ATOMIC ENERGY CENTRAL SCHOOL

Class-10

Subject- Mathematics

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=8cm in the ratio 2:3.

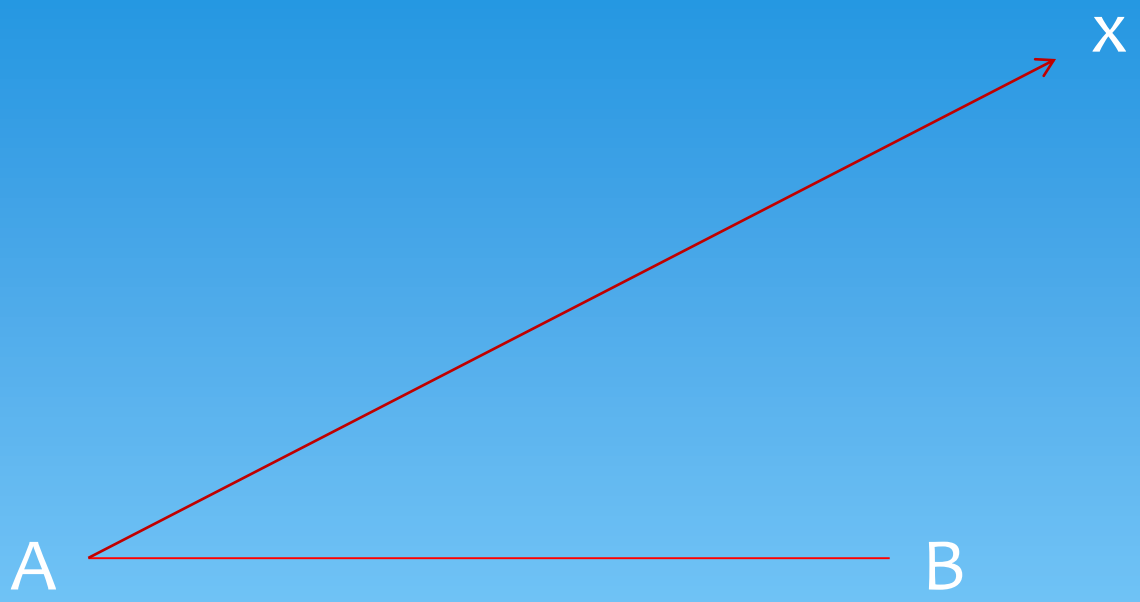
Steps of construction-

1. Draw a line segment AB=8cm by using a ruler.

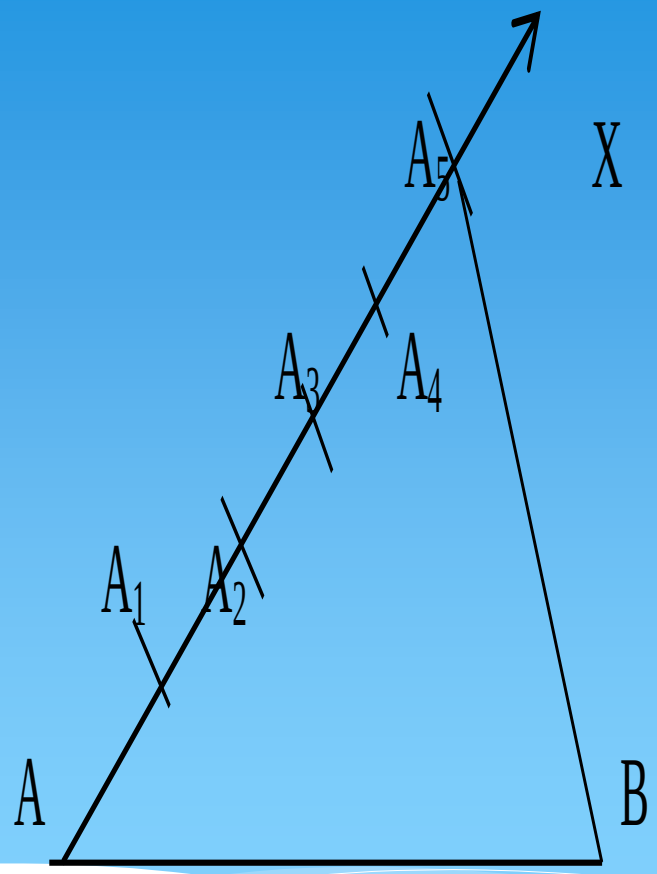
A ——————————— B

3..

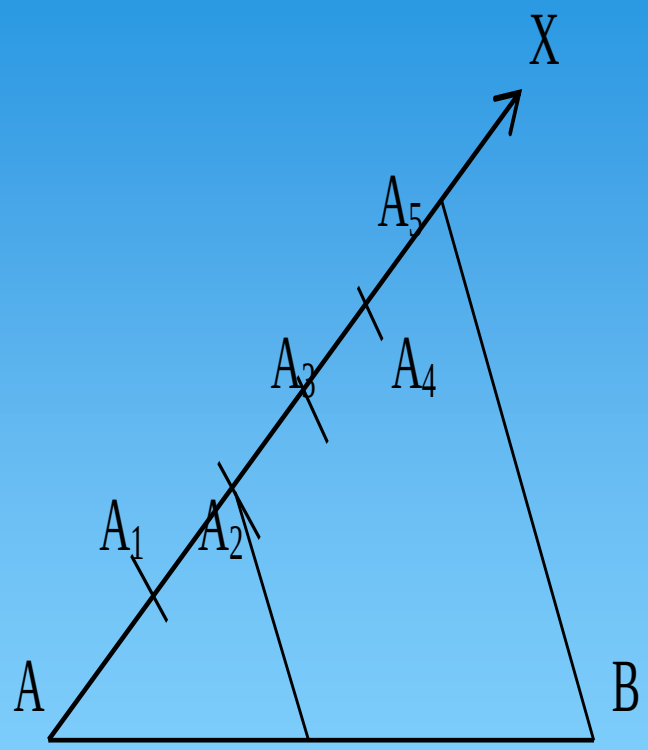
2.Draw a ray AX by making an acute angle with AB.



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 intersect AB at C.



AC:BC =2:3

Justification-

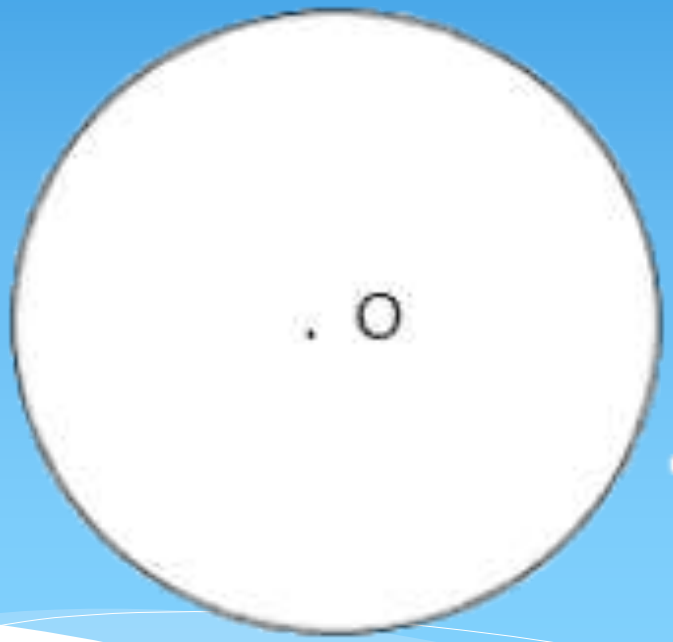
In ΔAA_5B , $A_2C \parallel A_5B$,so by Thales's Theorem

$\frac{AC}{CB} = \frac{AA2}{A2A5} = \frac{2}{3}$,so AC : BC = 2 : 3

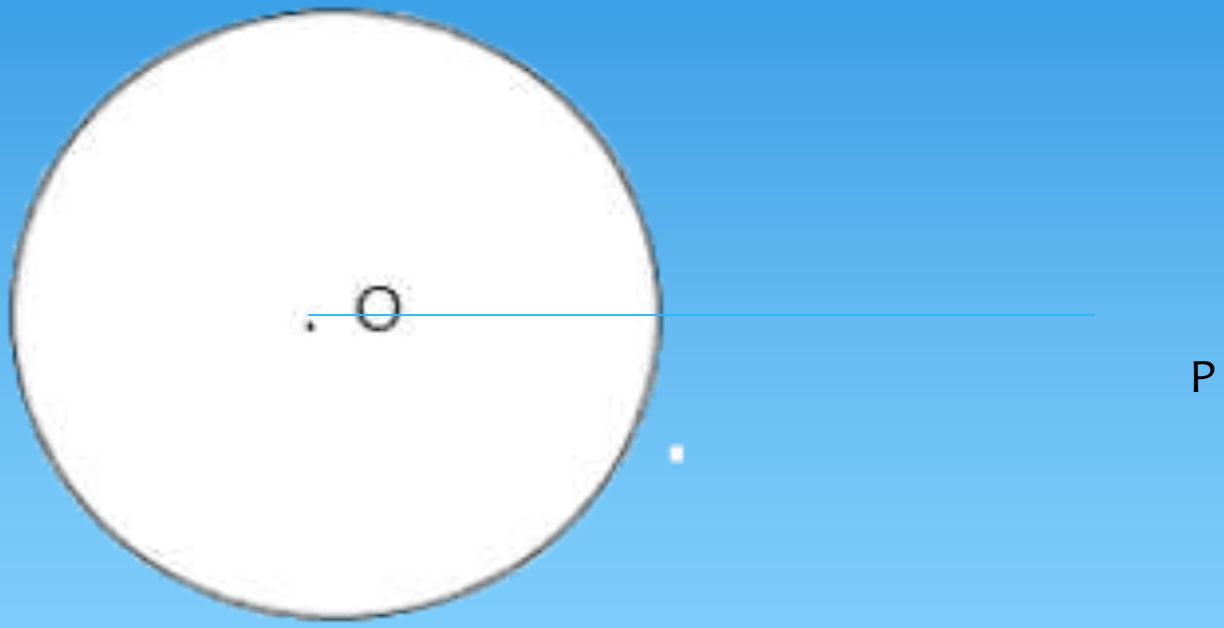
Construction -2. Construct a pair of tangents to a circle of radius 3 cm from a point 8cm away from the centre,

