CHAPTER 11

Constructions

ONE MARK QUESTIONS

Multiple Choice Questions

1. To divide a line segment AB is the ratio $6:7$, a ray AX is drawn first such that $\angle BAX$ is an acute angle and then points $A_1, A_2, A_3, \ldots\ldots\ldots$ are located equal distances on the ray AX and the point B is joined with

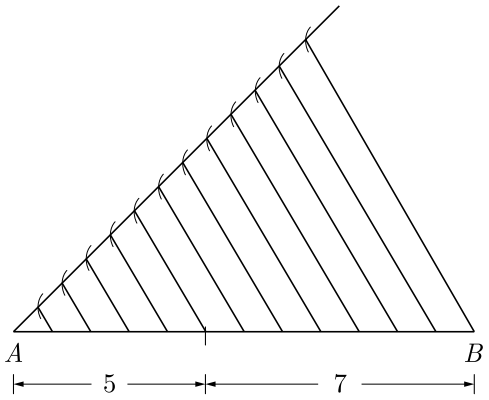
(a) A_{12} (b) A_{13}

(c) A_{10} (d) A_{11}

Ans : (b) A_{13}

The maximum number of points $= 5 + 7 = 12$

In this process, once line AX is drawn, it is divided into 12 equal parts using a pair of compasses. The points are marked from point a towards X. The last point is then joined to point B to form line XB. Lines are then drawn parallel to XB and passing through the points that were marked on AX. These lines can be drawn using set squares to ensure they are parallel. These parallel lines will divide line AB into 12 equal parts. So, to divide the line in the ratio 5:7, the first five portions will be taken and the last 7 left as shown in the attached figure.



2. The ratio of the sides of the triangle to be constructed with the corresponding sides of the given triangle is known as

(a) scale factors (b) length factor

(c) side factor (d) K-factor

Ans : (a) scale factors

The ratio of the sides of the triangle to be constructed with the corresponding sides of the given triangle is known as scale factor.

3. To divide a line segment AB in the ratio $3:5$ first a ray AX is drawn so that $\angle BAX$ is an acute angle and then at equal distances points are marked on the ray AX such that the minimum number of these points is

(a) 8 (b) 9

(c) 10 (d) 11

Ans : (a) 8

Minimum number of points $= 3 + 5 = 8$

4. Given a triangle with side $AB = 8$ cm. To get a line segment $AB' = \frac{3}{4}$ of AB, it required to divide the line segment AB in the ratio.

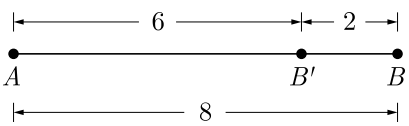
(a) 3 : 4 (b) 4 : 3

(c) 1 : 3 (d) 3 : 1

Ans : (d) 3 : 1

We have $AB = 8$ cm

$$AB' = \frac{3}{4} \text{ of } AB$$



$$= \frac{3}{4} \times 8 = 3 \times 2 = 6 \text{ cm}$$

and $BB' = AB - AB' = 8 - 6 = 2$

$$AB' : BB' = 6:2 = 3:1$$

Hence, the line segment AB should be divided in 3 : 1.

5. To divide a line segment AB in the ratio 3 : 4, we draw a ray AX, so that $\angle BAX$ is an acute angle and then mark the points on ray AX at equal distances such that the minimum number of these points is

(a) 3 (b) 4

(c) 7 (d) 10

Ans : (c) 7

Minimum number of these points $= 3 + 4 = 7$

6. To divide a line segment AB in the ratio 2 : 5, first a ray AX is drawn, so that $\angle BAX$ is an acute angle and then at equal distance points are marked on the ray AX such that the minimum number of these point is

(a) 2 (b) 5

(c) 4 (d) 7

Ans : (d) 7

We know that, to divide a line segment AB in the ratio $m:n$, first draw a ray AX which makes an acute $\angle BAX$ then, marked $m+n$ points at equal distance.

Here, $m = 2,\ n = 5$

Minimum number of these points $= 2 + 5 = 7$

7. To divide a line segment AB in ratio $m:n$ (m, n are positive integers), draw a ray AX to that $\angle BAX$ is an acute angle and the mark point on ray AX at equal distances such that the minimum number of these points is

(a) greater of m and n (b) $m+n$

(c) $m+n-1$ (d) mn

Ans : (b) $m+n$

To divide a line segment in the ratio $m:n$, the maximum number of the points to mark are $m+n$.

