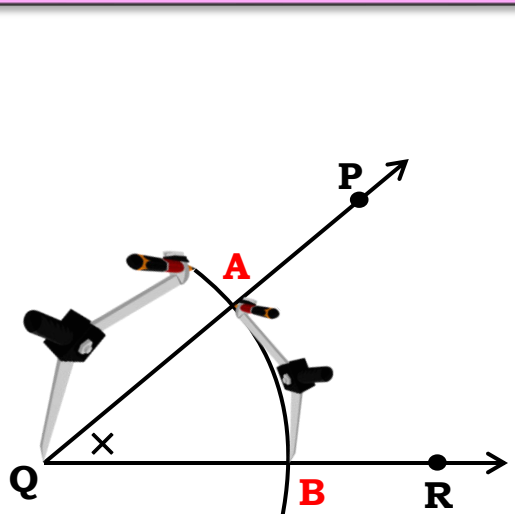
Module 1

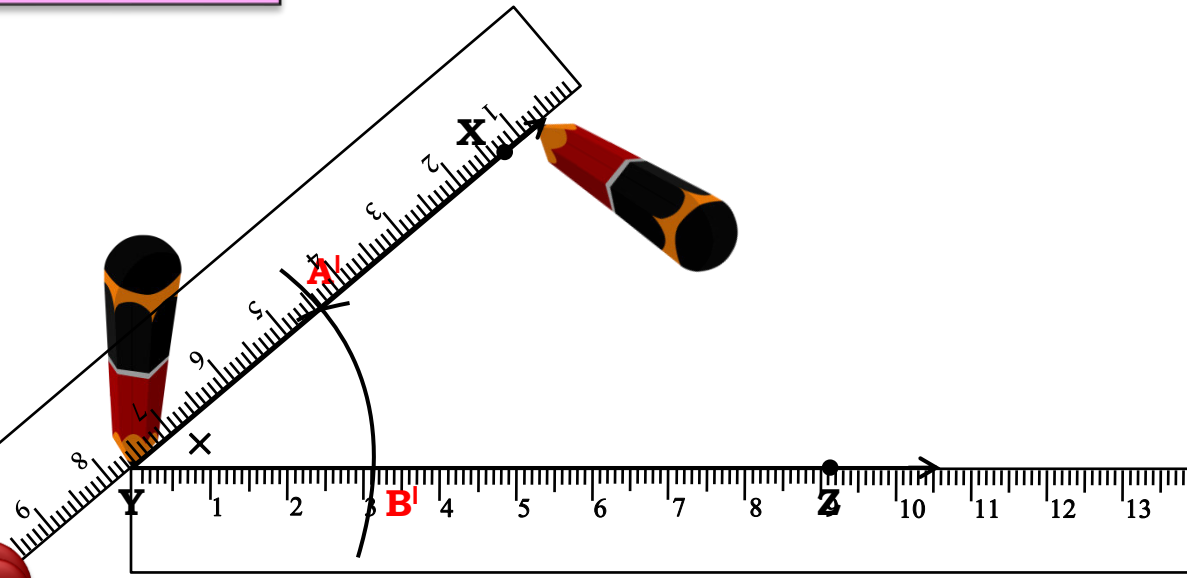
CONSTRUCTIONS

- To construct equal angles
- To divide line segment into given equal parts

BASIC CONSTRUCTIONS

To construct an angle equal to the given angle.





