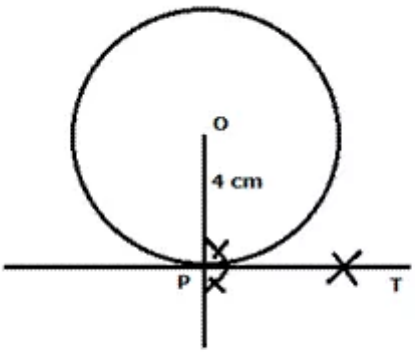
Chapter 18. Constructions

Ex 18.1

Answer 1.



Steps of constructions:

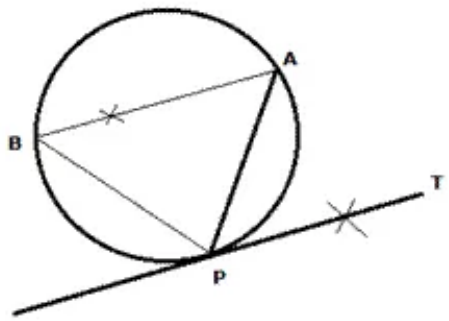
(i) Draw a circle of radius 4 cm with centre O.

(ii) Join the centre O to the given point P.

(iii) On the given point P, draw a perpendicular to OP.

(iv) PT is the required tangent.

Answer 2.



Steps of construction:

(i) Draw a circle with radius 4.5 cm.

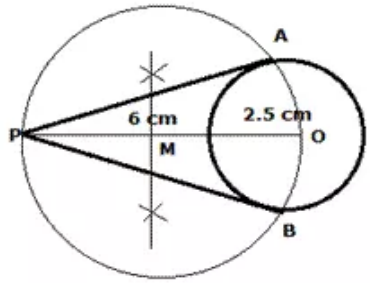
(ii) At any point P draw a chord PA.

(iii) Take any point B on the circle and join PB and AB.

(iv) At P, draw $\angle APT$ equal to $\angle ABP$..

(v) PT is the required tangent.

Answer 3.



Steps of construction:

(i) Draw a circle of radius 2.5 cm with centre O.

(ii) Join the centre O to the given point P which is 6 cm away from O.

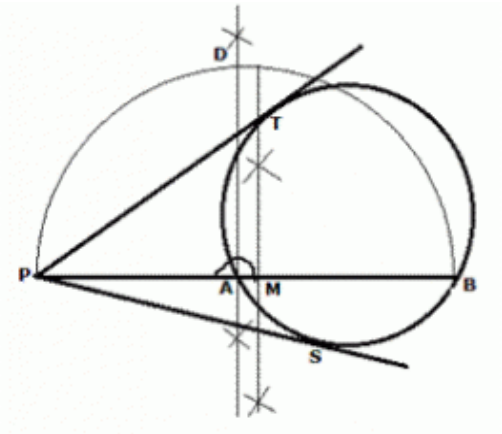
(iii) Draw a perpendicular bisector of OP. Let M be the mid-point of OP.

(iv) With M as centre and radius OM, draw a circle cutting the first circle at A and B.

(v) Join PA and PB.

(vi) PA and PB are the required tangents.

Answer 4.



Steps of construction:

(i) Draw a circle of radius 3 cm with centre O.

(ii) If P is the given point, then draw PAB a secant to the given circle.

(iii) Draw a perpendicular bisector of PB and let M be the mid-point of PB.

(iv) With M as centre and MP as radius , draw a semi-circle on PB.

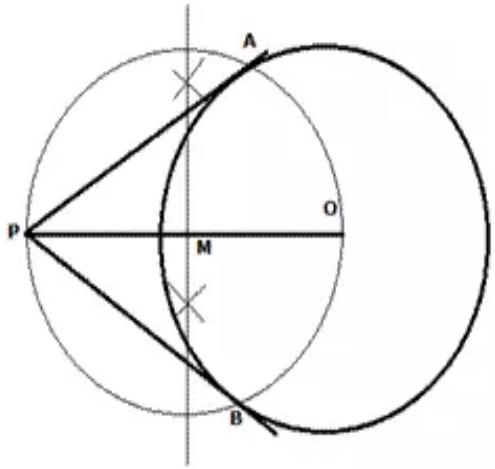
(v) At A, draw a perpendicular to PB. Let this perpendicular meet the semi-circle at D.

