

CHAPTER – 11 (CONSTRUCTION)

Hand Out

Module - $\frac{1}{1}$

Introduction – The geometrical constructions are done on the basis of some Mathematical reasoning.

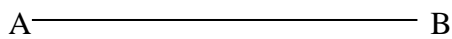
In this chapter we shall study some more constructions by using our previous knowledge.

1. Division of a line segment in a given ratio.

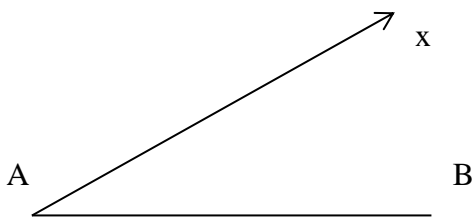
Construction – 1. Divide a line segment $AB=8\text{cm}$ in the ratio 2:3.

Steps of construction-

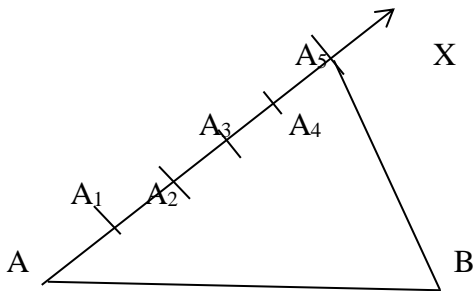
1. Draw a line segment $AB=8\text{cm}$ by using a ruler.



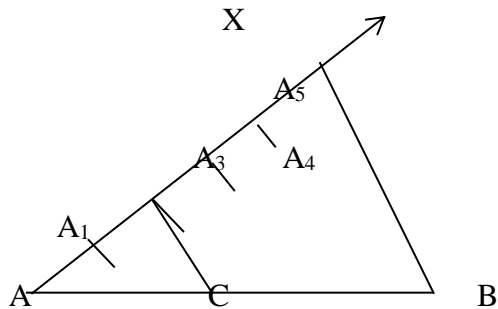
2. Draw a ray AX by making an acute angle with AB .



3. Along AX , we mark $AA_1 = A_1A_2 = A_2A_3 = A_3A_4 = A_4A_5$ with the help of a compass and join A_5B .



4. Draw a line parallel to A_5B from A_2 by making an angle equal to $\angle AA_5B$. The parallel line intersects AB at C .



$$AC : BC = 2 : 3$$

Justification-

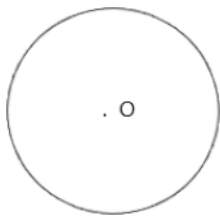
In $\triangle AA_5B$, $A_2C \parallel A_5B$, so by Thales's Theorem

$$\frac{AC}{CB} = \frac{AA_2}{A_2A_5} = \frac{2}{3}, \text{ so } AC : BC = 2 : 3$$

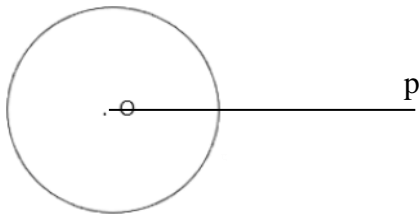
Construction -2. Construct a pair of tangents to a circle of radius 3 cm from a point 8cm away from the centre,

Steps of construction-

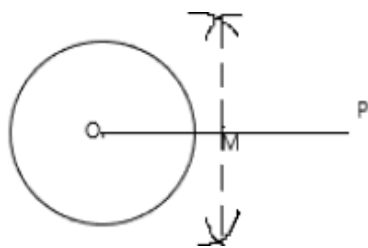
1. Draw a circle of radius 3cm with the help of a compass and name the centre O.



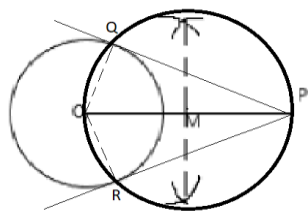
2. Take a point P 8 cm away from O ie OP.



3. Draw a perpendicular bisector of OP, M is the midpoint of OP.



4. Taking M as a centre and $OM = PM$ as radius, draw a circle which passes through O and P and intersects the circle at Q and R.



PQ and PR are the tangents.