Y as centre and same

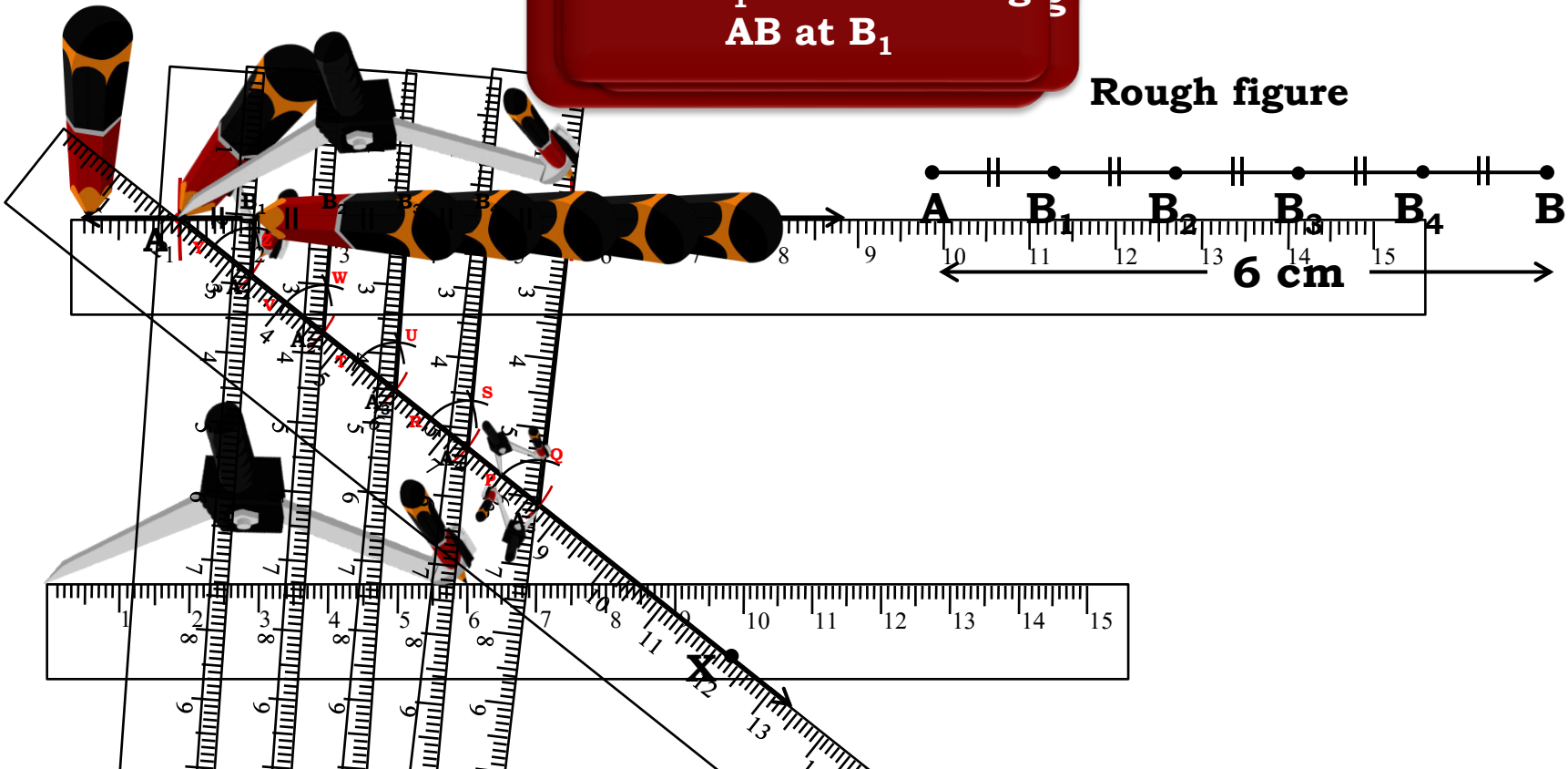
$\angle PQR = \angle XYZ$

respectively

Q. Draw a line segmen… d divide it into 5 equal parts.

Draw A_1Z intersecting AB at B_1

Rough figure

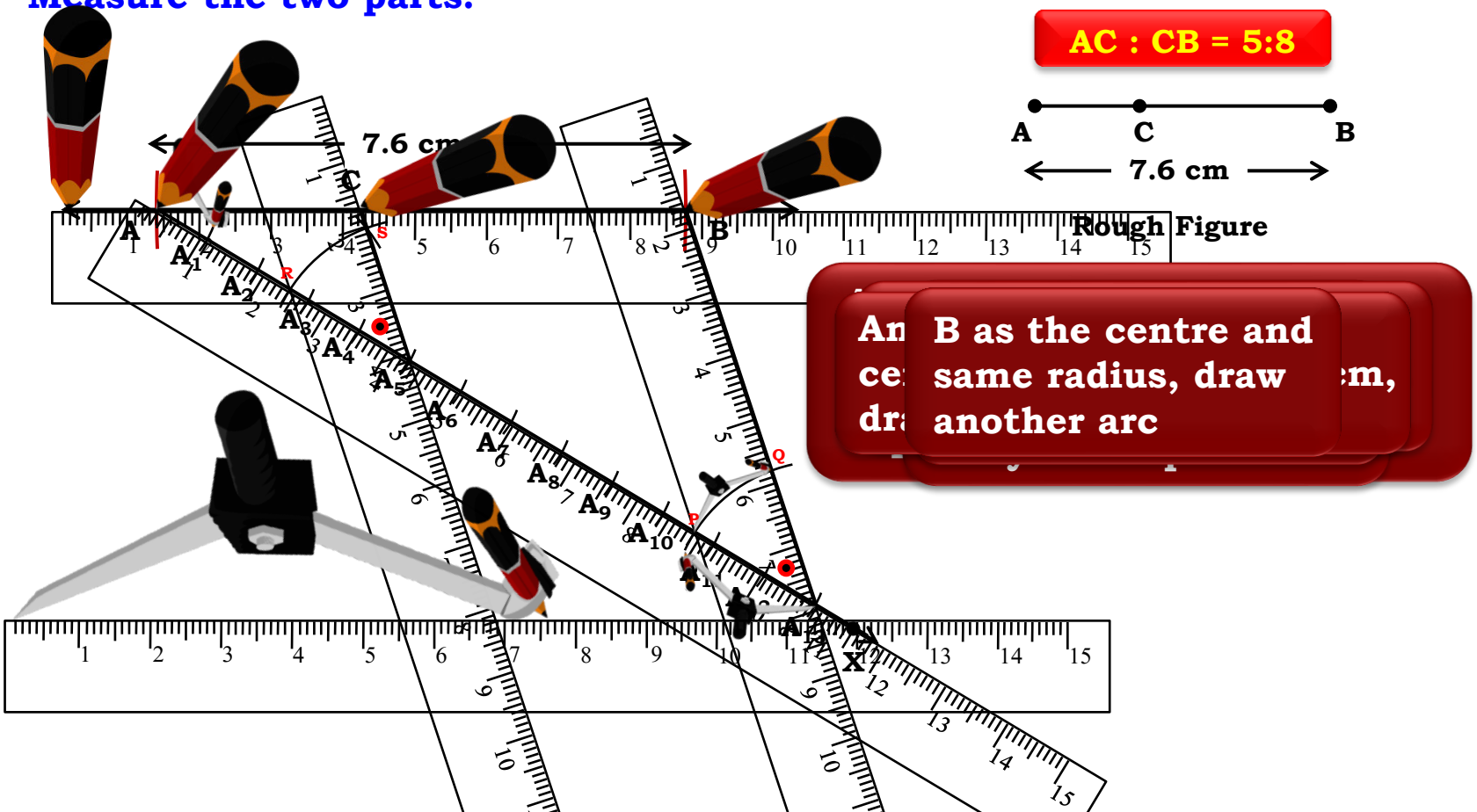


Module 2

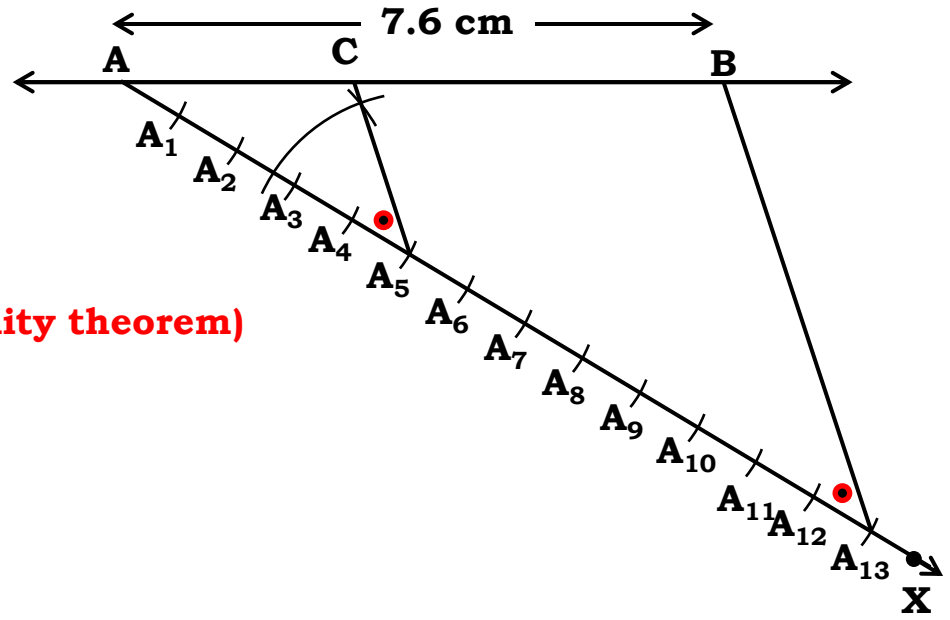
CONSTRUCTIONS

- **To divide line segment into given ratio**

Q. Draw a line segment of length 7.6cm and divide it in the ratio 5:8, Measure the two parts.



Q. Draw a line segment of length 7.6cm and divide it in the ratio 5:8, Measure the two parts.



Justification :