8. The sides of a triangle (in cm) are given below. In which case, the construction of triangle is not possible.

(a) 8, 7, 3 (b) 8, 6, 4

(c) 8, 4, 4 (d) 7, 6, 5

Ans : (c) 8, 4, 4

We know that, in a triangle sum of two sides of triangle is greater than the third side. Here, the sides of triangle given in option (c) does not satisfy this condition. So, with these sides the construction of a triangle is not possible.

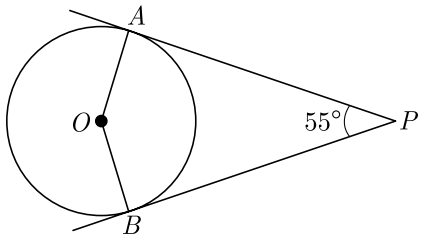
9. To draw a pair of tangents to a circle which are inclined to each other at an angle of 55°, it is required to draw tangents at the end points of these two radii of the circle, the angle between two radii is

(a) 105° (b) 70°

(c) 125° (d) 135°

Ans : (c) 125°

According to the question we can draw the following diagram.



From figure,

$$\angle AOB + \angle APB = 180^\circ$$
$$\angle AOB = 180^\circ - \angle APB$$
$$= 180^\circ - 55^\circ = 125^\circ$$

10. From the following ratios, a line segment cannot be devided into A ratio.

(a) $A \to \sqrt{5} : \frac{1}{\sqrt{5}}$ (b) $A \to \frac{1}{\sqrt{5}} : \frac{1}{\sqrt{5}}$

(c) $A \to \frac{2}{\sqrt{5}} : \frac{\sqrt{5}}{\sqrt{2}}$ (d) $A \to \frac{1}{5} : 1$

Ans : (c) $A \to \frac{2}{\sqrt{5}} : \frac{\sqrt{5}}{\sqrt{2}}$

Since,

a. (a) $\sqrt{5} : \frac{1}{\sqrt{5}} = 5:1$

b. (b) $\frac{1}{\sqrt{5}} : \frac{1}{\sqrt{5}} = 1:1$

c. (c) $\frac{2}{\sqrt{5}} : \frac{\sqrt{5}}{\sqrt{2}} = 2\sqrt{2} : 5$

d. (d) $\frac{1}{5} : 1 = 1:5$

Since, (a), (b) and (d) are the ratio of 2 integers. So, it is possible to divide a line segment into these points.

Fill in the Blank Questions

11. Two points on a line segment are marked such that the three parts they make are equal then we say that

the two points ..... the line segment.

Ans :

Trisect

12. Two circles are drawn with same centre then the ..... circle have bigger radius.

Ans :

Outer

13. Only two ..... can be drawn to a circle from an external point.

Ans : Tangents

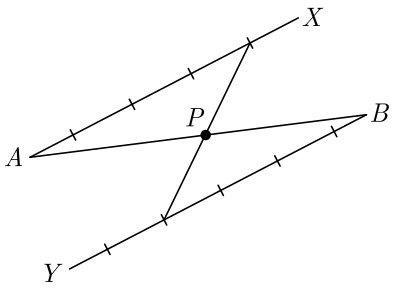
14. A curve made by moving one point at a fixed distance from another is called .....

Ans :

Circle

VERY SHORT ANSWER QUESTIONS

15. In given figure, in what ratio does P divides AB internally ?



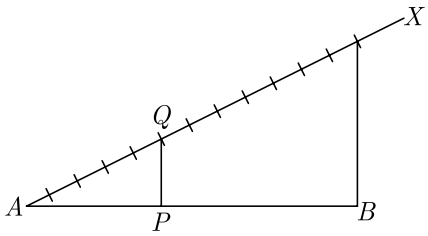
Ans : [Board Term-2, 2012]

Point P divide AB internally in the ratio 4:4 i.e. 1:1.

16. To divide a line segment AB in the ratio 5:7, first AX is drawn, so that $\angle BAX$ is an acute angle and then at equal distance, points are marked on the ray AX, find the minimum number of these points.