Steps of construction-

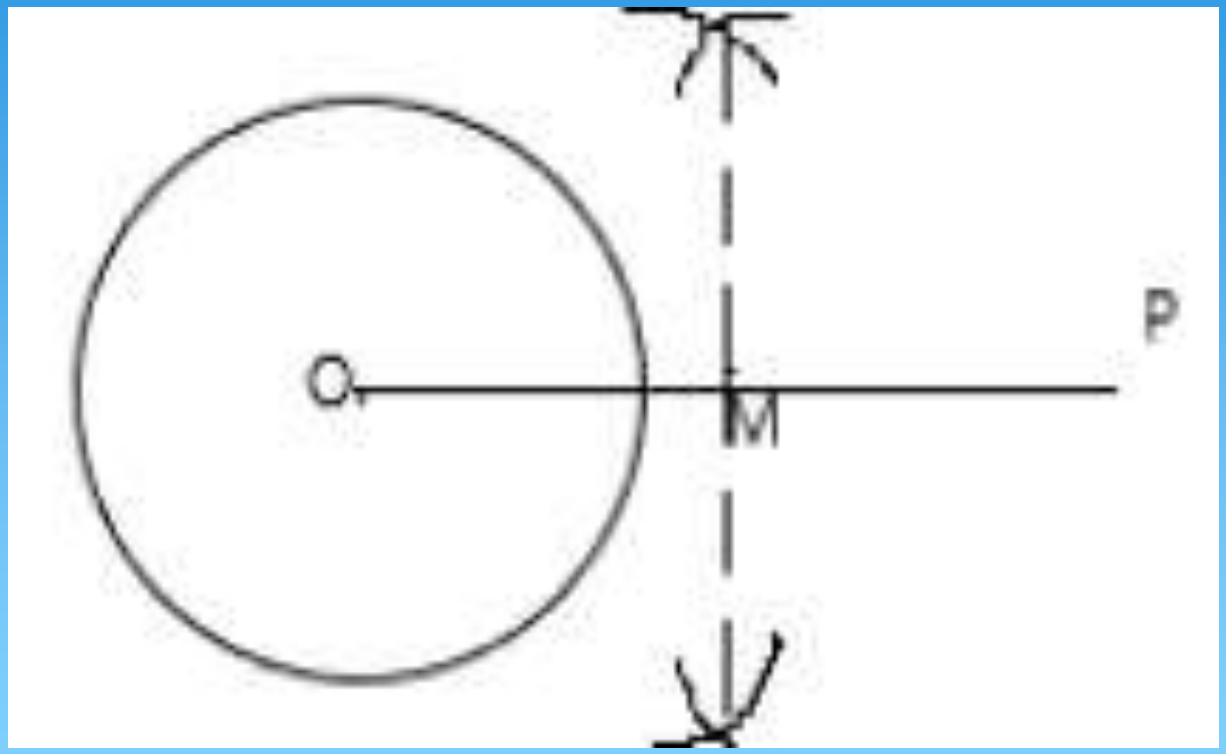
1.Draw a circle of radius 3cm with the help of a compass and name the centre O.



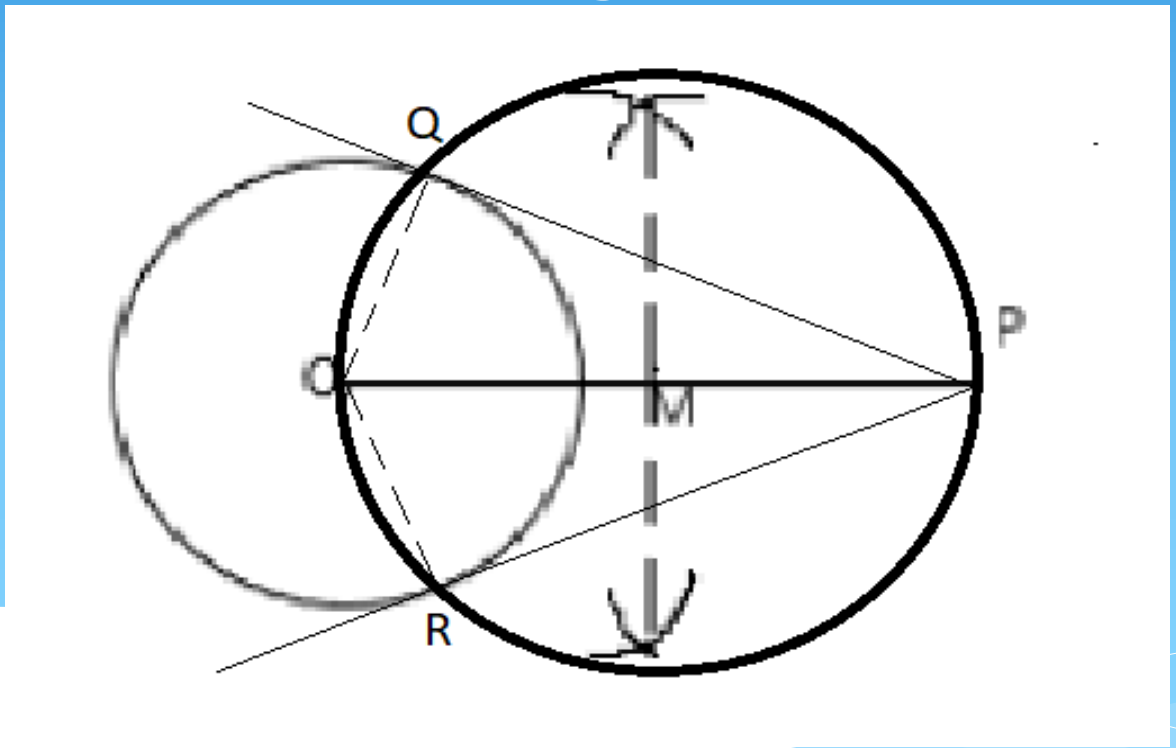
2. Take a point P 8 cm away from O ie OP.



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 OP 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

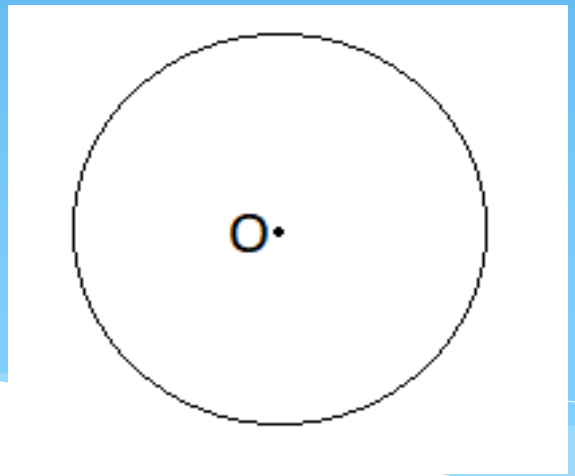
$\angle OQP = \angle ORP = 90^\circ$ [angle at the semicircle is a right angle]

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.]

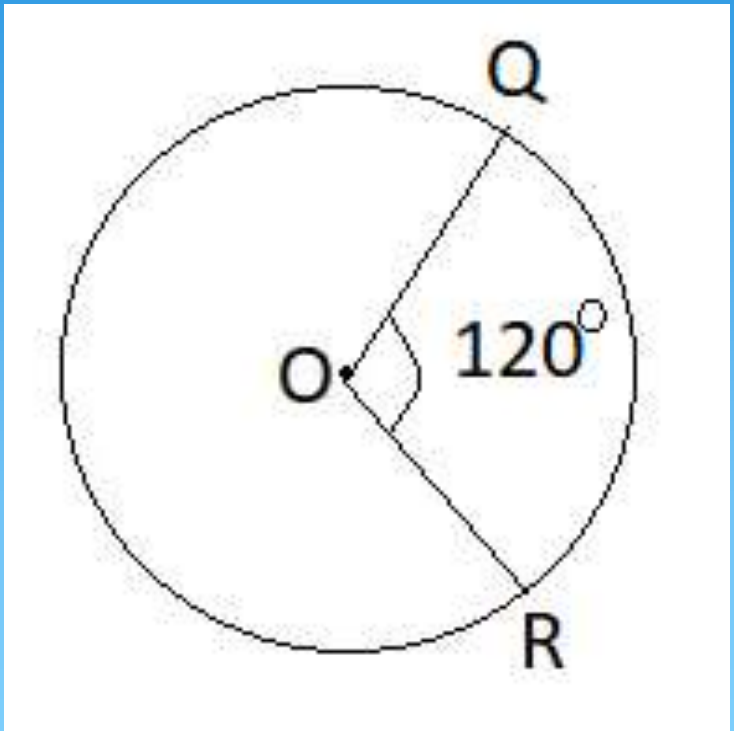
Construction 3: Draw a pair of tangents to a circle of radius 3cm, which are inclined at 60° .

