, intersecting each other at point I_1.

iv. From point I_1, we draw $\overrightarrow{I_1P}$ perpendicular to $\overline{AB}$ produced.

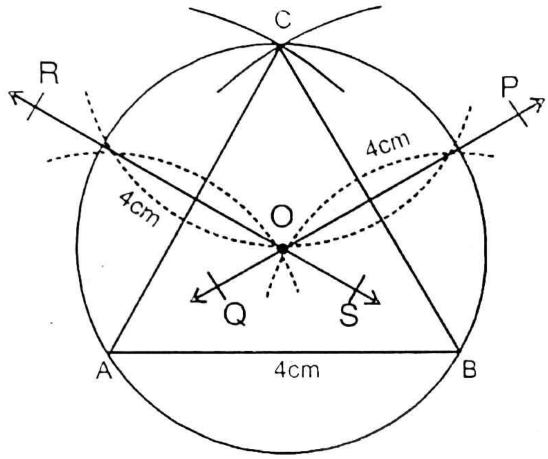
v. Taking I_1, as centre and radius equal to I_1P, we draw a circle, touching one side of ΔABC externally and other two produced sides internally.

vi. This is the required escribed circle, whose radius is measured to be 2.2 cm.

Q. 4 Circumscribe a circle about an equilateral triangle ABC with each side of length 4cm.

Solution:

Data: $m\overline{AB} = m\overline{BC} = m\overline{CA} = 4cm$



Steps of construction:

i. We construct equilateral triangle ABC with each side 4cm long.

ii. We draw right bisectors $\overleftrightarrow{PQ}$ and $\overleftrightarrow{RS}$ of side $\overline{BC}$ and $\overline{AC}$ respectively intersecting each other at point O.

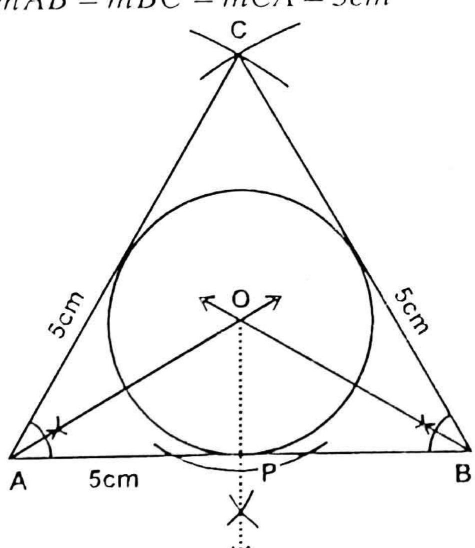
iii. Taking O as centre and radius equal to $m\overline{OA}$ or $m\overline{OB}$ or $m\overline{OC}$, we draw a circle passing through the points A, B and C.

iv. This is our required circum circle whose radius is measured to be 2.3 cm.

Q. 5 Inscribe a circle in an equilateral triangle ABC with each side of length 5cm.

Solution:

Data: $m\overline{AB} = m\overline{BC} = m\overline{CA} = 5cm$



Steps of construction:

i. We construct equilateral triangle ABC with each side 5cm long.

ii. We draw bisectors of $\angle A$ and $\angle B$ intersecting each other at point 'O'.

iii. From point O, we draw $\overrightarrow{OP}$ perpendicular to $\overline{AB}$.

iv. Taking 'O' as centre and radius equal to $\overline{OP}$, we draw a circle, touching three sides of triangle internally.

v. This is the required in-circle whose radius is measured to be 1.4 cm.

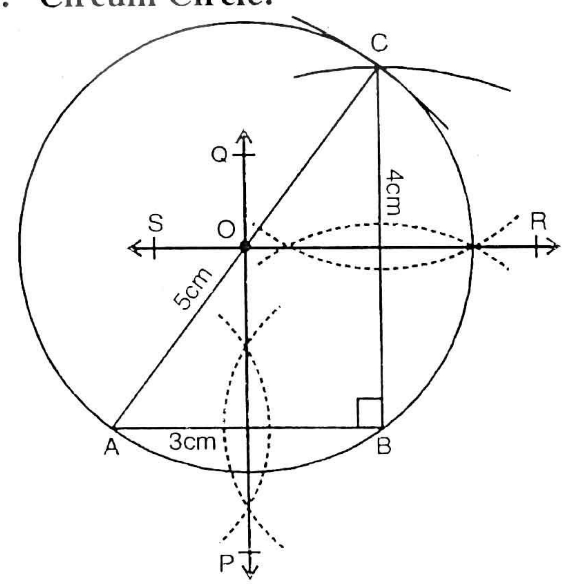
Q. 6 Circumscribe and inscribe circles with regard to a right angle triangle with sides 3cm, 4cm and 5cm.