Ans : [Board Term-2 2012]

Minimum number of points marked on AX are $5+7=12$



17. To divide a line segment AB in the ratio 2:5, a ray AX is drawn such that $\angle BAX$ is acute. Then points are marked at equal intervals on AX. What is the minimum number of these points ?

Ans : [Board Term-2, 2012]

Minimum number of points marked on AX are $2+5=7$.

18. To divide the line segment AB in the ratio $2:3$, a ray AX is drawn such that $\angle BAX$ is acute, AX is then marked at equal intervals. Find minimum number of these marks.

Ans : [Board Term-2 2012]

Minimum number of points marked on AX are $2+3=5$.

19. To find a point P on the line segment $AB=6$ cm, such that $\frac{AP}{AB}=\frac{2}{5}$, in which ratio the line segment AB is divided.

Ans : [Board Term-2 2012]

The line segment AB is divided in the ratio $AP:PB=2:(5-2)=2:3$

20. A line Segment AB is divided at point P such that $\frac{PB}{AB}=\frac{3}{7}$, then find the ratio $AP:PB$.

Ans : [Board Term-2, 2012 Set (44)]

Here, $AB=7, PB=3$

Thus $AP = AB-PB=7-3=4$

$AP:PB=4:3$

21. What is the ratio of division of the line segment AB by the point P from A ?

Ans : [Board Term-2 2012]

The ratio of division of the line segment AB by the point P from A is $AP:AB=3:5$.

22. In drawing a triangle, if $AB=3$ cm, $BC=2$ cm and $AC=6$ cm. What is the possibility that a triangle cannot be drawn.

Ans : [Board Term-2 2014]

When $AB+BC<AC$ triangle cannot be drawn.

Here $3\,\text{cm}+2\,\text{cm}<6\,\text{cm}$. Hence ΔABC can not be

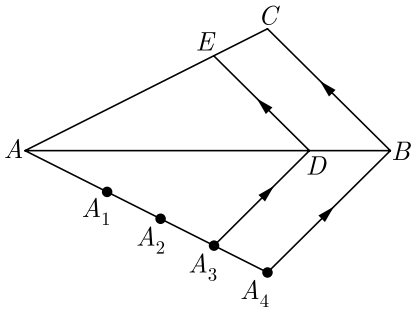
drawn.

23. When construction of a triangle similar to a given triangle in the scale factor $\frac{5}{3}$, then what is the nature of given triangle ?

Ans : [Board Term-2 2014]

Triangle is bigger than to original Δ.

24. In figure, ΔADE is constructed similar to ΔABC, write down the scale factor.



Ans : [Board Term-2 2012]

Scale factor is $\frac{3}{4}$.

25. Triangle PQR is constructed similar to triangle ABC with scale factor $\frac{2}{3}$. Find triangle PQR.

Ans : [Board Term-2 2011]

Triangle PQR is smaller to triangle ABC. Reduced scale factor figures are smaller in size.

26. Give three sides such that construction of a triangle is possible.

Ans : [Board Term-2 2011]

To construct a triangle sum of two sides of a triangle must be greater than largest side. Let the sides are 3 cm, 4 cm and 5 cm.

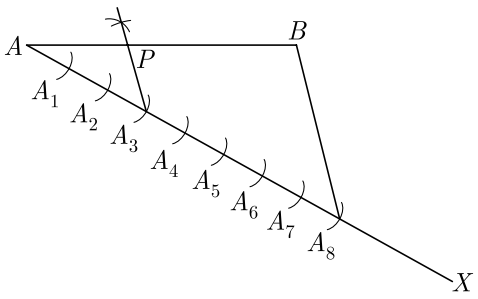
TWO MARKS QUESTIONS

27. Draw a line segment of length 7 cm. Find a point P on it which divides it in the ratio 3 : 5.

Ans : [Board Term-2, 2015]

Steps of Construction :

1. Draw a line segment AB of length 7 cm.
2. Draw any ray AX making an acute angle with AB.
3. Mark eight point $A_1, A_2, A_3, ..., A_8$ on AX such that $AA_1 = A_1A_2 = A_2A_3 = ..., A_7A_8$.
4. Join BA_8.
5. At point A_3, draw a line PA_3 parallel to BA_8. Hence $AP : PB = 3 : 5$