Justification:-

In the circle with the centre as O, OP is the diameter

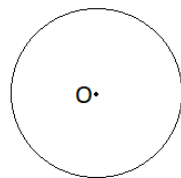
$$\angle OQP = \angle ORP = 90^\circ \text{ [angle at the semicircle is a right angle]}$$

So, PQ and PR are the tangents. [The line which makes a right angle with the radius at the point of contact is a tangent]

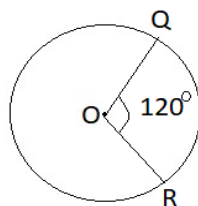
Construction 3: Draw a pair of tangents to a circle of radius 3cm, which are inclined at 60° .

Steps of construction:

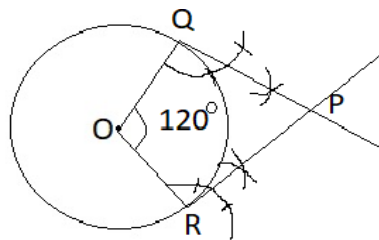
1. Draw a circle of radius 3cm and centre O



2. Draw the radii OQ and OR such that angle QOR = 120°



3. Draw a right angle at Q and R, which intersect at P



Justification:-

$$\angle OQP = \angle ORP = 90^\circ \text{ (The tangent at the point of contact is perpendicular to the radius)}$$

$$\angle O + \angle Q + \angle R + \angle P = 360^\circ \text{ [Angle Sum property of a quadrilateral]}$$

$$\angle O + 90^\circ + 90^\circ + 60^\circ = 360^\circ$$

$$\angle O = 360^\circ - 240^\circ = 120^\circ$$

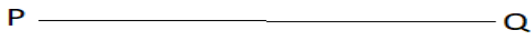
$$\text{since, } \angle OQR = \angle ORP = 90^\circ$$

PQ and PR are tangents. [The line which makes a right angle with the radius at the point of contact is a tangent]

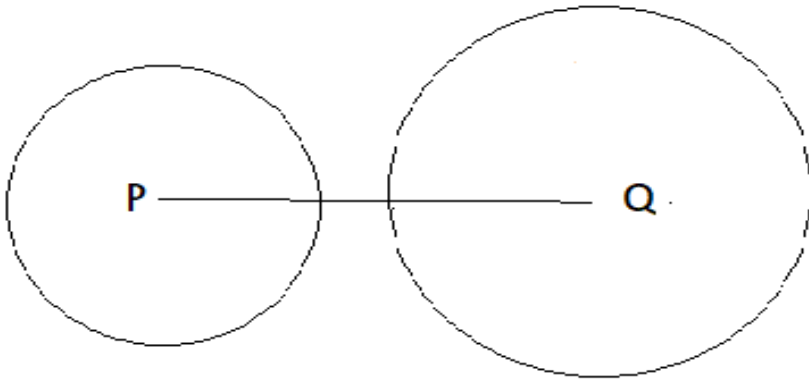
Construction-4 :- Draw a line segment PQ of length 7.5cm. Taking P as a centre draw a circle of radius 3cm and taking Q as centre draw a circle of radius 4cm. Construct the tangents to each circle from the centre of the other circle.

Steps of construction:-

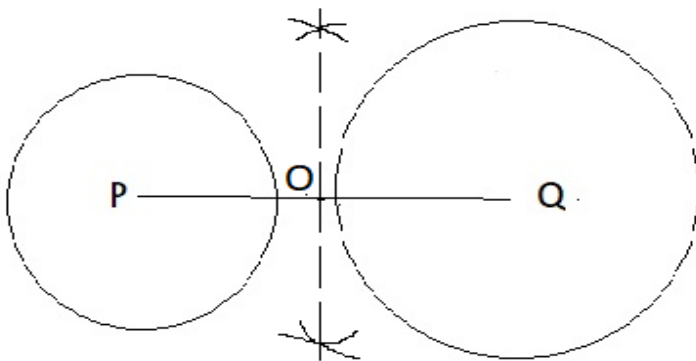
1. First draw a line segment $PQ=7.5\text{cm}$ with the help of a ruler.