In $\Delta AA_{13}B$

$A_5C \parallel A_{13}B$ (construction)

$\therefore \quad \frac{AA_5}{A_5A_{13}} = \frac{AC}{BC}$ (Basic proportionality theorem)

But, $\frac{AA_5}{A_5A_{13}} = \frac{5}{8}$

$\therefore \quad \frac{AC}{BC} = \frac{5}{8}$

Module 3

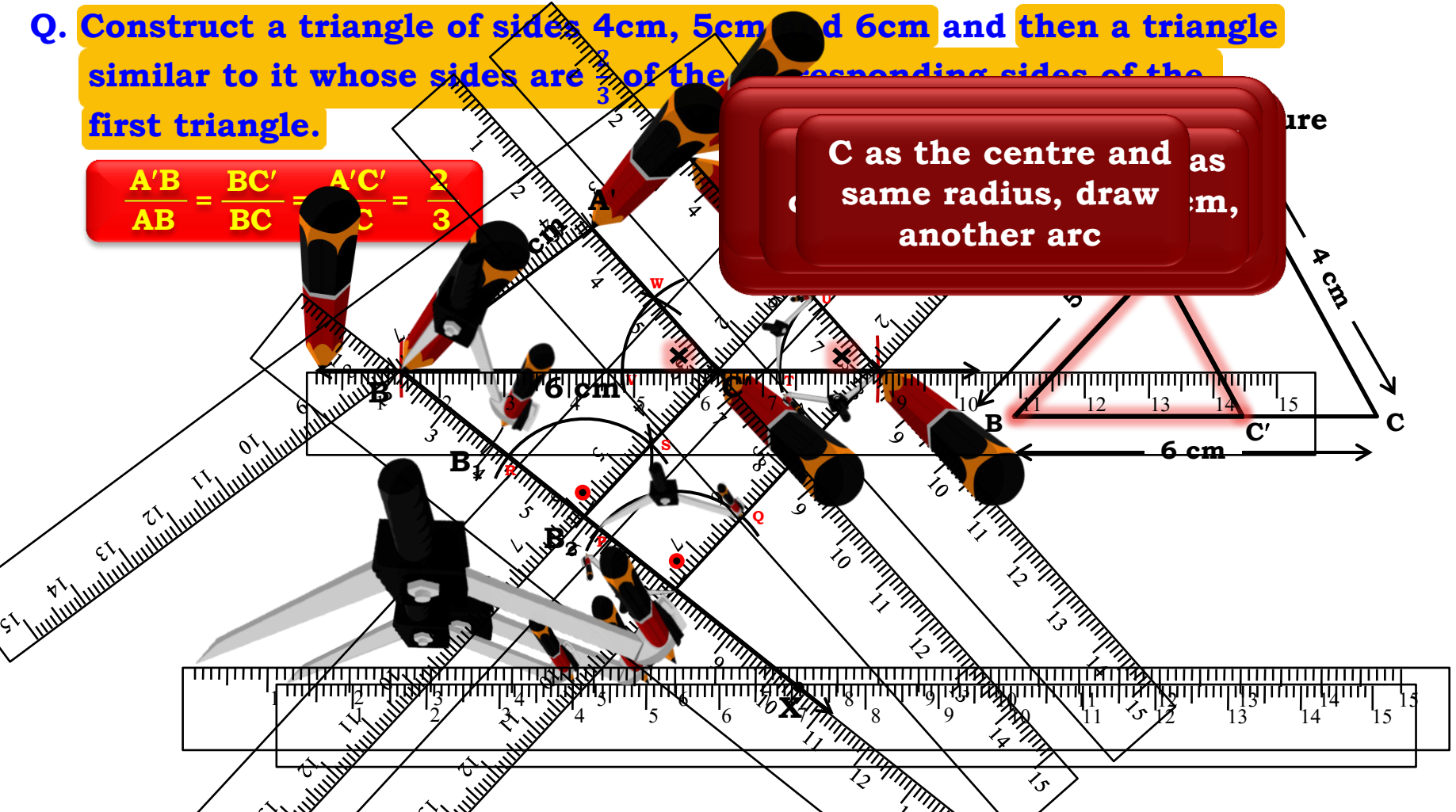
CONSTRUCTIONS

- **To construct triangle similar to a given triangle**

Q. Construct a triangle of sides 4cm, 5cm and 6cm and then a triangle similar to it whose sides are $\frac{2}{3}$ of the corresponding sides of the first triangle.

$$\frac{A'B}{AB} = \frac{BC'}{BC} = \frac{A'C'}{AC} = \frac{2}{3}$$

C as the centre and same radius, draw another arc



Q. Construct a triangle of sides 4cm, 5cm and 6cm and then a triangle similar to it whose sides are $\frac{2}{3}$ of the corresponding sides of the first triangle.