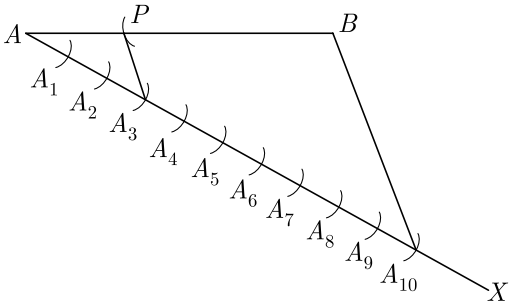


28. Draw a line segment of length 5 cm and divide it in the ratio 3 : 7.

Ans : [Board Term-2 2015]

Step of Construction :

1. Draw a line segment AB of length 5 cm.
2. Draw any ray AX making on acute angle with AB.
3. Mark ten points $A_1, A_2, A_3, ...A_{10}$ on AX such that $AA_1 = A_1A_2 = ... = A_9A_{10}$.
4. Join BA_{10}.
5. At point A_3 draw a line PA_3 parallel to BA_{10}. Hence $AP : PB = 3 : 7$



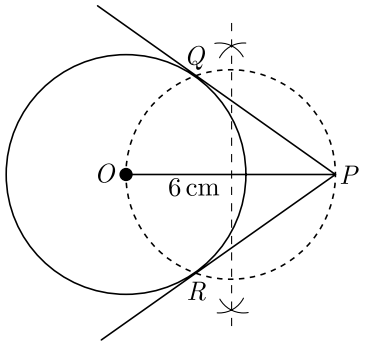
THREE MARKS QUESTIONS

29. Draw a circle of radius 3.5 cm. From a point P, 6 cm from its centre, draw two tangents to the circle.

Ans : [Board 2020 OD Standard]

Step of construction :

1. Draw a line segment OP of length 6 cm.
2. From the point O, draw a circle of radius $= 3.5$ cm.
3. Draw a perpendicular bisector of OP. Let M be the mid point of OP.
4. Taking M as centre and OM as radius draw a circle.
5. This circle intersects the given circle at Q and R.
6. Join PQ and PR, which are tangents to the circles.

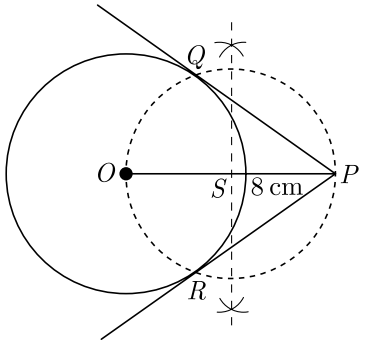


30. Construct a pair tangents PQ and PR to a circle of radius 4 cm from a point P outside the circle 8 cm away from the centre. Measure PQ and PR.

Ans : [Board Term-2 2014]

Steps of Construction :

1. Draw a line segment OP of length 8 cm.
2. Draw a circle with centre O and radius 4 cm.
3. Taking OP as diameter draw another circle which intersects the first circle at Q and R.
4. Join P to Q and P to R. On measuring, we get $PQ = PR = 5$ cm

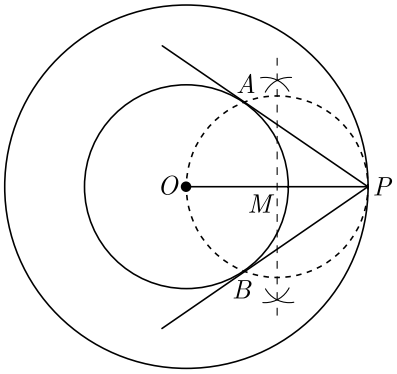


31. Construct a tangent to a circle of radius 4 cm from a point on the concentric circle of radius 6 cm.

Ans : [Board Term-2, 2013]

Steps of Construction :

1. Draw a circle with centre O and radius 4 cm.
2. Draw another circle with centre O and radius 6 cm.
3. Take a point P on outer circle and join OP.
4. Draw perpendicular bisector of OP which intersect OP at M.
5. Draw a circle with centre M which intersects inner circle at points A and B.
6. Join AP and BP. Thus AP and BP are required tangents.