Solution:

Let

$m\overline{AB} = 3cm, m\overline{BC} = 4cm$ and $m\overline{CA} = 5cm$

a. Circum Circle:



Steps of construction:

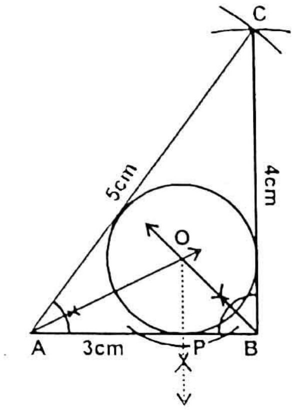
i. We construct right angle triangle ABC with sides 3cm, 4cm and 5cm.

ii. We draw right bisectors $\overleftrightarrow{PQ}$ and $\overleftrightarrow{RS}$ of side $\overline{AB}$ and $\overline{BC}$ respectively intersecting each other at point O.

iii. Taking O as centre and radius equal to $m\overline{OA}$ or $m\overline{OB}$ or $m\overline{OC}$, we draw a circle passing through the points A, B and C.

iv. This is our required circum circle whose radius is measured to be 2.5 cm.

b. Inscribed Circle



Steps of construction:

i. We construct right angle triangle ABC according to given condition.

ii. We draw bisectors of ∠A and ∠B intersecting each other at point 'O'.

iii. From point O, we draw $\overrightarrow{OP}$ perpendicular to $\overline{AB}$.

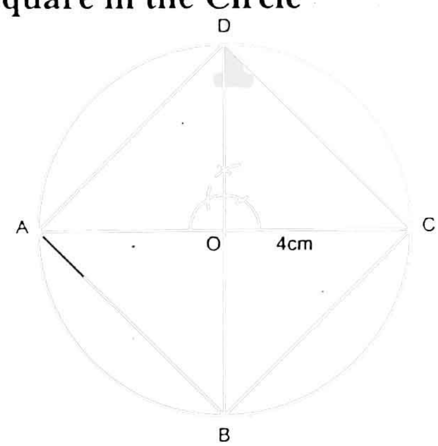
iv. Taking 'O' as centre and radius equal to $\overline{OP}$, we draw a circle, touching three sides of triangle internally.

v. This is the required in-circle whose radius is measured to be 1 cm.

Q. 7 In and about a circle of radius 4 cm describe a square.

Solution:

a. Square in the Circle



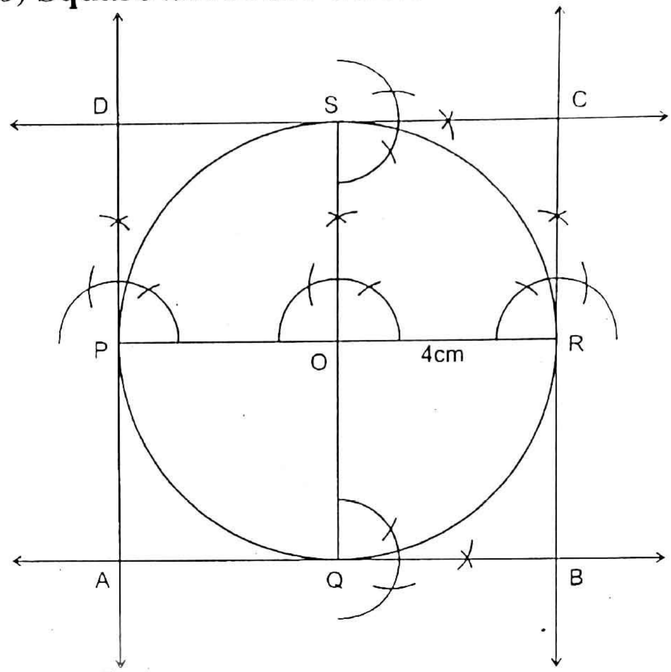
Steps of construction:

i. We draw a circle with centre 'O' of radius 4cm.

ii. We draw two diameters $\overline{AC}$ and $\overline{BD}$ of circle perpendicular to each other.

iii. By joining points A with B, B with C, C with D and D with A, we get the required square inscribed in the given circle.

(b) Square about the Circle



Steps of Construction:

i. We draw a circle with centre "O' and a radius 4cm.

ii. We draw two diameters $\overline{PR}$ and $\overline{QS}$ of circle perpendicular to each other.

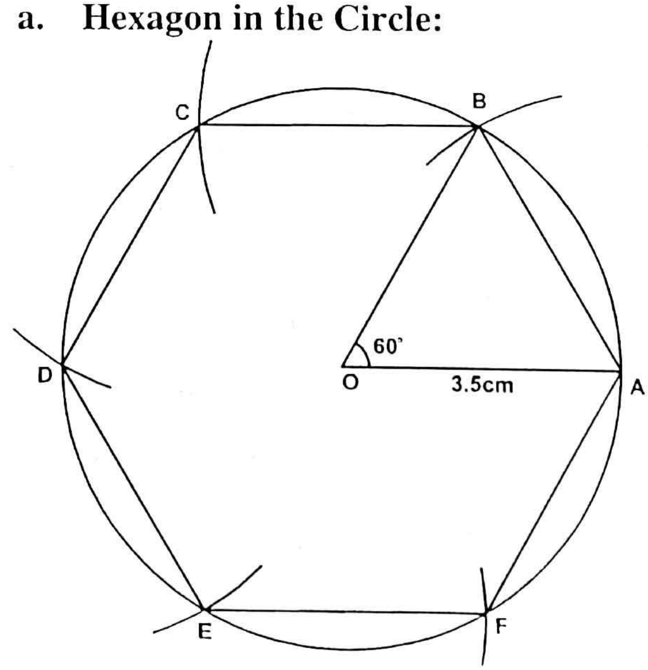
iii. We draw tangents to the circle at points P, Q, R and S.

iv. We produce the tangents to meet each other at point A, B, C and D.

v. ABCD is the required circumscribed square.