Justification:-

$\because$ $A'C' \parallel AC$ [By construction]

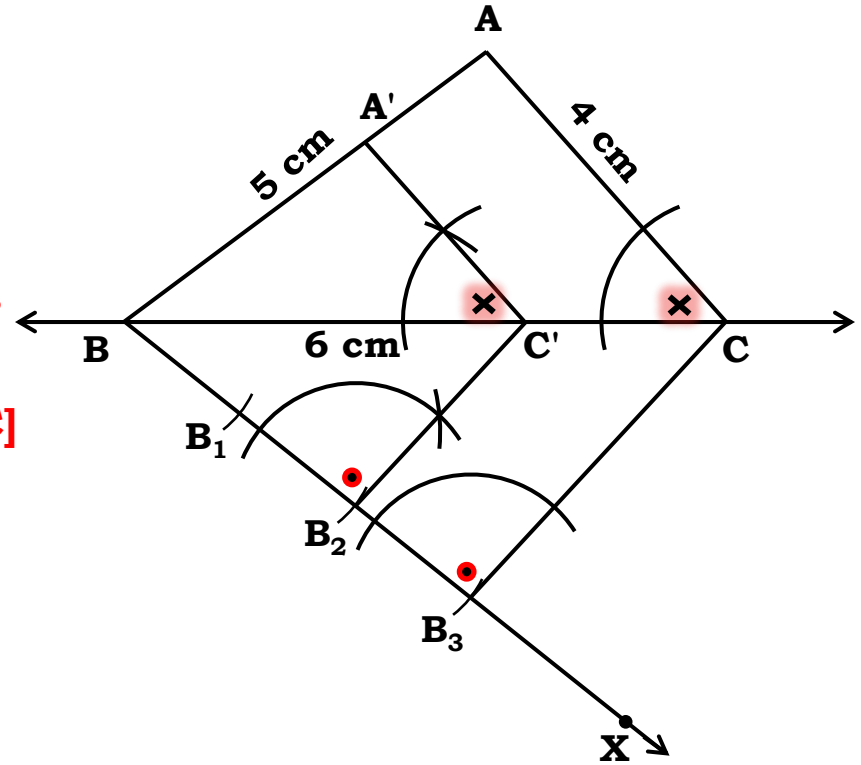
$\Delta A'BC' \sim \Delta ABC$ [AA Similarity]

$\frac{A'B}{AB} = \frac{BC'}{BC} = \frac{A'C'}{AC}$ [corresponding sides of similar triangles]

But, $\frac{BC'}{BC} = \frac{BB_2}{BB_3} = \frac{2}{3}$ [since $\Delta BB_2C_1 \sim \Delta BB_3C$]

$\therefore$ $\frac{BC'}{BC} = \frac{2}{3}$

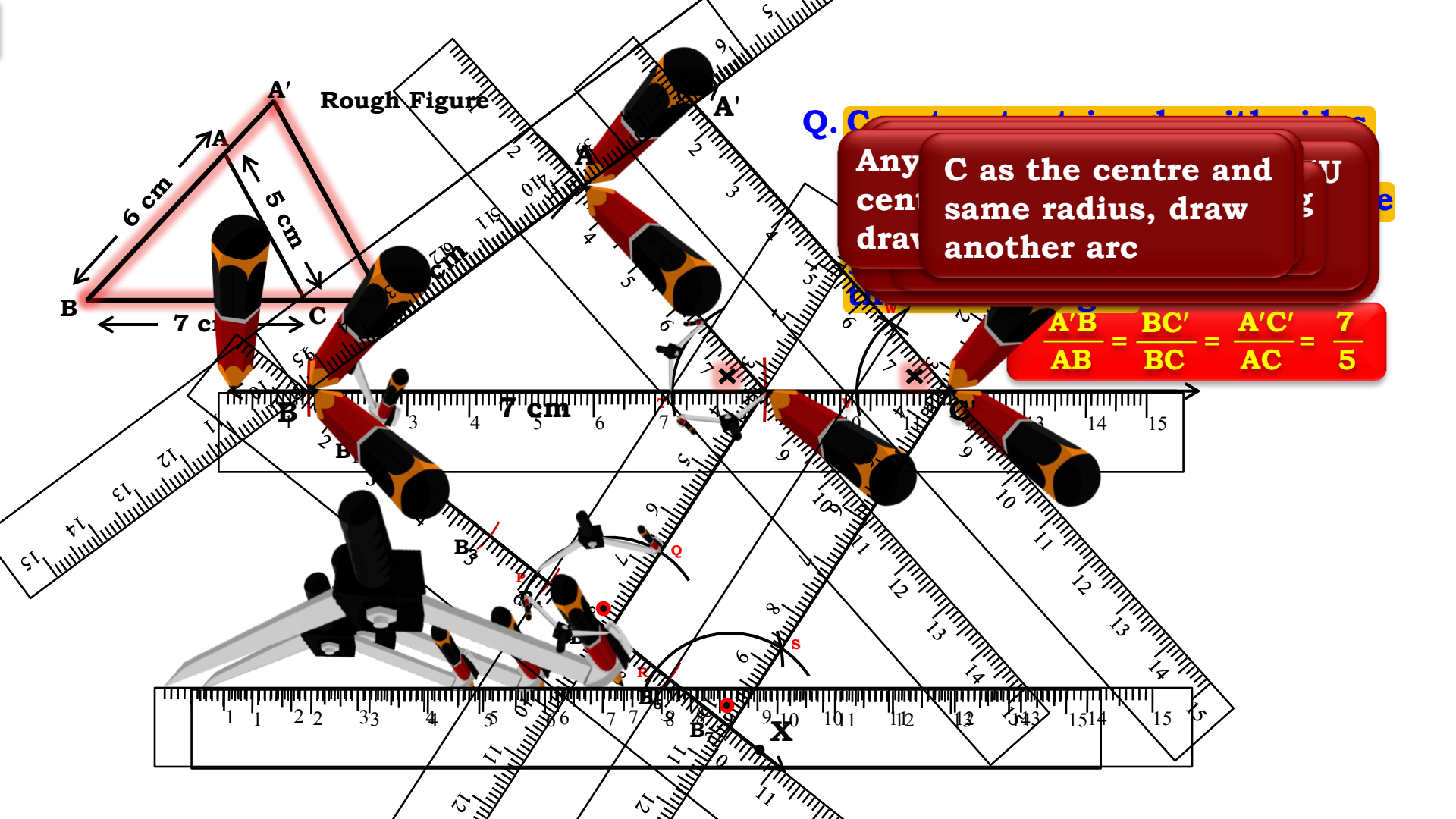
$\therefore$ $\frac{A'B}{AB} = \frac{BC'}{BC} = \frac{A'C'}{AC} = \frac{2}{3}$