Steps of construction:

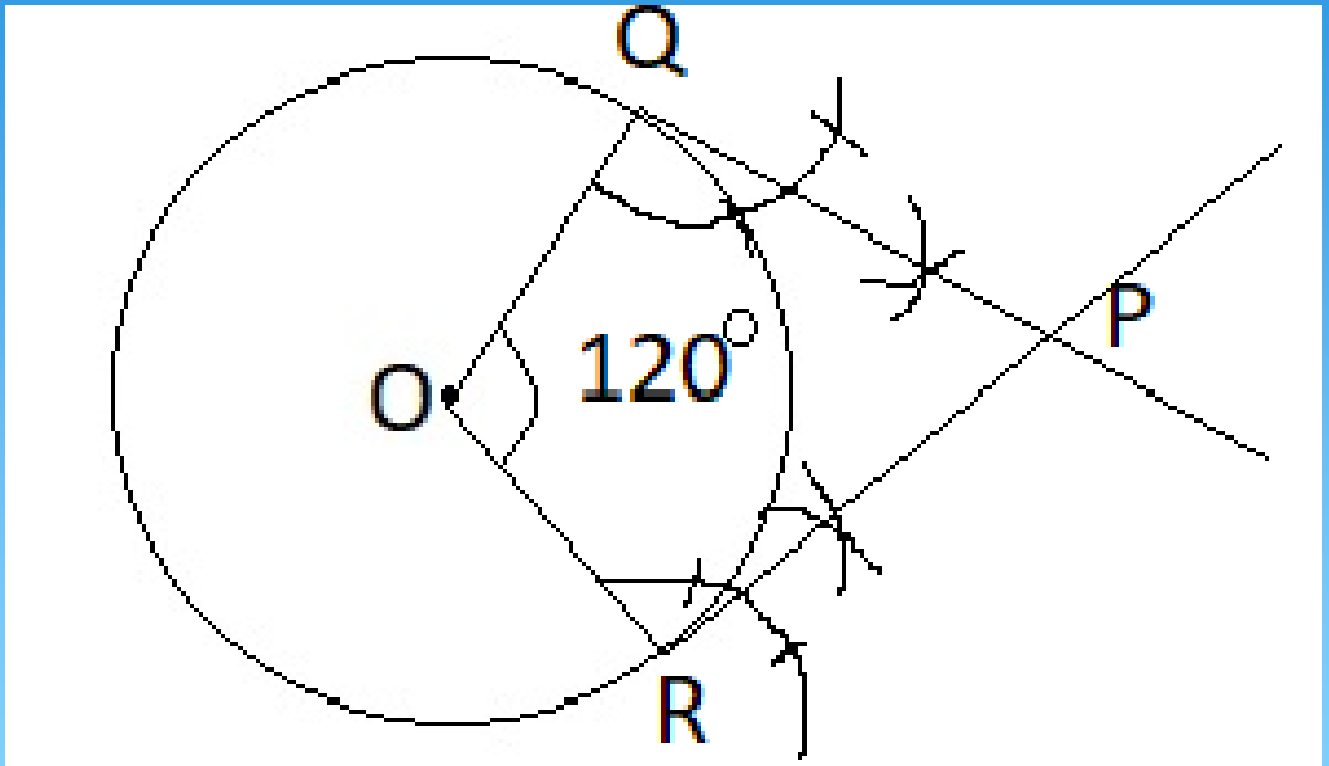
1. Draw a circle of radius 3cm and centre O



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:-

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

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

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

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

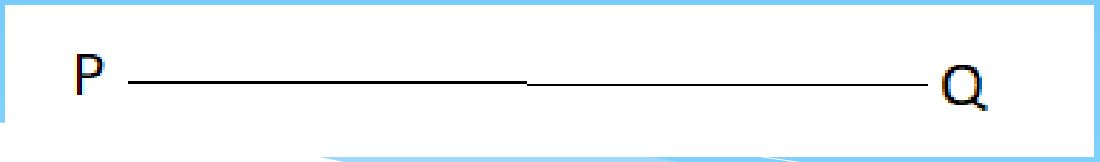
since, $\angle OQR = \angle ORP = 90^\circ$

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

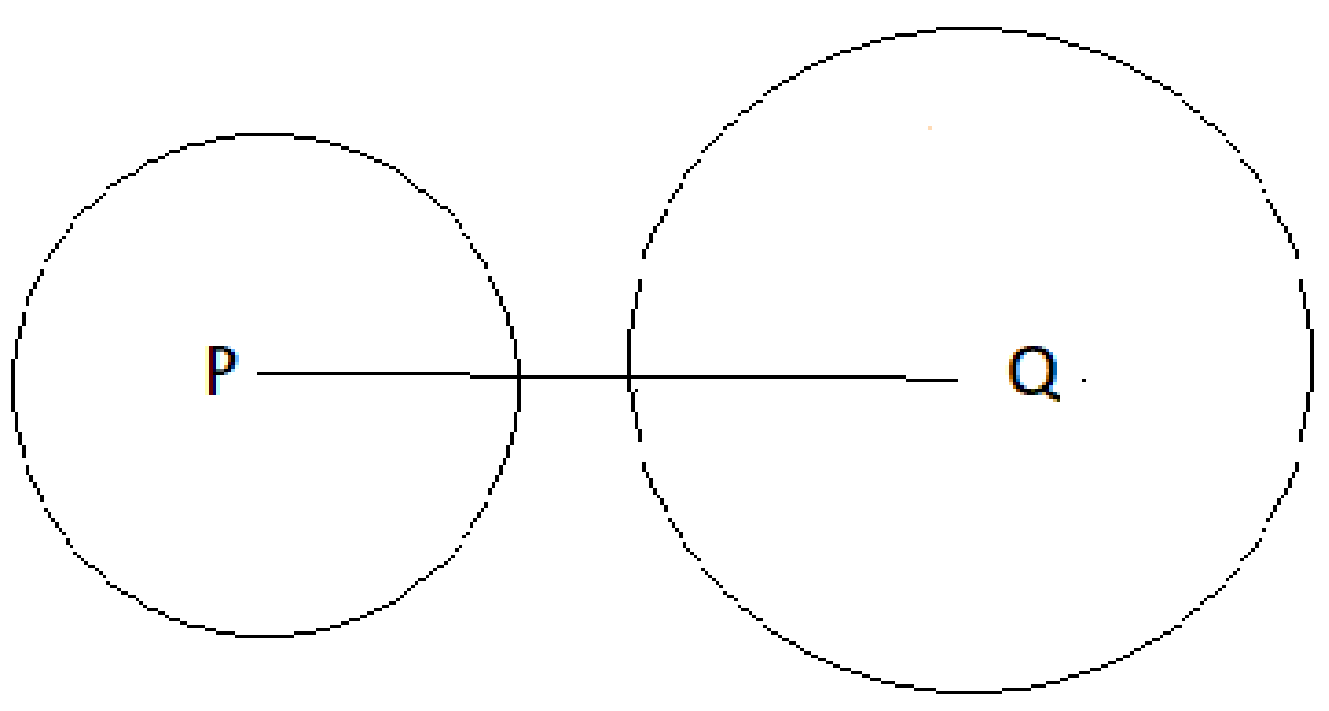
Construction-4 :- Draw a line segment PQ of length 7.5cm.Taking P as a centre draw a circle of radius 3cmand taking Q as centre draw a circle of radius 4cm.Construct the tangents to each circle from the centre of the other circle.

Steps of construction:-

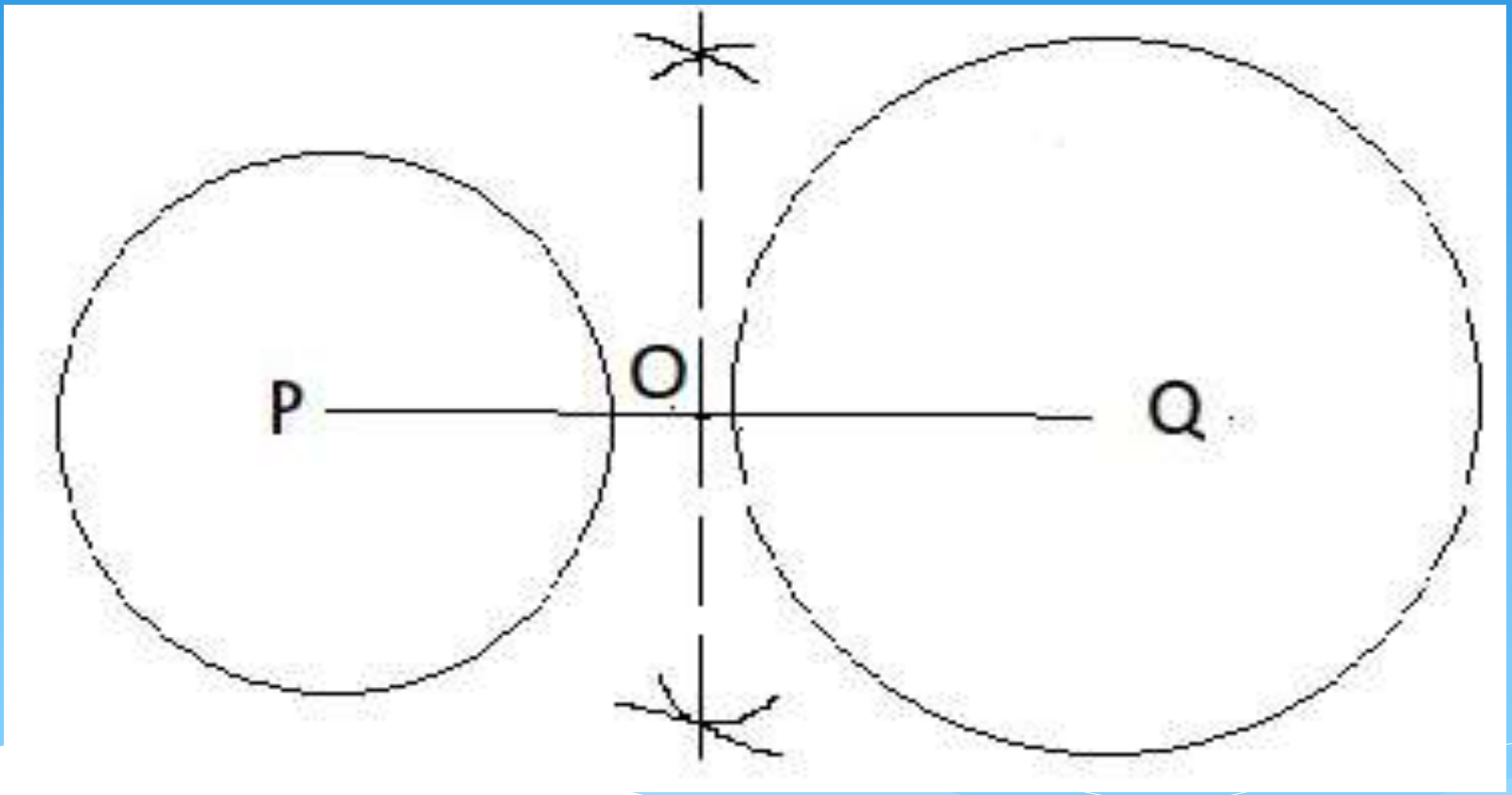
1. First draw a line segment PQ=7.5cm with the help of a ruler.