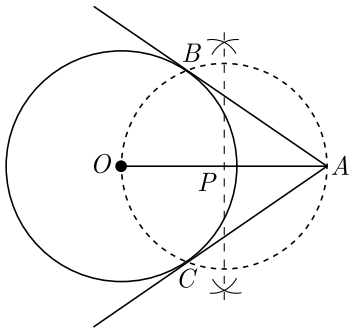


32. Draw a circle of radius 5 cm. Marks a point A which is 8 cm away from its centre O, construct the tangents AB and AC. Measure the lengths of AB and AC.

Ans :

Steps of Construction :

1. Draw a line segment OA of length 8 cm.
1. Draw a circle with centre O and radius 5 cm.
3. Taking OA as diameter draw another circle which intersects the given circle at B and C.
4. Join A to B and A to C. Thus AB and AC are required tangents.
5. $AB = AC = 6.2$ cm.



$\therefore$ AB and AC are required tangents.
$AB = AC = 6.2$ cm.

FOUR MARKS QUESTIONS

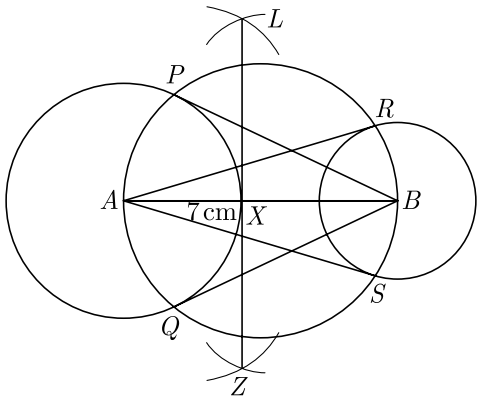
33. Draw a line segment AB of length 7 cm. Taking A as centre, draw a circle of radius 3 cm and taking B as centre, draw another circle of radius 2 cm. Construct tangents to each circle from the centre of the other circle.

Ans : [Board 2020 Delhi Standard]

Steps of construction :

1. Draw a line segment AB of length 7 cm.

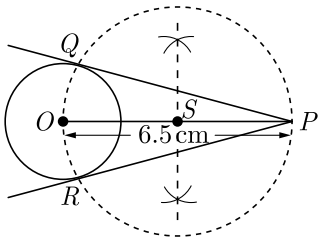
2. Draw a circle with A as centre and radius 3 cm.
3. Draw another circle with B as centre and radius 2 cm.
4. Draw another circle taking AB as diameter circle, which intersects first two circles at P and Q, R and S.
5. Join B to P, B to Q A to R and A to S. Hence, BP, BQ, AR and AS are the required tangents.



34. Draw a circle of radius 2 cm with centre O and take a point P outside the circle such that $OP = 6.5$ cm. From P, draw two tangents to the circle.

Ans : [Board 2020 OD Standard]

1. Draw a line segment OP of length 6.5 cm.
2. Draw a circle taking O as centre and radius 2 cm.
3. Taking OP as diameter draw another circle which intersects the first circle at Q and R.
4. Join P to Q and P to R. Hence PQ and PR are two tangents.

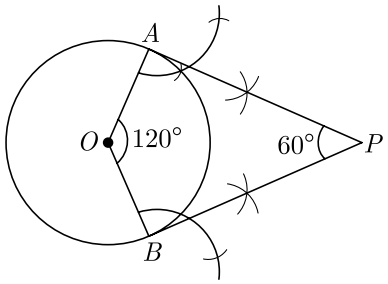


35. Draw two tangents to a circle of radius 4 cm, which are inclined to each other at an angle of 60°.

Ans : [Board 2020 OD Standard]

Step of construction :

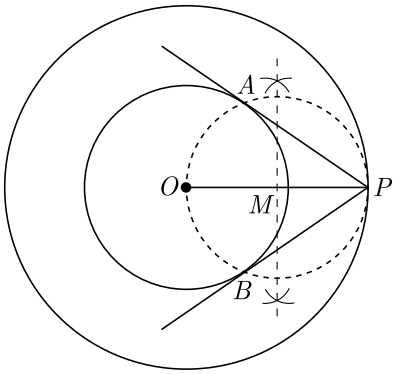
1. Draw a circle of radius 4 cm with O as centre.
2. Draw two radii OA and OB inclined to each other at an angle of 120°.
3. Draw $AP \perp OA$ at A and $BP \perp OB$ at B. which meet at P.
4. PA and PB are the required tangents inclined to each other an angle of 60°.