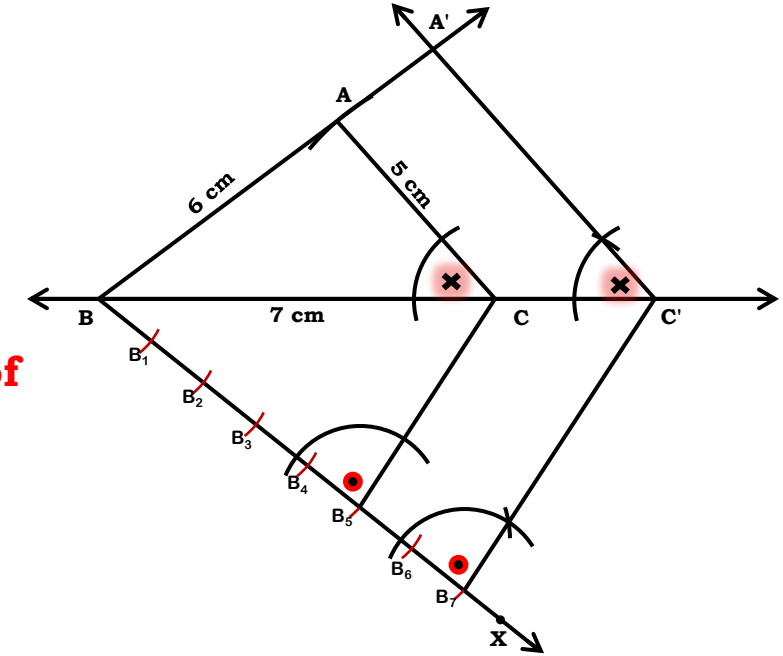
Module 4

CONSTRUCTIONS

- **To construct triangle similar to a given triangle**


Rough Figure
A′
A
6 cm
5 cm
B
7 cm
C
Q.
Any
cent
draw
C as the centre and same radius, draw another arc
A′B / AB = BC′ / BC = A′C′ / AC = 7 / 5
7 cm
B
B1
B2
B3
A′
A
P
Q
R
S
X

Q. Construct a triangle with sides 5cm, 6cm and 7cm. And then another triangle whose sides are $\frac{7}{5}$ of the corresponding sides of the first triangle.



Justification :

$\because$ $A'C' \parallel AC$ **[by construction]**

$\Delta A'BC' \sim \Delta ABC$ **[AA Similarity]**

$\frac{A'B}{AB} = \frac{BC'}{BC} = \frac{A'C'}{AC}$ **[corresponding sides of similar triangles]**

But, $\frac{BC'}{BC} = \frac{BB_7}{BB_5} = \frac{7}{5}$ **[since $\Delta BB_5C \sim \Delta BB_7C_1$]**

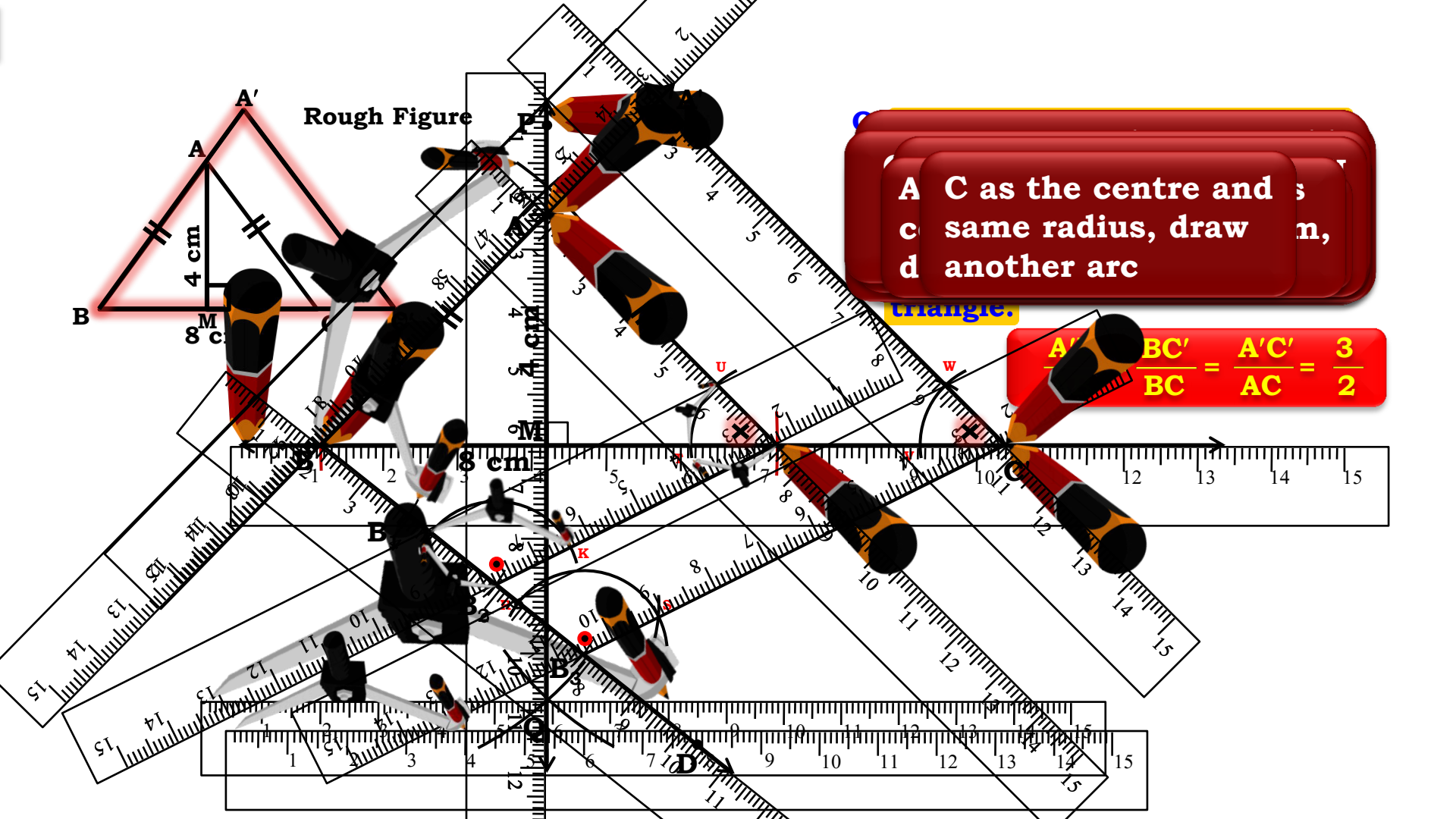
$\therefore$ $\frac{BC'}{BC} = \frac{7}{5}$