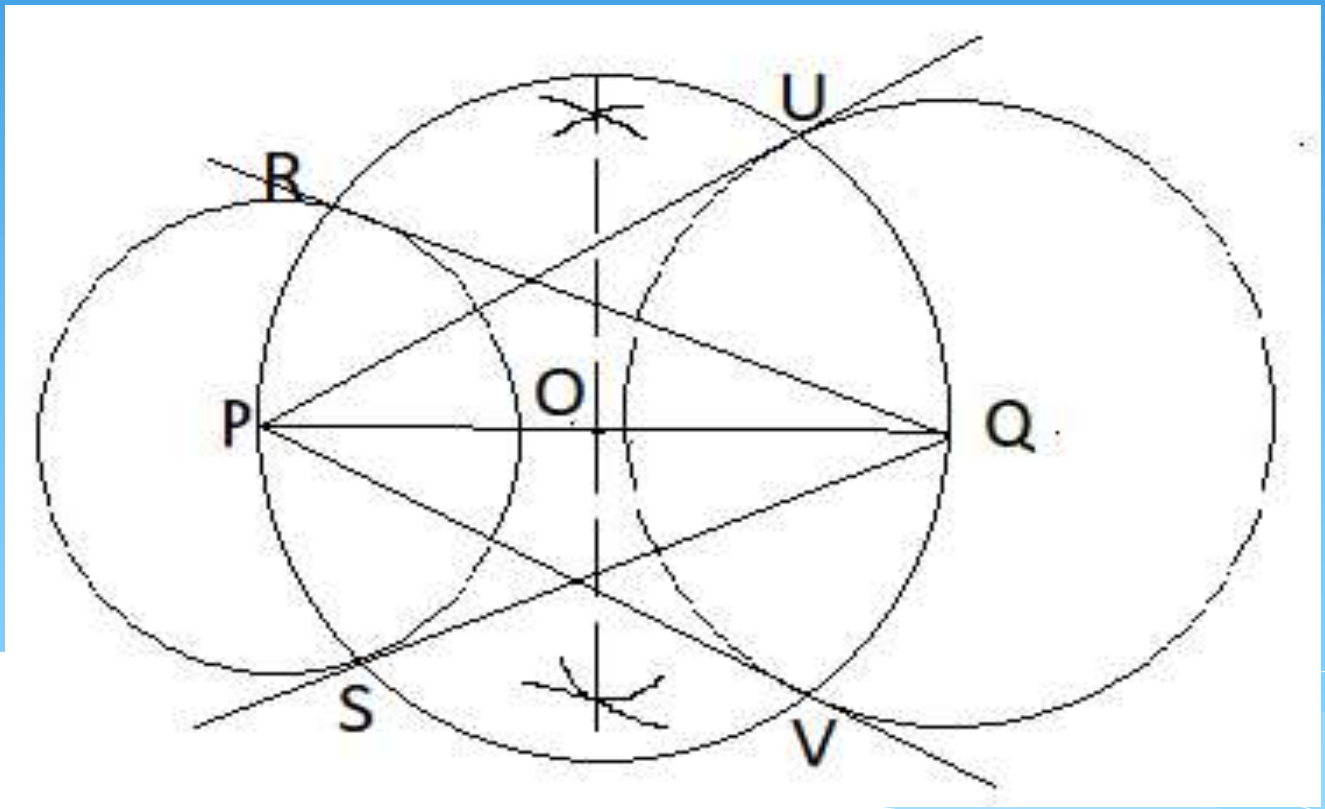
2. Draw a circle of radius 3cm with centre P and another circle of radius 4cm with centre Q.



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.

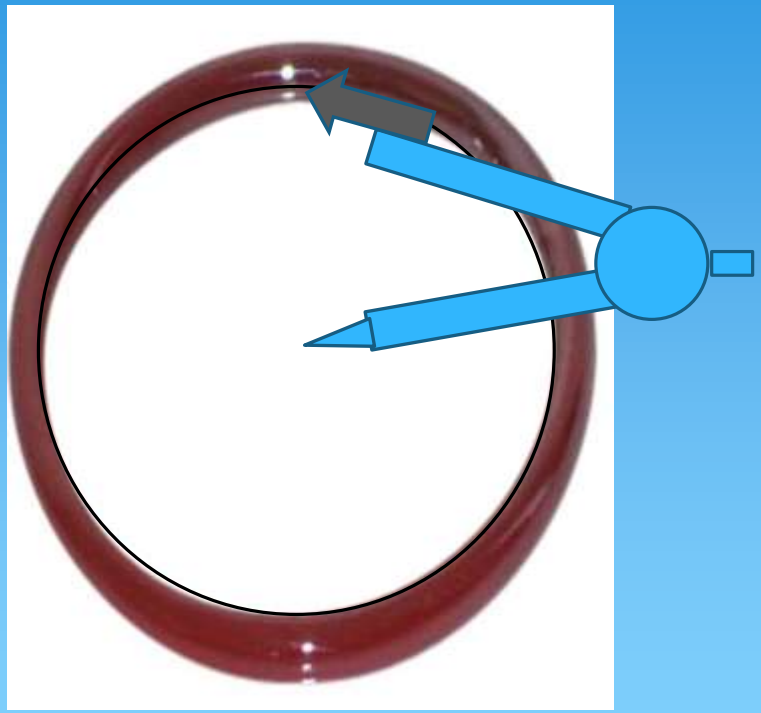


Construction 5

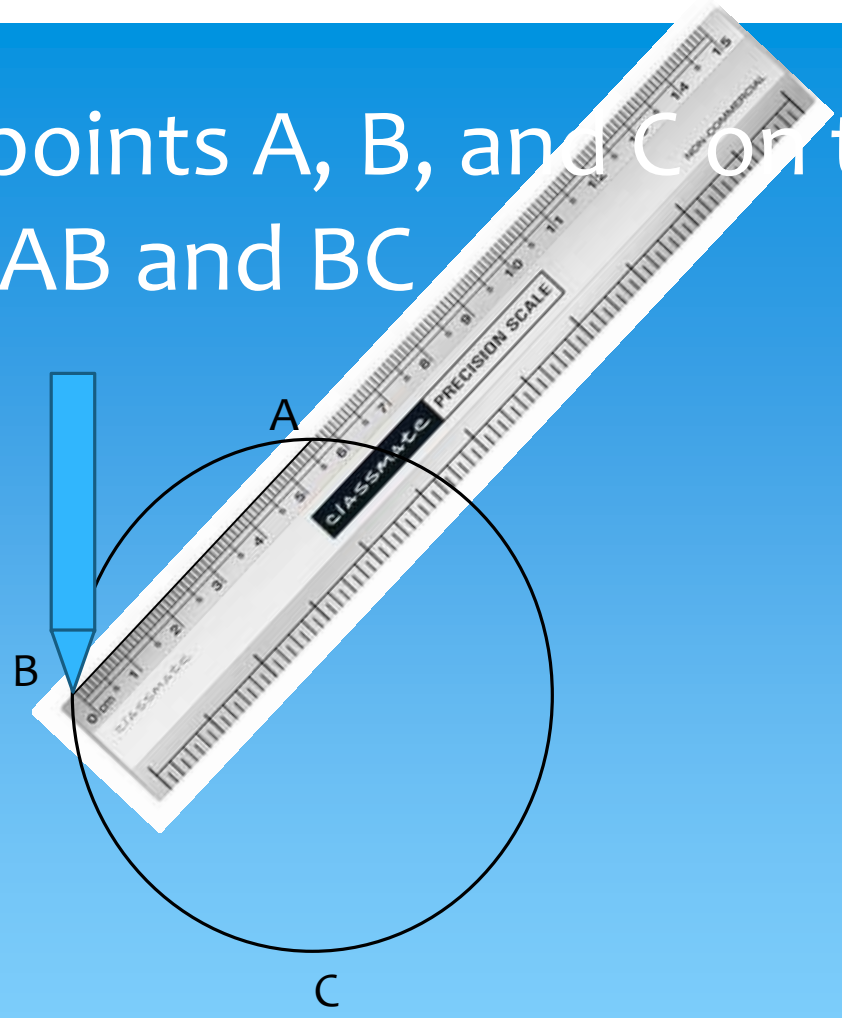
Draw a circle with the help of a bangle. Take a point outside of the circle. Construct a pair of tangents from the point to a circle.