36. Draw two concentric circles of radii 2 cm and 5 cm. Take a point P on the outer circle and construct a pair of tangents PA and PB to the smaller circle. Measure PA.

Ans : [Board 2019 OD Standard]

1. Draw a circle with centre O and radius 2 cm.
2. Draw another circle with centre O and radius 5 cm.
3. Take a point P on outer circle and join OP.
4. Draw perpendicular bisector of OP which intersect OP at M.
5. Draw a circle with centre M which intersects inner circle at points A and B.
6. Join AP and BP. Thus AP and BP are required tangents.



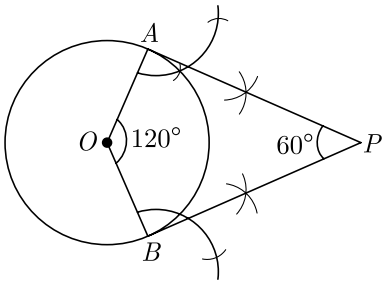
$$PA = \sqrt{5^2 - 2^2}$$
$$= \sqrt{21} = 4.6 \text{ cm}$$

37. Draw a circle of radius 4 cm. Draw two tangents to the circle inclined at an angle of 60° to each other.

Ans : [Board Term-2 Foreign 2015, OD 2016]

Steps of Construction :

1. Draw a circle with centre O and radius 6 cm.
2. Draw two radii OA and OB inclined to each other at an angle of 120°.
3. Draw $AP \perp OA$ at A and $BP \perp OB$ at B, which meet at P.
4. PA and PB are the required tangents inclined to each other an angle of 60°.



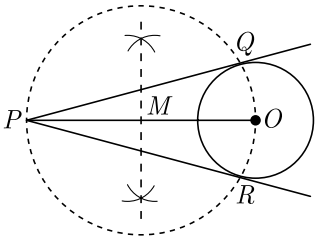
38. Draw a circle of radius 3 cm. From a point P, 7 cm away from centre draw two tangents to the circle. Measure the length of each tangent.

Ans : [Board Term-2 Foreign 2015]

Steps of Construction :

1. Draw a line segment PO of length 7 cm.
2. Draw a circle with centre O and radius 3 cm.
3. Draw a perpendicular bisector of PO. Let M be the mid-point of PO.
4. Taking M as centre and OM as radius draw a circle. Let this circle intersects the given circle at the point Q and R.
5. Join PQ and PR. On measuring we get

$$PQ = PR = 6.3 \text{ cm}.$$

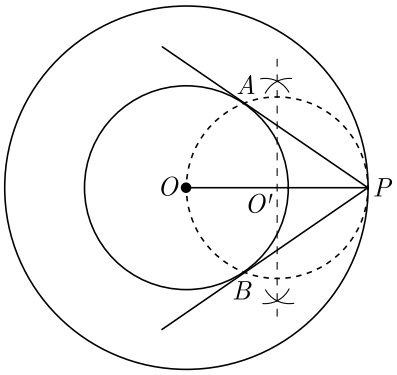


39. Draw two concentric circle of radii 3 cm and 5 cm. Taking a point on the outer circle, construct the pair of tangents to the inner circle.

Ans : [Foreign Set I 2017]

Steps of Construction :

1. Draw a circle with radius 3 cm and centre O.
2. Draw another circle with centre O and radius 5 cm.
3. Take a point P on the circumference of outer circle and join O to P.
4. Taking OP as diameter draw another circle which intersect the smallest circle at A and B.
5. Join A to P and B to P. AP and BP are the required tangents.