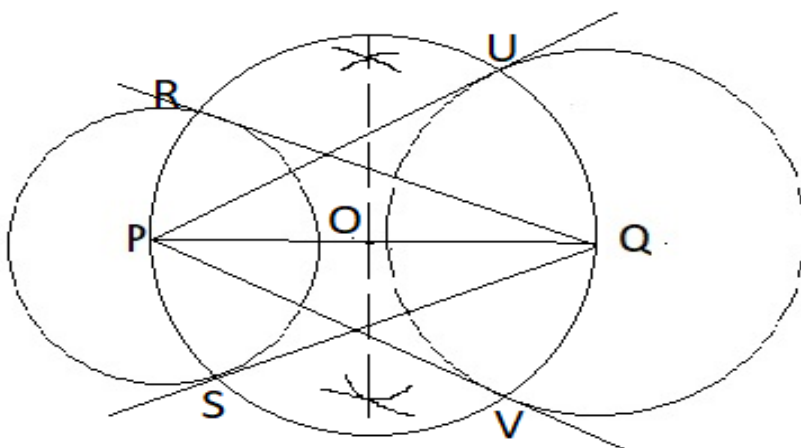
2. Draw a circle of radius 3cm with centre P and another circle of radius 4cm with centre Q.



3. Draw a perpendicular bisector of PQ, O is the midpoint.



4. Draw a circle with centre O, and radius $OP=OQ$, It intersect the circle with centre P at R and S, circle with centre Q at U and V. And Join QR and RS, PU and PV. QR, QS, PU and PV are the tangents.

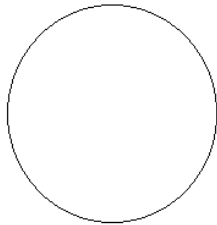


Construction 5

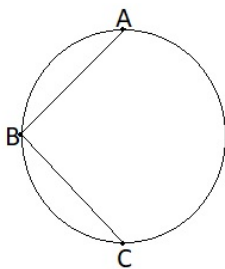
Draw a circle with the help of a bangle. Take a point outside of the circle. Construct a pair of tangents from the point to a circle.

Steps of Construction

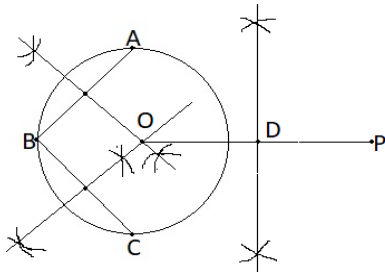
1. First marks a circle with the help of a bangle.



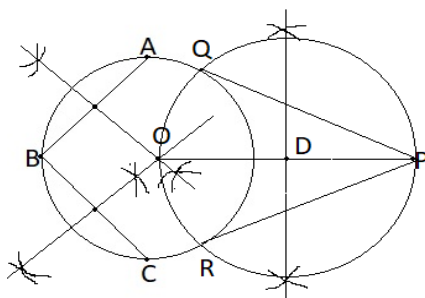
2. Take three points A, B and C on the circle and join AB and BC.



3 Draw the perpendicular bisectors of AB and BC and where they meet together is the centre of the circle and name it 'O'. Take a point P in the exterior of the circle and join OP and bisect and name the mid-point D.



4. Draw a circle with centre D and Radius $OD=DP$ which intersects the circle with centre O at Q and R, join PQ and PR. PQ and PR are the required tangents.



WHAT WE HAVE LEARNT:-

1. To divide a line segment in a given ratio and its justification.
2. To construct a pair of tangents from an external point to a circle with justification.

ASSIGNMENTS:-

1. Draw a line segment AB of length 6.5cm and divide it in the ratio 4:3.
2. Draw a line segment PQ of length 5.8cm and divide it in the ratio 5:3.
3. Draw a circle of radius 2.5 cm with centre O and take a point P outside the circle such that $OP = 5$ cm. From P, draw a pair of tangents to the circle.
4. Draw a circle of radius 3.2cm. Draw a pair of tangents to this circle inclined to each other at an angle of 45° .
5. Draw a line segment $AB = 8.5$ cm. With A as centre, draw a circle of radius 3.5cm and B as a centre draw another circle of radius 3cm. From the centre of each circle, draw a pair of tangents to the other circle.
6. Draw two concentric circles of radius 3.5cm and 5.5cm. Construct a tangent to the smaller circle from a point on the larger circle.
7. Draw a circle of radius 3cm. Draw a tangent to the circle making an angle of 30° with a line passing through the centre.
8. Draw a circle of radius 3.5cm. Take two points P and Q on one of its extended diameter, each at a distance of 7cm from its centre. Draw tangents to the circle from each of these points P and Q.

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