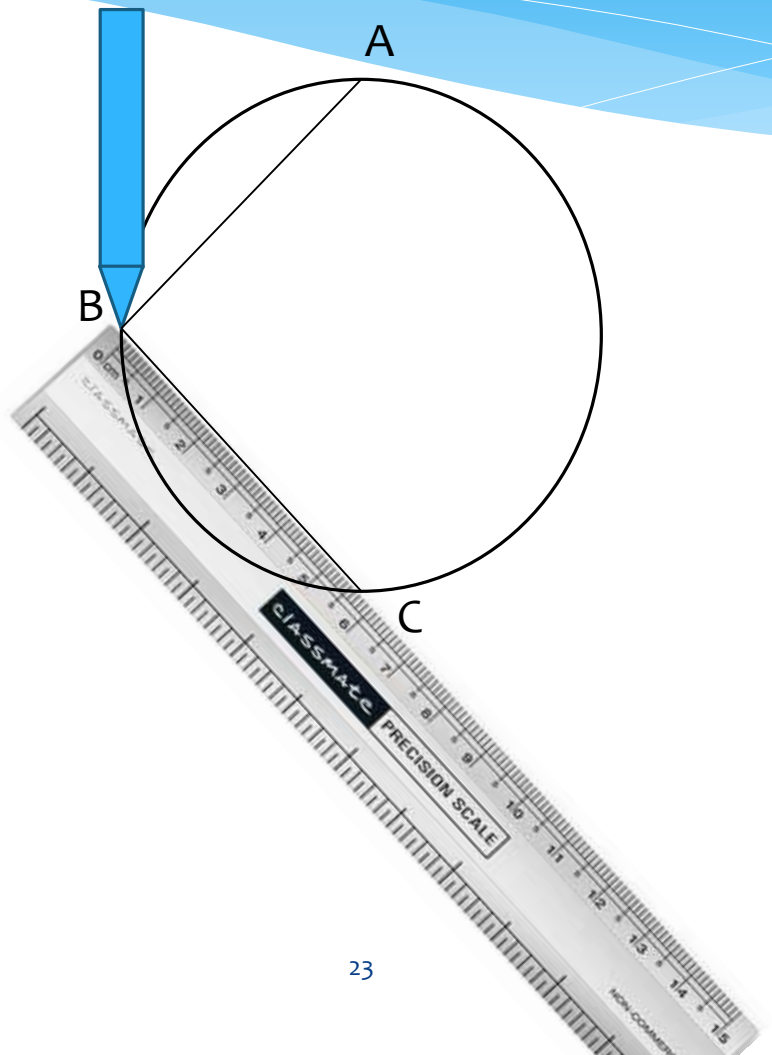
Steps of Construction:

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

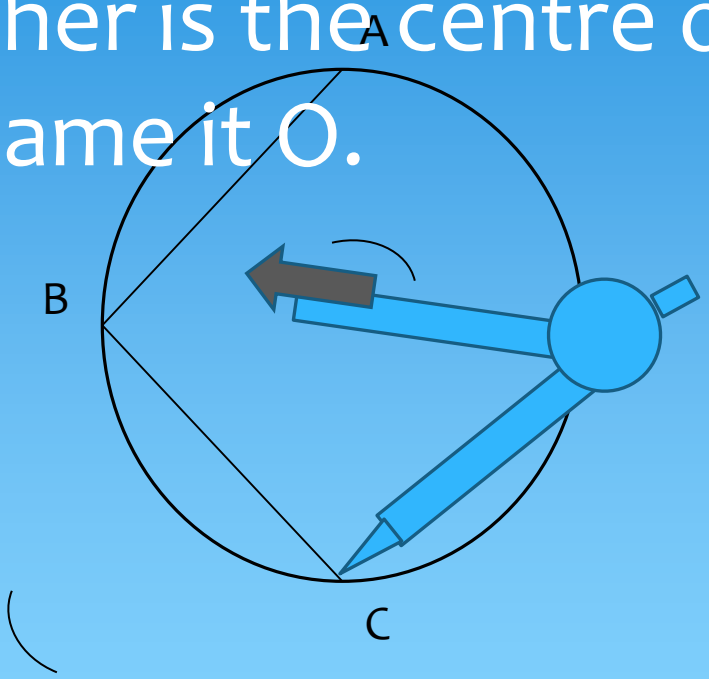


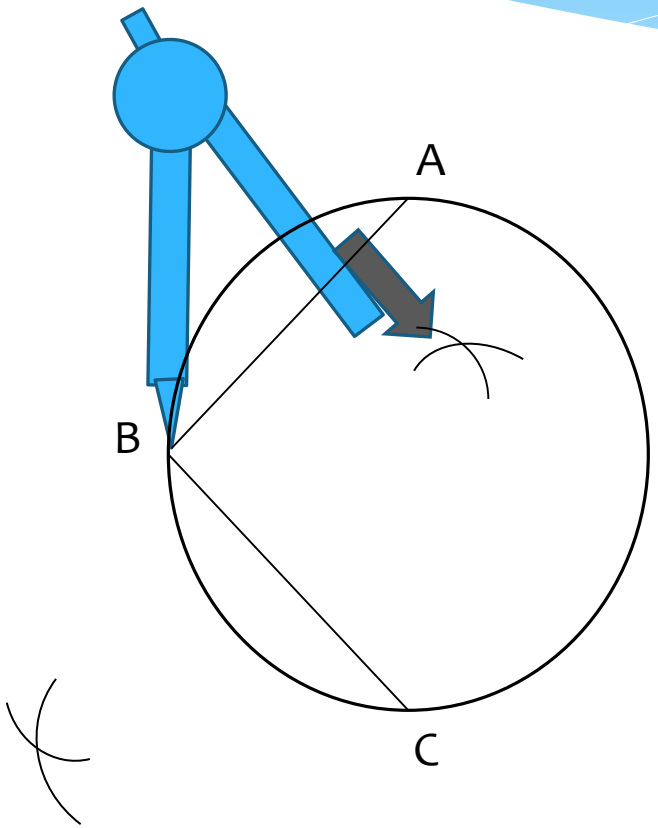
2. Take Three points A, B, and C on the circle and join AB and BC