$\therefore$ $\frac{A'B}{AB} = \frac{BC'}{BC} = \frac{A'C'}{AC} = \frac{7}{5}$

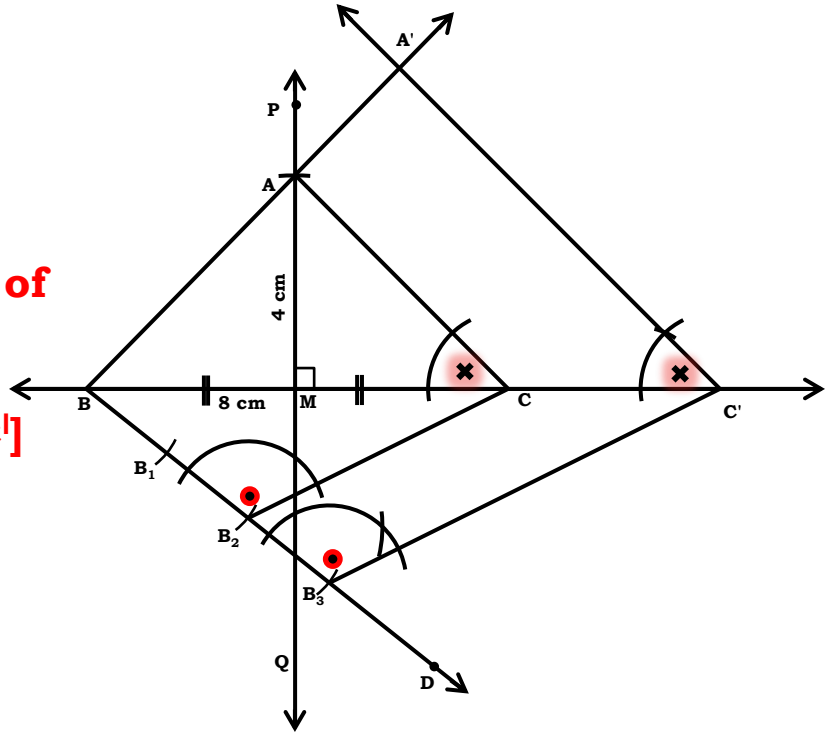
Module 5

CONSTRUCTIONS

- **To construct triangle similar to a given triangle**


Rough Figure
A′
A
4 cm
B
M
8 cm
C as the centre and same radius, draw another arc
triangle.
A′B′/AB = BC′/BC = A′C′/AC = 3/2
8 cm
4 cm
B
C
D
K
U
W

Q. Construct an isosceles triangle whose base is 8cm and altitude 4cm and then another triangle whose sides are $1\frac{1}{2}$ times the corresponding sides of isosceles triangle.



Justification :

$\because$ $A'C' \parallel AC$ **[By construction]**

$\Delta A'BC' \sim \Delta ABC$ **[AA Similarity]**

$\frac{A'B}{AB} = \frac{BC'}{BC} = \frac{A'C'}{AC}$ **[corresponding sides of similar triangles]**

But, $\frac{BC'}{BC} = \frac{BB_3}{BB_2} = \frac{3}{2}$ **[since $\Delta BB_2C \sim \Delta BB_3C'$]**

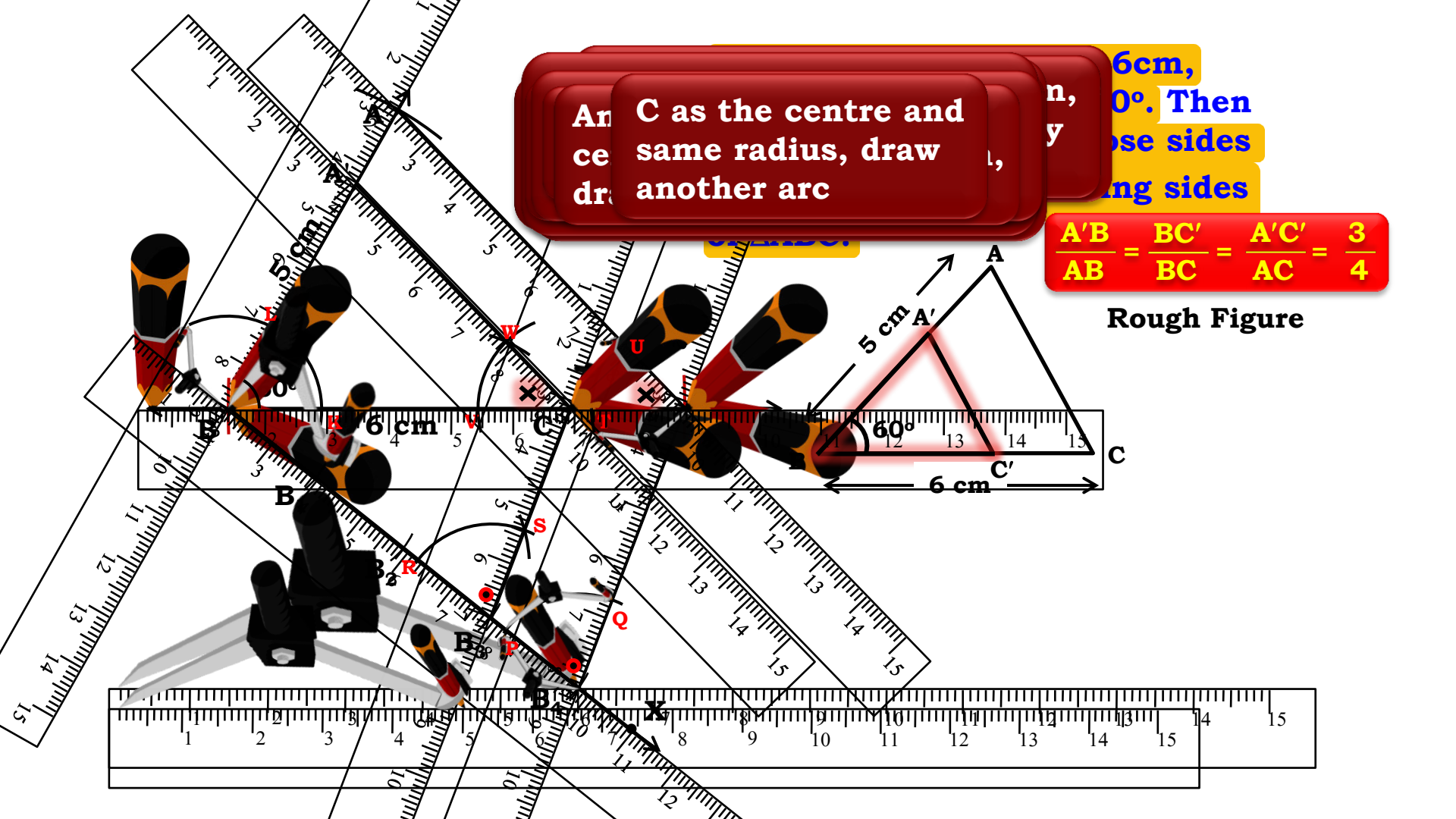
$\therefore$ $\frac{BC'}{BC} = \frac{3}{2}$