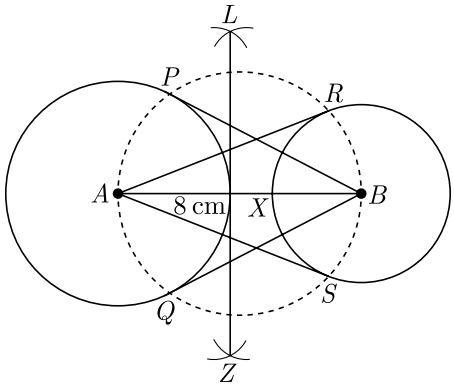


40. Draw a line segment AB of length 8 cm. Taking A as centre, draw a circle of radius 4 cm, and taking B as centre draw another circle of radius 3 cm. Construct tangents to each circle of radius centre of the other circle.

Ans : [Board Term-2 Foreign 2017, OD 2014]

Steps of Construction :

1. Draw a line segment AB of length 8 cm.
2. Draw a circle with centre A and radius 4 cm.
3. Draw another circle with centre B and radius 3 cm.
4. Taking AB as diameter draw another circle, which intersects first two circles at P and Q, and R and S.
5. Join B to P, B to Q, A to R and A to S. Thus BP, BQ, AR and AS are the required tangents.



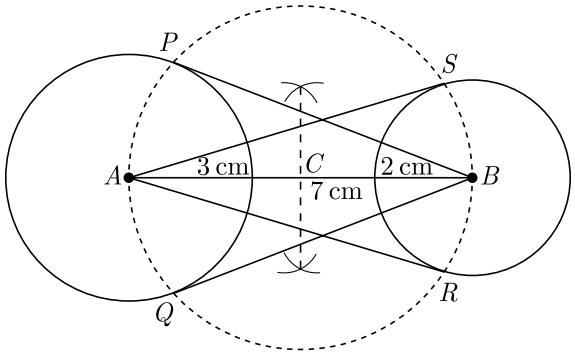
41. Draw a line segment AB of length 7 cm. Taking A as centre, draw a circle of radius 3 cm and taking B as center, draw another circle of radius 2 cm. Construct tangents to each circle from the centre of the other circle.

Ans : [Board Term-2 Delhi 2015]

Steps of Construction :

1. Draw a line segment AB of 7 cm.
2. Taking A and B as centre draw two circle of 3 cm and 2 cm radius respectively.

3. Bisect the line AB. Let mid-point of AB be C.
4. Taking C as centre draw a circle of radius AC with intersects the two circles at point P, Q, R and S.
5. Join BP, BQ, AS and AR. BP, BQ and AR, AS are the required tangents.

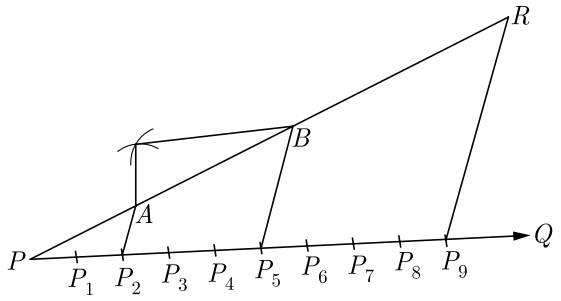


42. Construct a triangle whose perimeter is 13.5 cm and the ratio of the three sides is 2:3:4.

Ans : [Board Term-2 2011, 2012]

Steps of Construction :

1. Draw a line segment PR of length 13.5 cm.
2. At the point P draw a ray PQ making an acute angle RPQ with PR.
3. On PQ mark $(2+3+4)$ a points $P_1, P_2, P_3, P_4, P_5, P_6, P_7, P_8, P_9$ such that $PP_1 = P_1P_2 = P_2P_3 = P_3P_4 = P_4P_5 = P_5P_6 = P_6P_7 = P_7P_8 = P_8P_9$.
4. Join P_9R
5. Through P_2 and P_5 draw lines P_2A and P_5B respectively parallel to P_9R intersecting PR at A and B respectively.
6. With A as centre and radius AP draw and arc. ABC is the required triangle.
7. With B as centre and radius BR draw another arc to intersect first arc.
8. Join A to C and B to C.

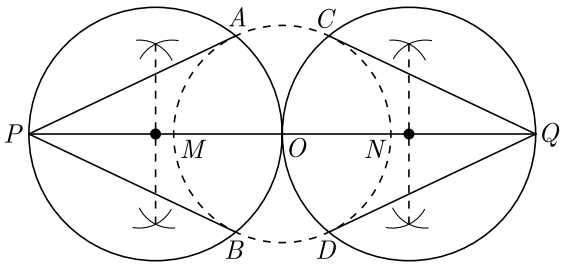


43. Draw a circle of radius of 3 cm. Take two points P and Q one of its diameter extended on both sides, each at a distance of 7 cm on opposite sides of its centre. Draw tangents to the circle from these two points.