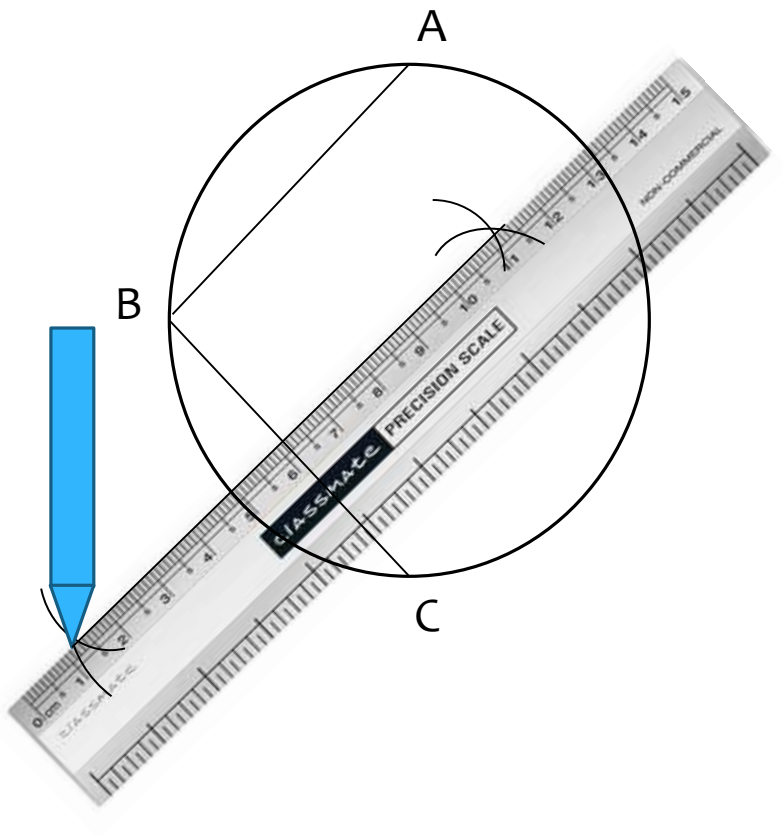


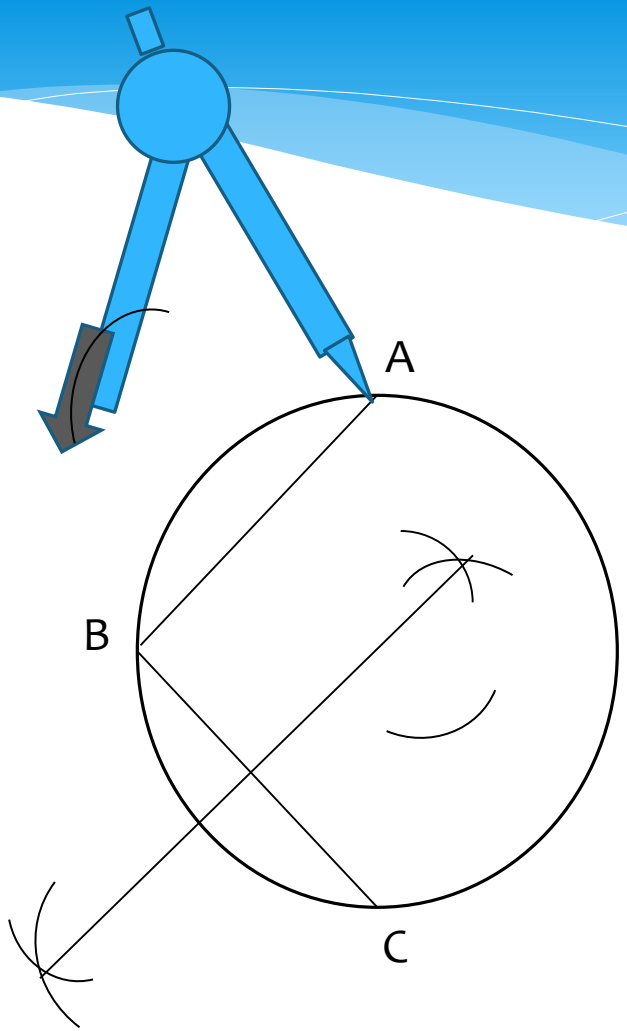

A
B
C
CLASSMATE
PRECISION SCALE

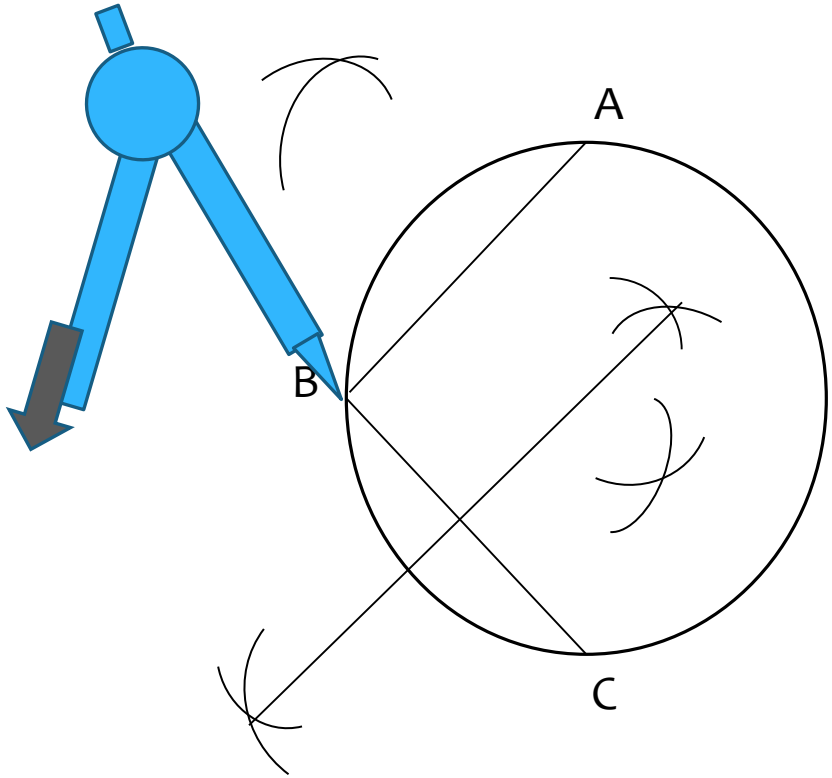
Draw the perpendicular bisectors of AB and BC and where they meet together is the centre of the circle and name it O.