$\therefore$ $\frac{A'B}{AB} = \frac{BC'}{BC} = \frac{A'C'}{AC} = \frac{3}{2}$

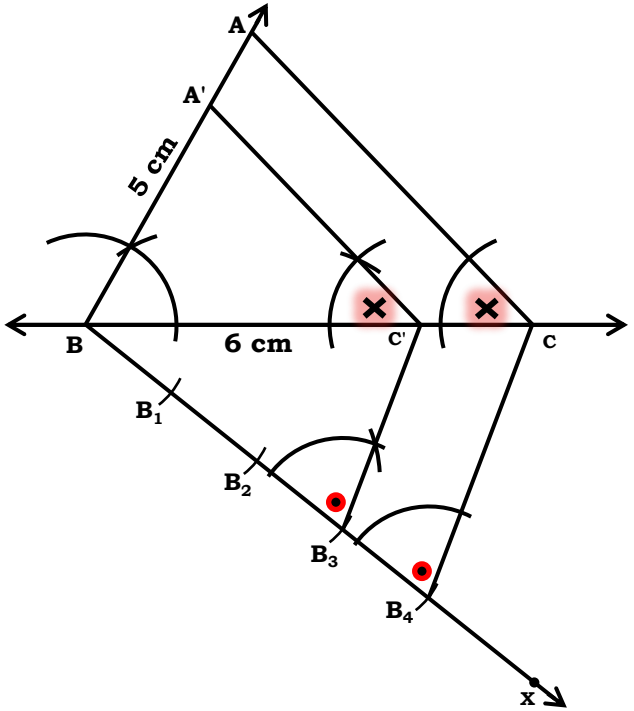
Module 6

CONSTRUCTIONS

- **To construct triangle similar to a given triangle**


C as the centre and same radius, draw another arc
6cm,
0°. Then
se sides
ng sides
A′B / AB = BC′ / BC = A′C′ / AC = 3 / 4
Rough Figure
5 cm
6 cm
60°
A
A′
C
C′
B
B′
B₁
B₂
B₃
B₄
P
Q
R
S
U
W
X

Q. Draw a ΔABC with BC = 6cm, AB = 5cm and $\angle ABC = 60^{o}$. Then construct a triangle whose sides are $\frac{3}{4}$ of the corresponding sides of ΔABC.



Justification :

$\because$ $A'C' \parallel AC$ **[By construction]**

$\Delta A'BC' \sim \Delta ABC$ **[AA Similarity]**

$\frac{A'B}{AB} = \frac{BC'}{BC} = \frac{A'C'}{AC}$ **[Corresponding sides of similar triangles]**

But, $\frac{BC'}{BC} = \frac{BB_3}{BB_2} = \frac{3}{4}$ **[since $\Delta BB_3C^{l} \sim \Delta BB_4C$]**

$\therefore$ $\frac{BC'}{BC} = \frac{3}{4}$

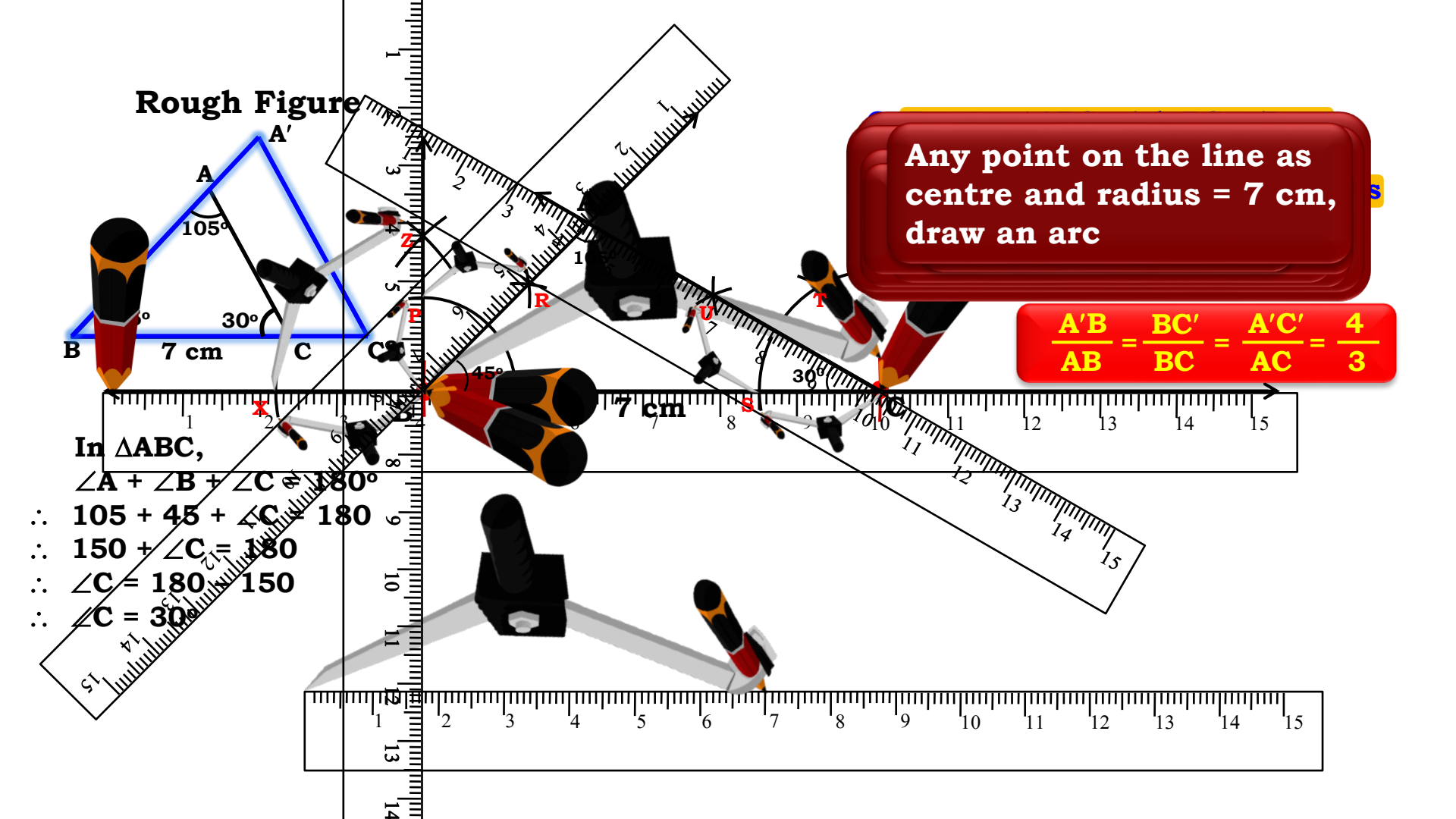
$\therefore$ $\frac{A'B}{AB} = \frac{BC'}{BC} = \frac{A'C'}{AC} = \frac{3}{4}$