(vi) With P as centre and PD as radius, cut off two arcs on the given circle at T and S.

(vii) Join PT and PS.

(viii) PT and PS are the required tangents.

Answer 5.



Steps of construction:

(i) Draw a circle of radius 3 cm with centre O.

(ii) Join the centre O to the given point P which is 5 cm away from O.

(iii) Draw a perpendicular bisector of OP. Let M be the mid-point of OP.

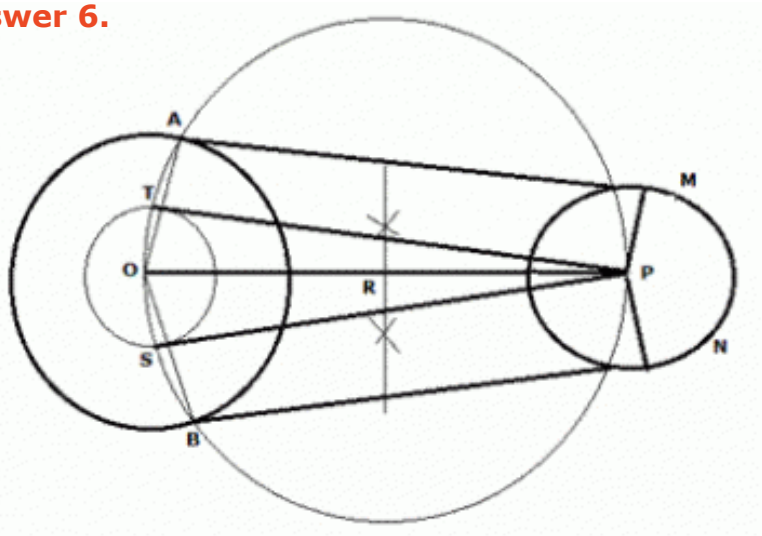
(iv) With M as centre and radius OM, draw a circle cutting the first circle at A and B.

(v) Join PA and PB.

(vi) PA and PB are the required tangents.

(vii) On measuring, PA and PB = 4 cm

Answer 6.



Steps of construction:

(i) Draw a line OP = 8 cm.

(ii) At O, draw a circle of radius 3.5 cm.

(iii) At P, draw a circle of radius 2.5 cm.

(iv) At O, draw a third circle concentric to the bigger circle and radius = (3.5 – 2.5) cm= 1 cm

(v) Draw a perpendicular bisector of OP. Let R be the mid-point of OP.

(vi) With R as centre and OR as radii, draw a fourth circle. Mark as T and S where the third and fourth circles intersect each other.

(vii) Join OT and OS and extend lines to meet the bigger circle at A and B.

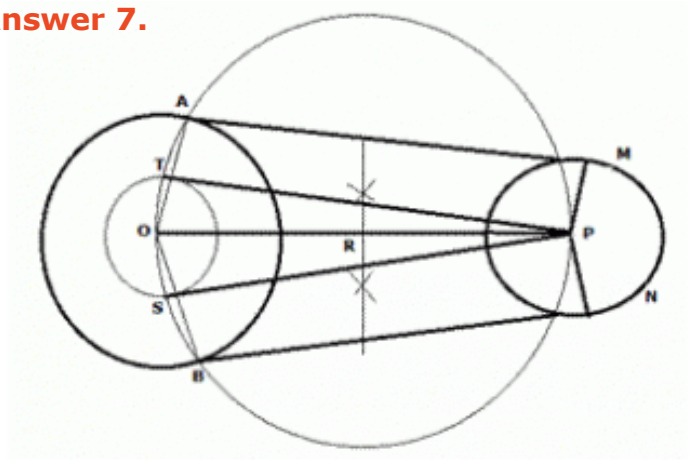
(viii)Join PT and PS.

(ix) On PT and PS, draw perpendiculars to meet the smaller circle at M and N.

(x) Join AM and BN.

AM and BN are the required tangents.

Answer 7.



Steps of construction:

(i) Draw a line OP = 6 cm.

(ii) At O, draw a circle of radius 3.5 cm.

(iii) At P, draw a circle of radius 2 cm.