Ans : [Board Term-2 Foreign 2017]

Steps of Construction :

1. Draw a circle with centre O and radius 3 cm.
2. Draw its diameter MON and extend it to both the sides to P and Q. Such that $OP = OQ = 7$ cm.
3. Taking diameters as OP and OQ draw two circles each of which intersects the first circle at the points A, B and C, D respectively.
4. Join PA, PB, QC and QO to get the required tangents

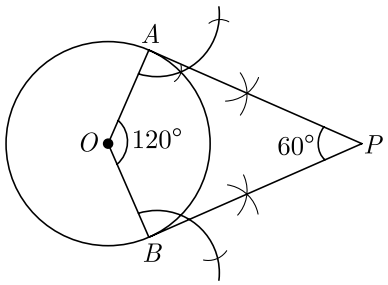


44. Draw a circle of radius 4 cm. Draw two tangents to the circle inclined at an angle of 60° to each other.

Ans : [Board Term-2 Foreign 2015, OD 2016]

Steps of Construction :

1. Draw a circle with centre O and radius 6 cm.
2. Draw two radii OA and OB inclined to each other at an angle of 120°.
3. Draw $AP \perp OA$ at A and $BP \perp OB$ at B, which meet at P.
4. PA and PB are the required tangents inclined to each other an angle of 60°.



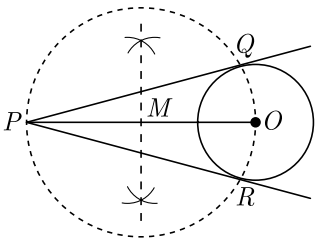
45. Draw a circle of radius 3 cm. From a point P, 7 cm away from centre draw two tangents to the circle. Measure the length of each tangent.

Ans : [Board Term-2 Foreign 2015]

Steps of Construction :

1. Draw a line segment PO of length 7 cm.
2. Draw a circle with centre O and radius 3 cm.
3. Draw a perpendicular bisector of PO. Let M be the mid-point of PO.
4. Taking M as centre and OM as radius draw a circle. Let this circle intersects the given circle at the point Q and R.
5. Join PQ and PR. On measuring we get

$PQ = PR = 6.3$ cm.

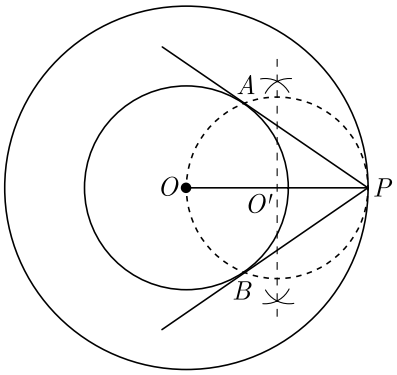


46. Draw two concentric circle of radii 3 cm and 5 cm. Taking a point on the outer circle, construct the pair of tangents to the inner circle.

Ans : [Foreign Set I 2017]

Steps of Construction :

1. Draw a circle with radius 3 cm and centre O.
2. Draw another circle with centre O and radius 5 cm.
3. Take a point P on the circumference of outer circle and join O to P.
4. Taking OP as diameter draw another circle which intersect the smallest circle at A and B.
5. Join A to P and B to P. AP and BP are the required tangents.



47. Draw a line segment AB of length 8 cm. Taking A as centre, draw a circle of radius 4 cm, and taking B as centre draw another circle of radius 3 cm. Construct tangents to each circle of radius centre of the other circle.

Ans : [Board Term-2 Foreign 2017, OD 2014]

Steps of Construction :

1. Draw a line segment AB of length 8 cm.
2. Draw a circle with centre A and radius 4 cm.
3. Draw another circle with centre B and radius 3 cm.
4. Taking AB as diameter draw another circle, which intersects first two circles at P and Q, and R and S.
5. Join B to P, B to Q, A to R and A to S. Thus BP, BQ, AR and AS are the required tangents.