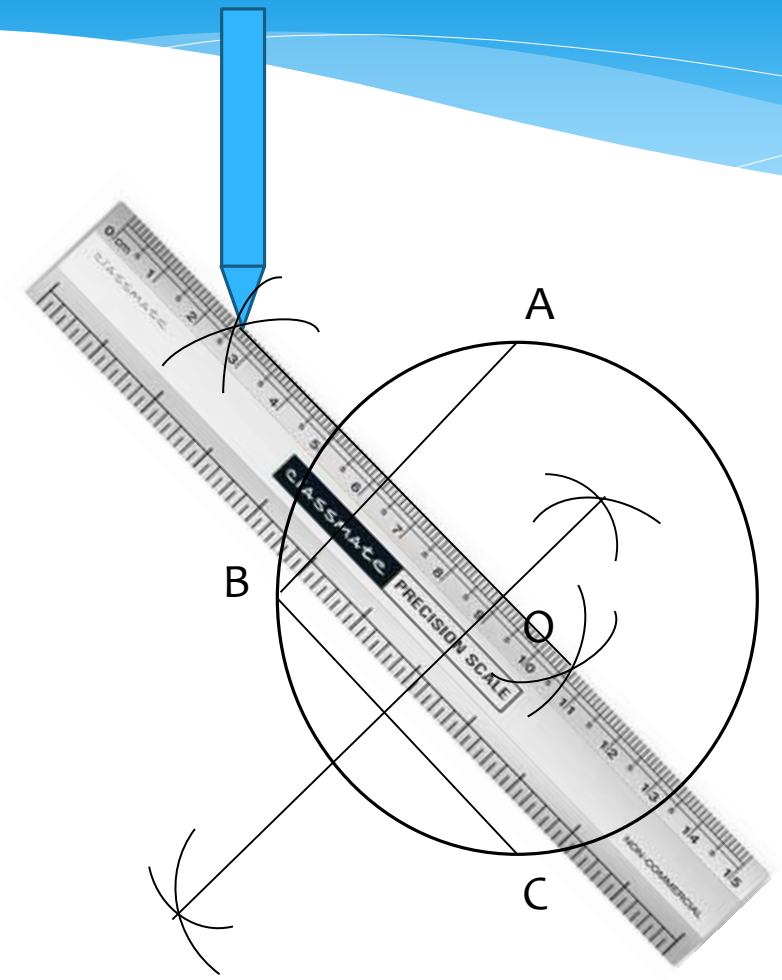



A
B
C

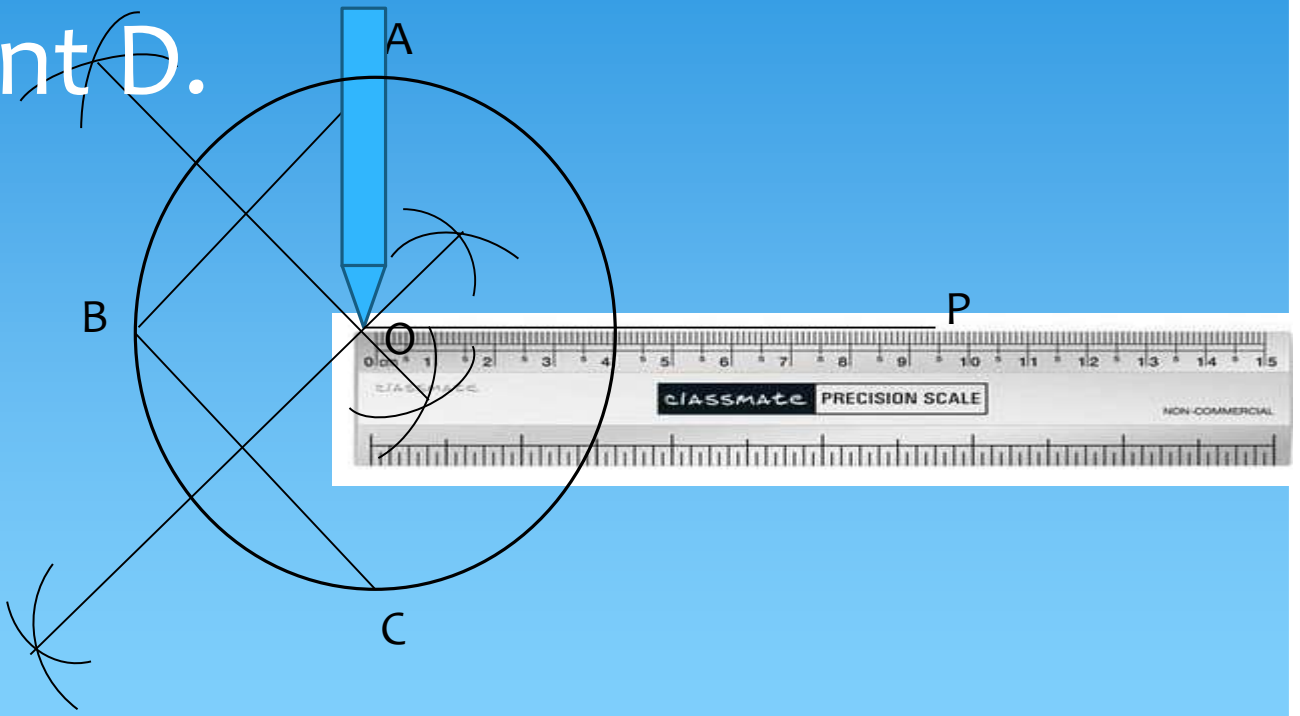

A
B
C
PRECISION SCALE
CLASSMATE
NON-COMMERCIAL

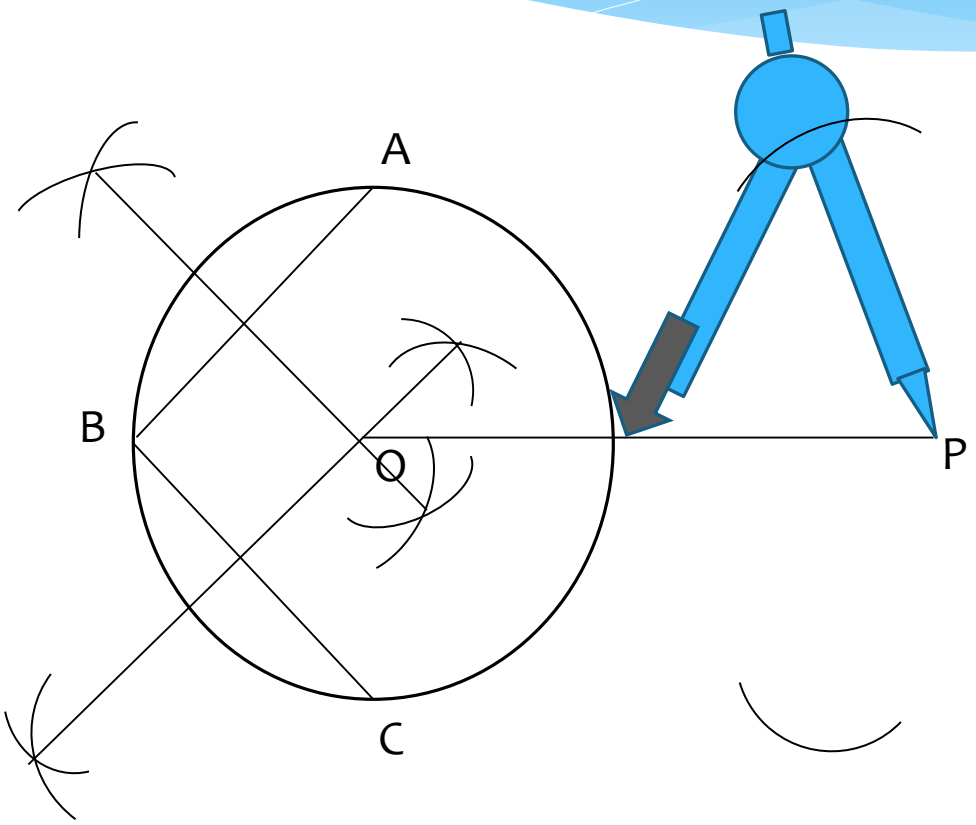

A
B
C

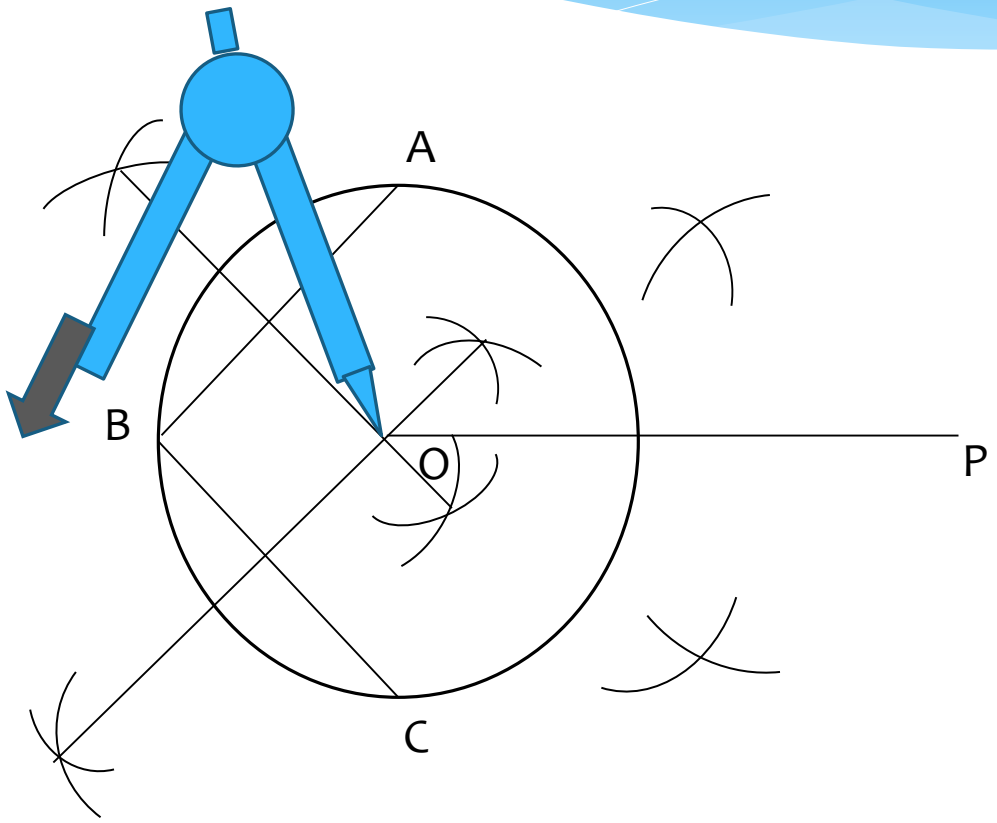

A
B
C

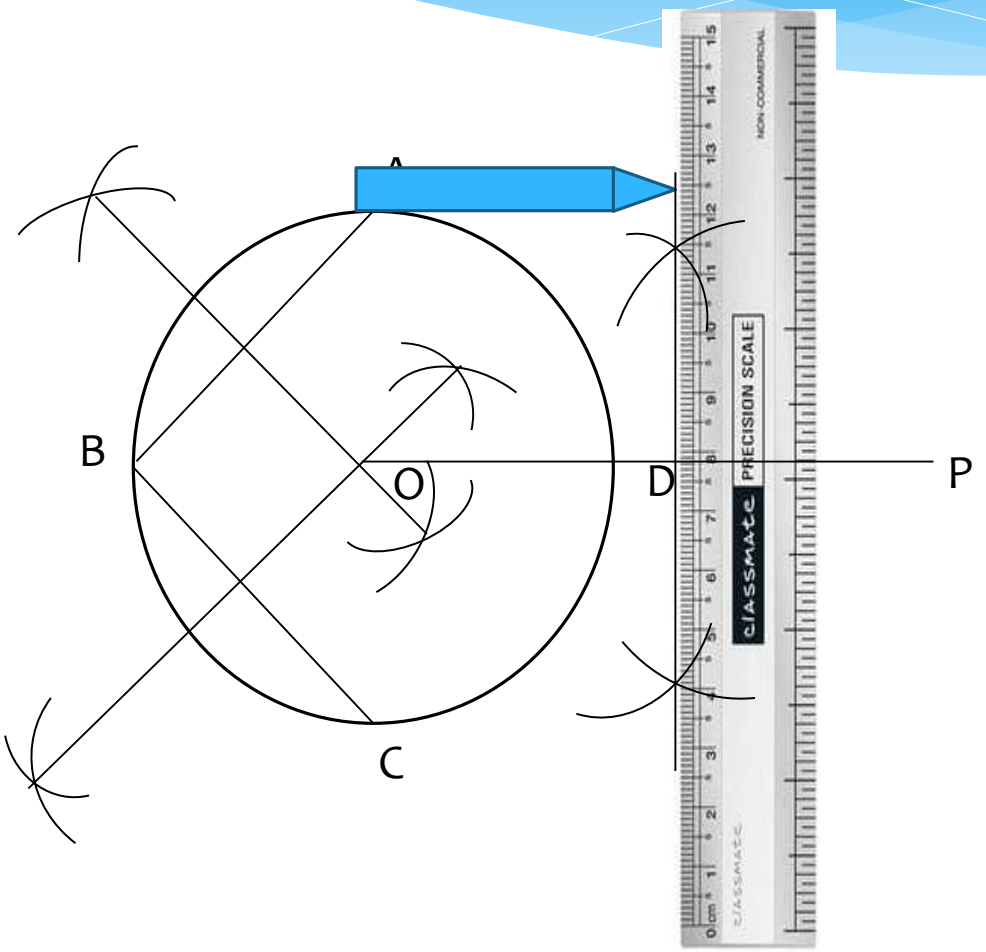

A
B
O
C
CLASSMATE
PRECISION SCALE
NON-COMMERCIAL

4. Take a point P in the exterior of the circle and join OP and Bisect and name the mid point D.

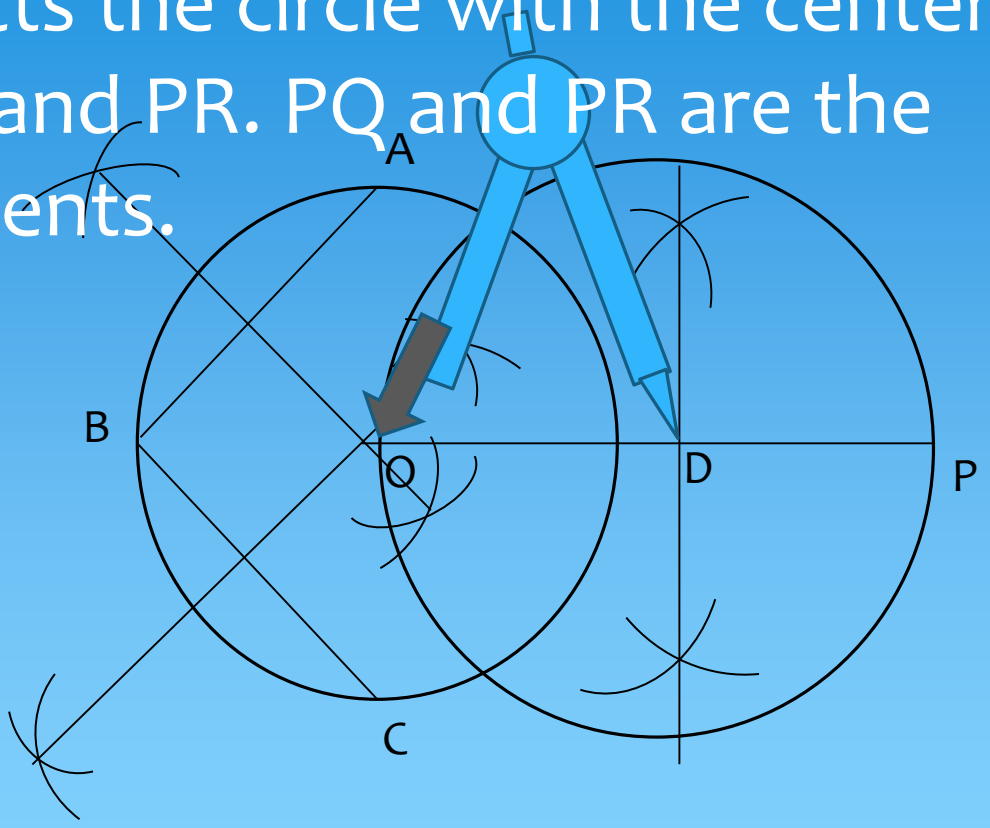


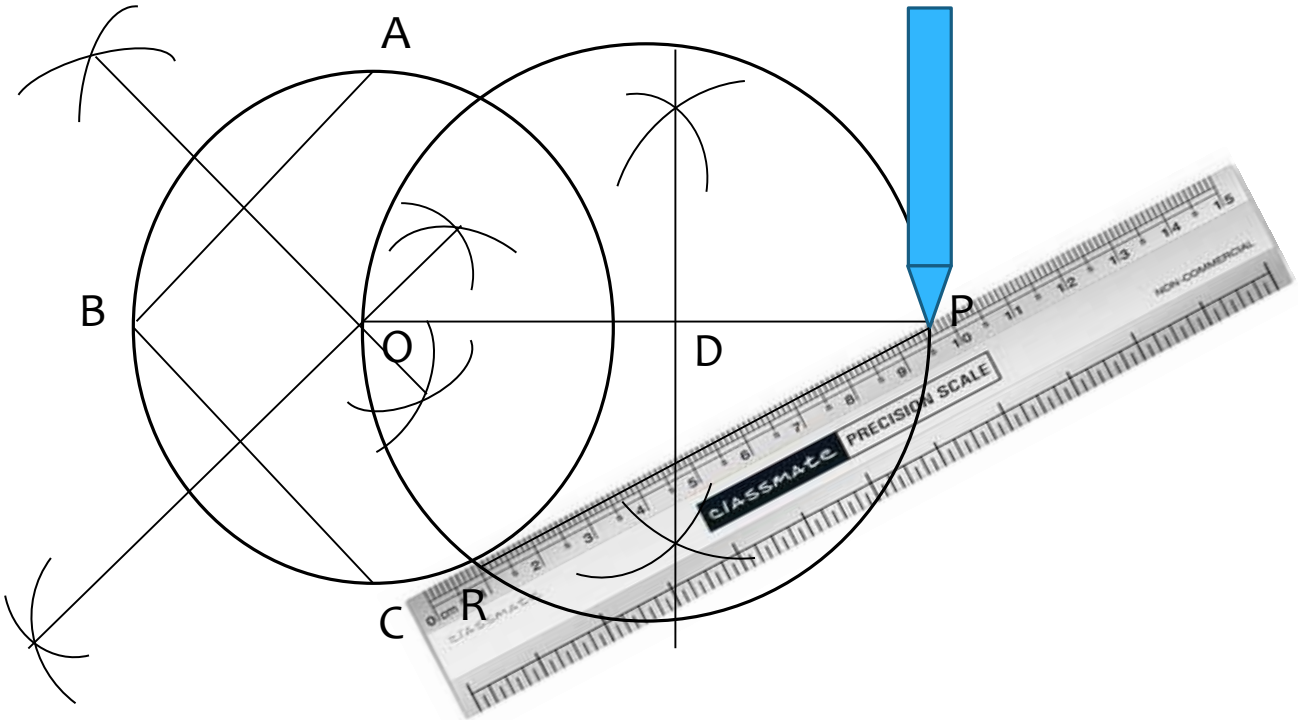

A
B
O
P
C

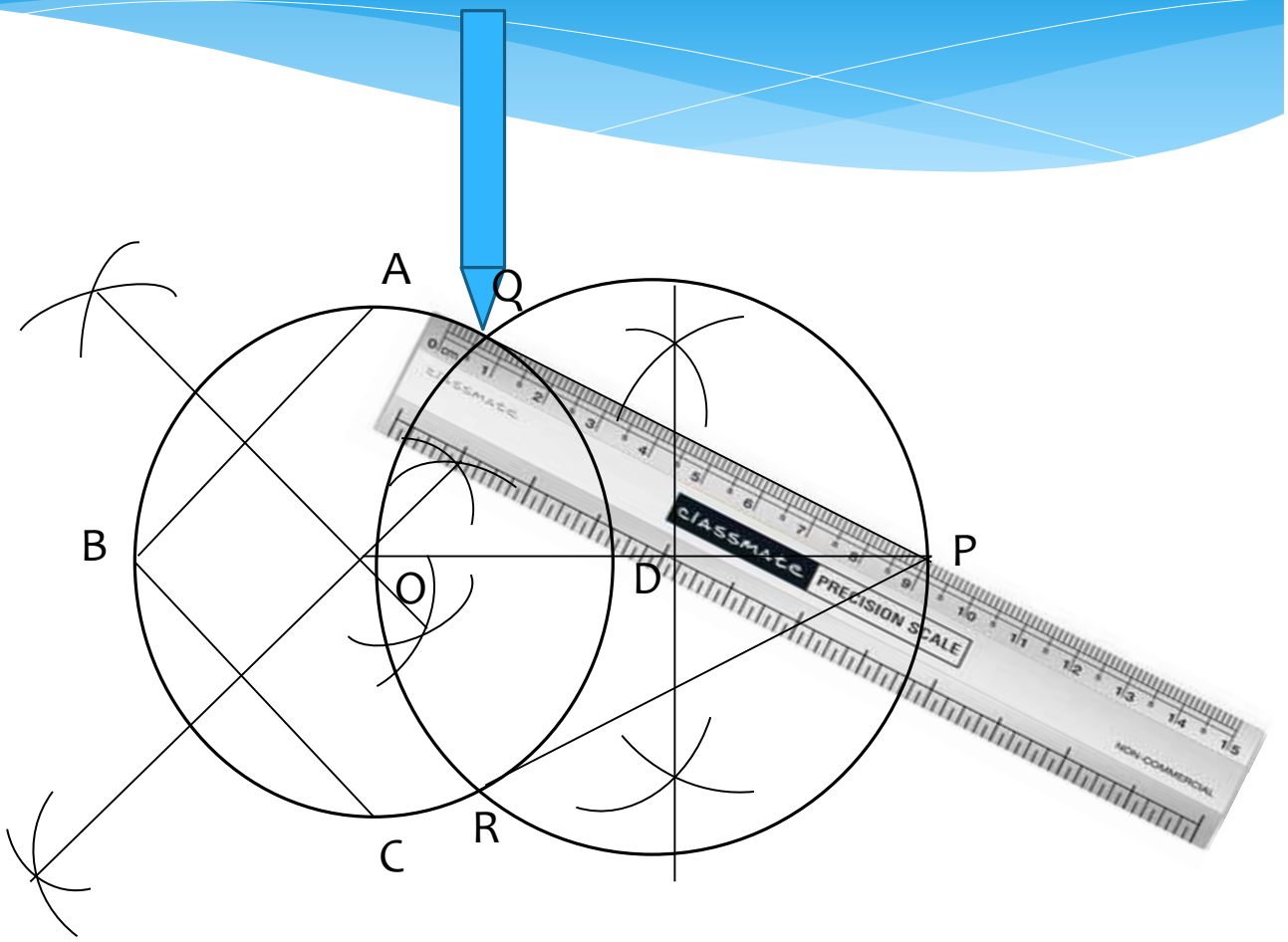

A
B
O
P
C

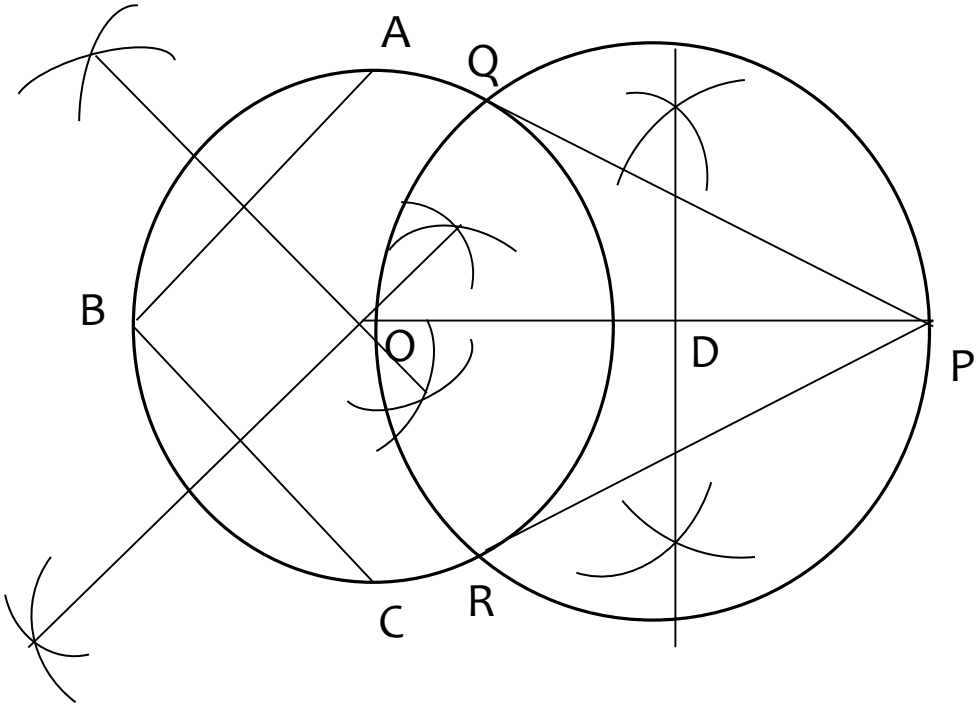

A
B
O
D
P
C
classmate
PRECISION SCALE
NON-COMMERCIAL

5. Draw a circle with centre D and radius OD = DP which intersects the circle with the center O at Q and R join PQ and PR. PQ and PR are the Required tangents.




A
B
O
D
P
C
R
CLASSMATE
PRECISION SCALE
NON-COMMERCIAL


A
Q
B
O
D
P
C
R
CLASSMATE
PRECISION SCALE
NON-COMMERCIAL


A
Q
B
O
D
P
C
R

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= 5cm.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^{0}.

5.Draw a line segment AB=8.5cm .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.

G.P.Jana

AECS-Jadugoda