(iv) At O, draw a third circle concentric to the bigger circle and radius = (3.5 – 2) cm= 1.5 cm

(v) Draw a perpendicular bisector of OP. Let R be the mid-point of OP.

(vi) With R as centre and OR as radii, draw a fourth circle. Mark as T and S where the third and fourth circles intersect each other.

(vii) Join OT and OS and extend lines to meet the bigger circle at A and B.

(viii)Join PT and PS.

(ix) On PT and PS, draw perpendiculars to meet the smaller circle at M and N.

(x) Join AM and BN.

AM and BN are the required tangents.

<u>Proof:</u>

Since AT || PM and BS || PN; therefore AM = PT and BN = PS

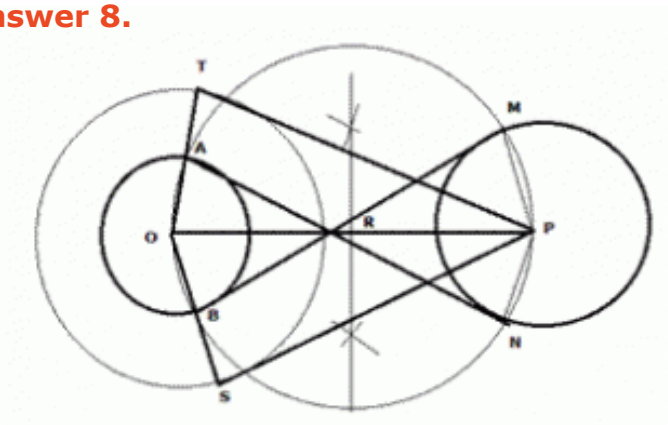
Now in ΔOTP and ΔOSP

PT = PS (Tangents to a circle from same point)

Therefore, AM = BN

Hence, proved.

Answer 8.



Steps of construction:

(i) Draw a line OP = 8 cm.

(ii) At O, draw a circle of radius 3 cm.

(iii) At P, draw a circle of radius 3.5 cm.

(iv) At O, draw a third circle concentric to the smaller circle and radius = (3.5 + 3) cm= 6.5 cm

(v) Draw a perpendicular bisector of OP. Let R be the mid-point of OP.

(vi) With R as centre and OR as radii, draw a fourth circle. Mark as T and S where the third and fourth circles intersect each other.

(vii) Join OT and OS to meet the smaller circle at A and B.

(viii)Join PT and PS.

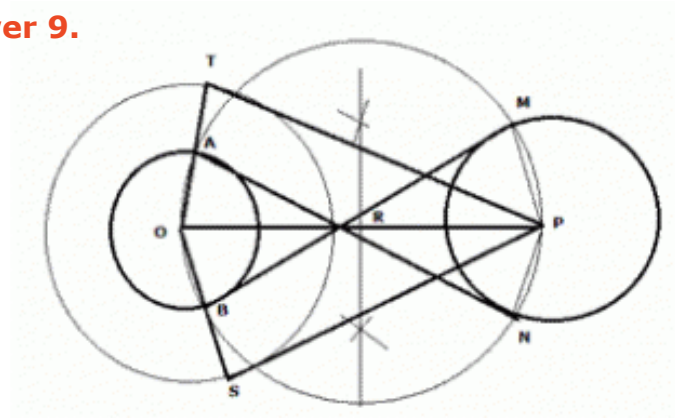
(ix) On PT and PS, draw perpendiculars to meet the bigger circle at M and N.

(x) Join AM and BN.

AM and BN are the required tangents.

On measuring, AM = BN = 8 cm.

Answer 9.



Steps of construction of transverse common tangent:

(i) Draw a line OP = 7 cm.

(ii) At O, draw a circle of radius 2.5 cm.

(iii) At P, draw a circle of radius 4 cm.

(iv) At O, draw a third circle concentric to the smaller circle and radius = (2.5 + 4) cm= 6.5 cm

(v) Draw a perpendicular bisector of OP. Let R be the mid-point of OP.

(vi) With R as centre and OR as radii, draw a fourth circle. Mark as T and S where the third and fourth circles intersect each other.

(vii) Join OT and OS to meet the smaller circle at A and B.