Q. 8 In and about a circle of radius 3.5 cm describe a hexagon.

a. Hexagon in the Circle:



Steps of Construction:

i. We draw a circle with centre 'O' of radius 3.5 cm.

ii. We take a point A anywhere on the circle and draw the radial segment $\overline{OA}$.

iii. From point A, we draw an arc of radius $\overline{OA}$ which intersects the circle at point B.

iv. By joining 'O' with A and B we get an equilateral triangle OAB, so that the angle subtended by the chord at the centre is 60°.

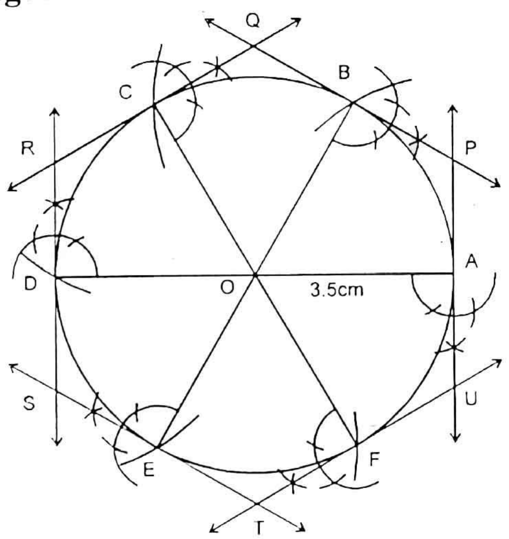
v. From point B, we draw an arc of same radius intersecting the circle at point C, then joining B to C we get another chord $\overline{BC}$.

vi. We continue to draw the arcs, which cut the circle at points D, E and F, such that

$$m\overline{OA} = m\overline{AB} = m\overline{BC} = m\overline{CD}$$
$$= m\overline{DE} = m\overline{EF} = m\overline{FA}$$

vii. We draw end to end on the circle the six chords $\overline{AB}$, $\overline{BC}$, $\overline{CD}$, $\overline{DE}$, $\overline{EF}$ and $\overline{FA}$, which completes the required hexagon

b. Hexagon about the Circle:



Steps Construction:

i. We draw a circle with centre 'O' of radius 3.5 cm.

ii. We take a point A anywhere on the circle and draw the radial segment $\overline{OA}$.

iii. From point A, we draw an arc of radius $\overline{OA}$, which intersects the circle at point B.

iv. From point B, we draw an arc of same radius intersecting the circle at point C.

v. We continue to draw the arcs, which cut the circle at points D, E and F.

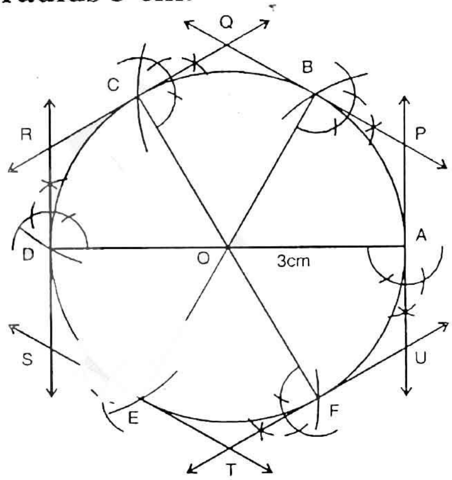
vi. We draw the diameters $\overline{AD}$, $\overline{BE}$ and $\overline{CF}$.

vii. We draw tangents at points A, B, C, D, E and F to the circle.

viii. We produce the tangents to meet each other at points P, Q, R, S, T and U.

ix. PQRSTU is the required circumscribed hexagon.

Q. 9 Circumscribe a regular hexagon about a circle of radius 3 cm.



Steps Construction:

i. We draw a circle with centre 'O' of radius 3 cm.

ii. We take a point A anywhere on the circle and draw radial segment $\overline{OA}$.

iii. From point A, we draw an arc of radius $\overline{OA}$, which intersects the circle at point B.

iv. From point B, we draw an arc of same radius intersecting the circle at point C.

v. We continue to draw the arcs, which cut the circle at points D, E and F.

vi. We draw diameter $\overline{AD}$, $\overline{BE}$ and $\overline{CF}$.

vii. We draw tangents at points A, B, C, D, E and F to the circle.

viii. We produce the tangents to meet each other at points P, Q, R, S, T and U.

ix. PQRSTU is the required circumscribed hexagon.