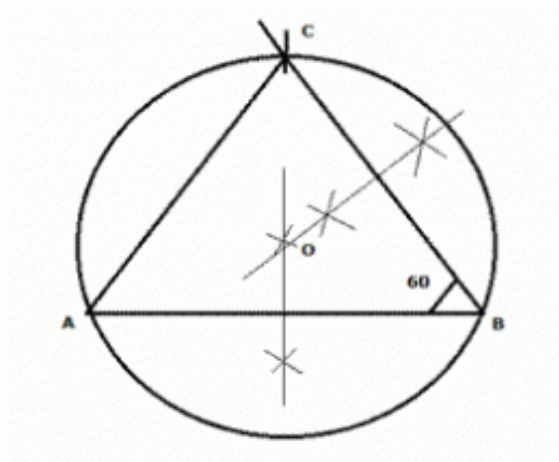
(viii)Join PT and PS.

(ix) On PT and PS, draw perpendiculars to meet the bigger circle at M and N.

(x) Join AM and BN.

AM and BN are the required tangents.

Answer 10.



Steps of construction:

(i) Draw line AB = 5 cm

(ii) At B, draw an arc making an angle of 60° with AB

(iii) On the arc cut BC = 4.5 cm.

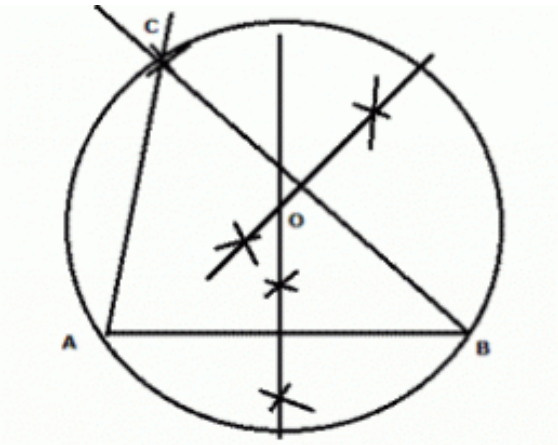
(iv) Join AC.

(v) Draw perpendicular bisectors of AB and BC, which meet at O.

(vi) With O as centre and radius equal to the distance between O and the vertex of the triangle, draw a circle to pass through all the three vertices of the triangle.

(vii) The drawn circle is the required circle with radius = 2.8 cm

Answer 11.



Steps of construction:

(i) Draw line AB = 5 cm

(ii) At B, draw an arc with radius 6 cm

(iii) On the arc cut AC = 4.5 cm.

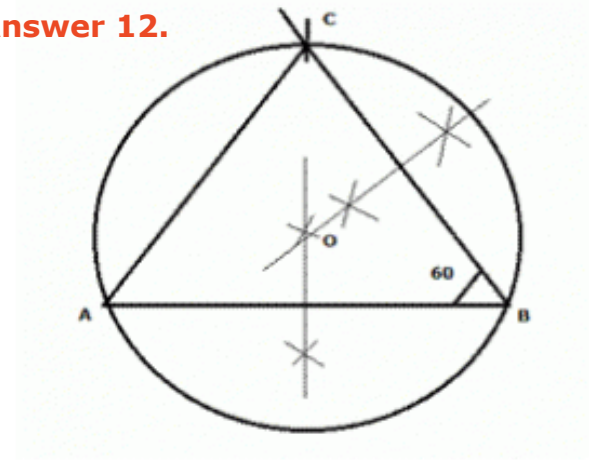
(iv) Join AC and BC.

(v) Draw perpendicular bisectors of AB and BC, which meet at O.

(vi) With O as centre and radius equal to the distance between O and the vertex of the triangle, draw a circle to pass through all the three vertices of the triangle.

(vii) The circle drawn is the required circle.

Answer 12.



Steps of construction:

(i) Draw line AB = 4.5 cm

(ii) At B, draw an arc making an angle of 60° with AB and length BC = 4.5 cm.

(iii) On the arc cut AC = 4.5 cm.

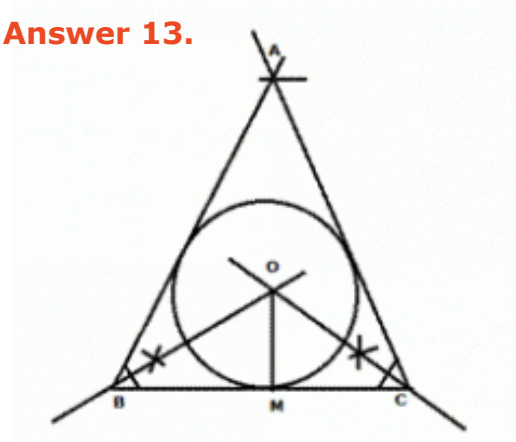
(iv) Join AC.

(v) Draw perpendicular bisectors of AB and BC, which meet at O.

(vi) With O as centre and radius equal to the distance between O and the vertex of the triangle, draw a circle to pass through all the three vertices of the triangle.

(vii) The drawn circle is the required circle with radius = 2.6 cm

Answer 13.



eps of construction:

) Draw a line segment BC = 7.5 cm

) At B, draw an arc making an angle of 60° with BC.

i) At C, draw an arc with radius (AC= AB+1.5 cm) = 9 cm cutting the previous arc.

) Join AC and AB.

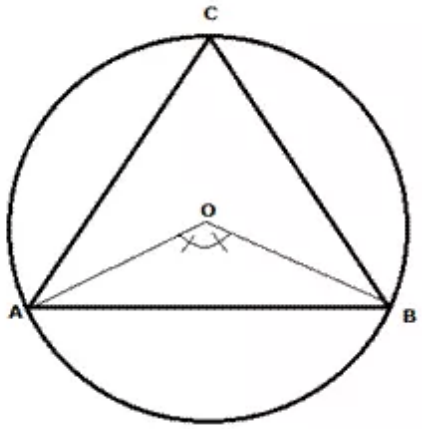
) Draw angle bisectors for ∠A and ∠B meeting at O.

i) Draw a perpendicular to BC from O and mark it as M.

ii) With OM as radius draw a circle touching all three sides of the triangle.

iii) The drawn circle is the required circle with radius = 2.3 cm

Answer 14.



Steps of construction:

(i) Draw a circle with centre O and radius = 3 cm.

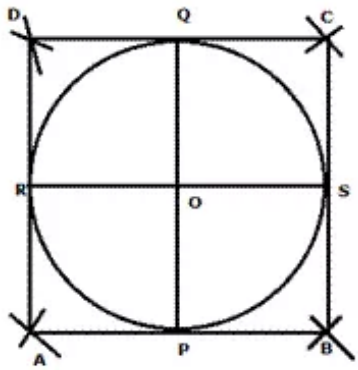
(ii) Draw radii OA and OB such that $\angle AOB = (360/3) = 120°$

(iii) Join AB. Cut off arcs AC and BC equal to AB.

(iv) Join AC and BC.

ΔABC is the required equilateral triangle.

Answer 15



Steps of construction:

(i) Draw a circle of radius 2.5 cm with centre O.

(ii) Draw two diameters PQ and RS of the circle meeting at centre O.

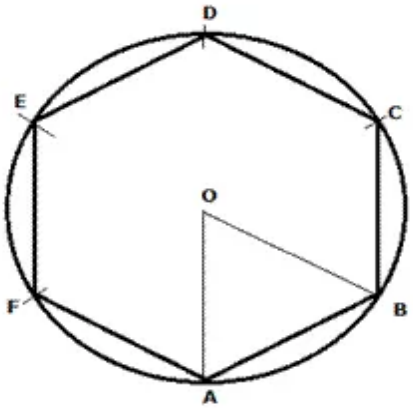
(iii) Taking OP as radius cut two arcs from P on both sides (left and right) of P.
Repeat same with Q, R and S.

(iv) Mark new points formed as A, B, C and D.

(v) Join AB, BC, CD and AD.

ABCD is the required square circumscribing the given circle.

Answer 16.



Steps of construction:

(i) Draw a circle with centre O and radius = 3.5 cm.

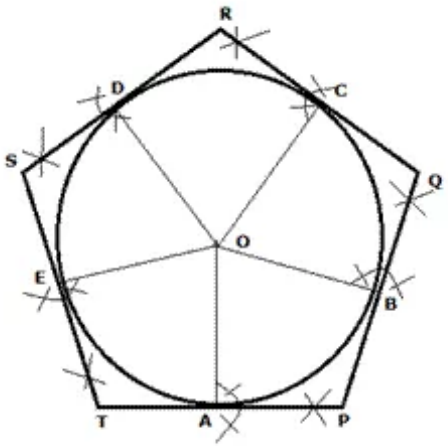
(ii) Draw radii OA and OB such that $\angle AOB = (360/3) = 120°$

(iii) Cut off arcs BC, CD, DE, EF and AF equal to AB.

(iv) Join AB, BC, CD, DE, EF and AF.

ABCDEF is the required regular hexagon inscribed in the given circle.

Answer 17.



Steps of construction:

(i) Draw a circle with centre O and radius = 3 cm.

(ii) Draw radii OA and OB such that $\angle AOB = (360/5) = 72°$.

(iii) Cut off arcs BC, CD, DE and AE equal to AB.

(iv) Draw tangents to the circle at A, B, C, D and E.

(v) Let these tangents intersect at P, Q, R, S and T.

PQRST is the required regular pentagon.

Answer 18.

Steps of construction:

(i) Draw a circle with centre O and radius = 4 cm.

(ii) Draw radii OT and OP such that $\angle TOP = (360/5) = 72°$.

(iii) Cut off arcs PQ, QR, RS, ST equal to TP.

(iv) Join TP, PQ, QR, RS and ST.

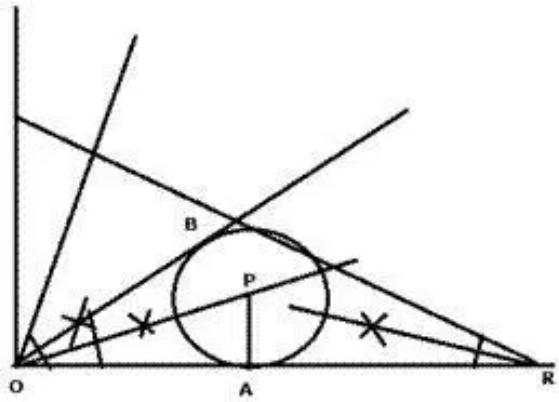
PQRST is the required regular hexagon inscribed in the given circle.

(v) From centre O, drop perpendiculars on TP, PQ, QR, RS and ST at A, B, C, D and E.

(vi) With OA as radius draw a circle touching the five sides of the pentagon.

The circle drawn is the required circle with radius = 3.3 cm

Answer 19.



Steps of construction:

(i) A 30 degree angle can be formed by knowing that the inverse sine of 0.5 is 30 degrees. In other words, a right triangle with a 30 degree angle has the hypotenuse twice as long as the leg opposite the near leg.

(ii) Using your compass, construct a 90°, then construct the leg opposite the 30 degree angle. Construct the hypotenuse twice as long, that makes a 30 degree angle.

(iii)Bisect 30 degree angle and you have 15 degrees,

(iv) From 90°,° cut off angle equal to 15° ' angle to get 75° angle. Bisect the 75° angle to get 37.5° angle.

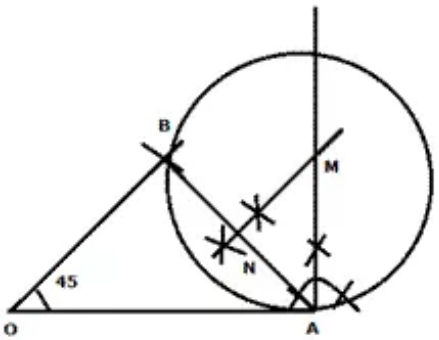
(v) Now draw angle bisector of angle 37.5°.

(vi) On OR, at 5 cm from O, drop a perpendicular PA from the angle bisector of angle 37.5°.

(vii) With PA as radius, draw a circle touching OA at A and OB at B.

This is the required circle.

Answer 20.



Steps of construction:

(i) Draw a OA = 4.5 cm

(ii) At O, draw an arc with angle 45 degree and radius 3.2 cm

(iii) Join AB

(iv) At A, draw a perpendicular to OA

(v) Bisect AB and let bisector meet the perpendicular to OA at M

(vi) with MA as radius draw a circle touching B and A.

The circle drawn is the required circle.