Thank You

Module 7

CONSTRUCTIONS

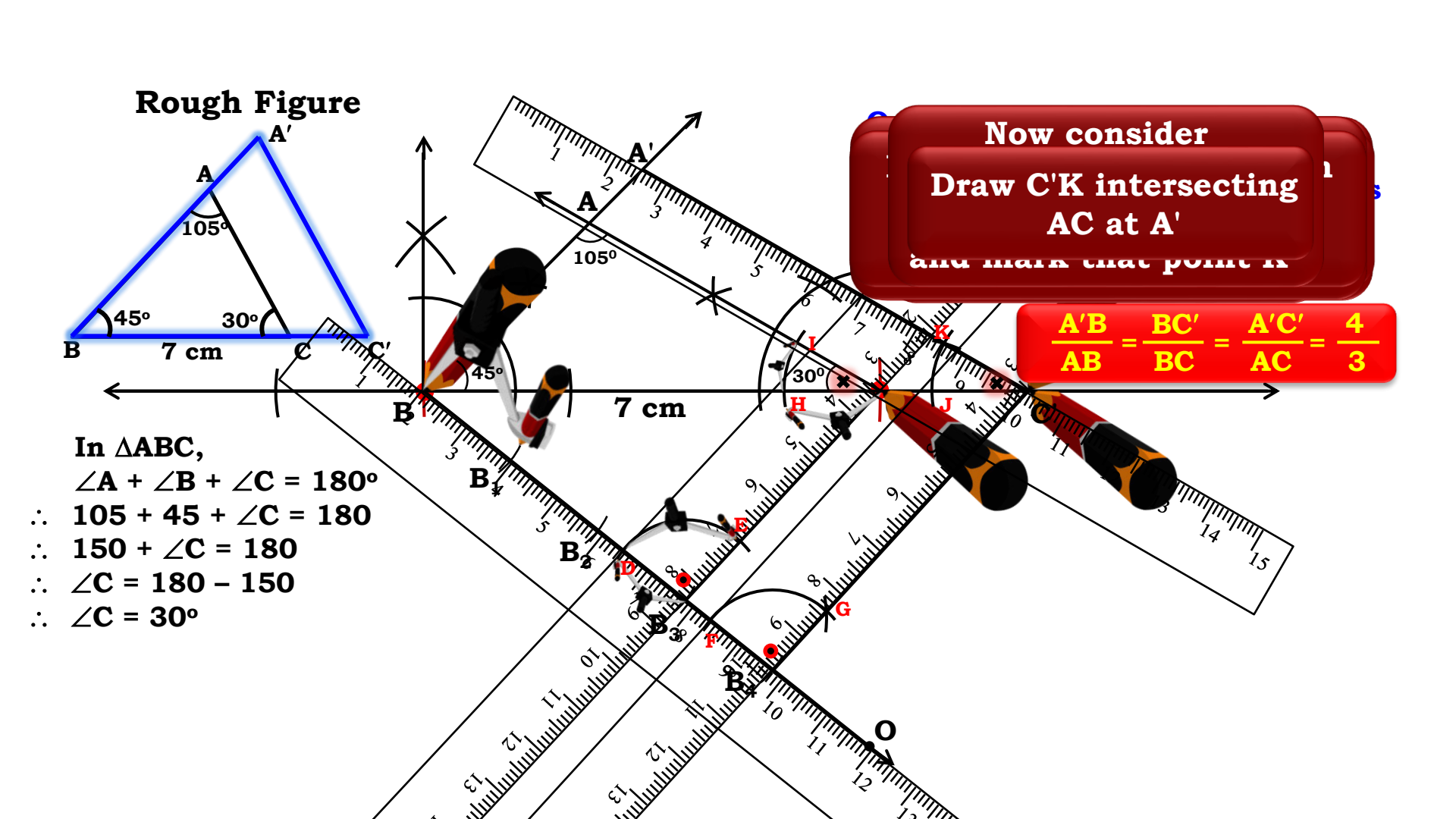
- To construct triangle similar to given triangle


Rough Figure
A′
A
105°
30°
B
7 cm
C
Any point on the line as centre and radius = 7 cm, draw an arc
$\frac{A'B}{AB} = \frac{BC'}{BC} = \frac{A'C'}{AC} = \frac{4}{3}$
In ΔABC,
∠A + ∠B + ∠C = 180°
∴ 105 + 45 + ∠C = 180
∴ 150 + ∠C = 180
∴ ∠C = 180 − 150
∴ ∠C = 30°
45°
30°
7 cm

Module 8

CONSTRUCTIONS

- **To construct triangle similar to given triangle (continuation of previous module)**


Rough Figure
A′
A
105°
45°
30°
B
7 cm
C
C′
Now consider
Draw C'K intersecting AC at A'
and mark that point K
$\frac{A'B}{AB} = \frac{BC'}{BC} = \frac{A'C'}{AC} = \frac{4}{3}$
In ΔABC,
∠A + ∠B + ∠C = 180°
∴ 105 + 45 + ∠C = 180
∴ 150 + ∠C = 180
∴ ∠C = 180 – 150
∴ ∠C = 30°
B1
B2
B3
B4
O

Q. Draw a ΔABC with BC = 7cm, B = $\angle 45^\circ$ A = $\angle 105^\circ$. Then construct a triangle whose sides are times $\frac{4}{3}$ the corresponding sides of ΔABC.

Justification :

$\because$ $A'C' \parallel AC$ **[By construction]**

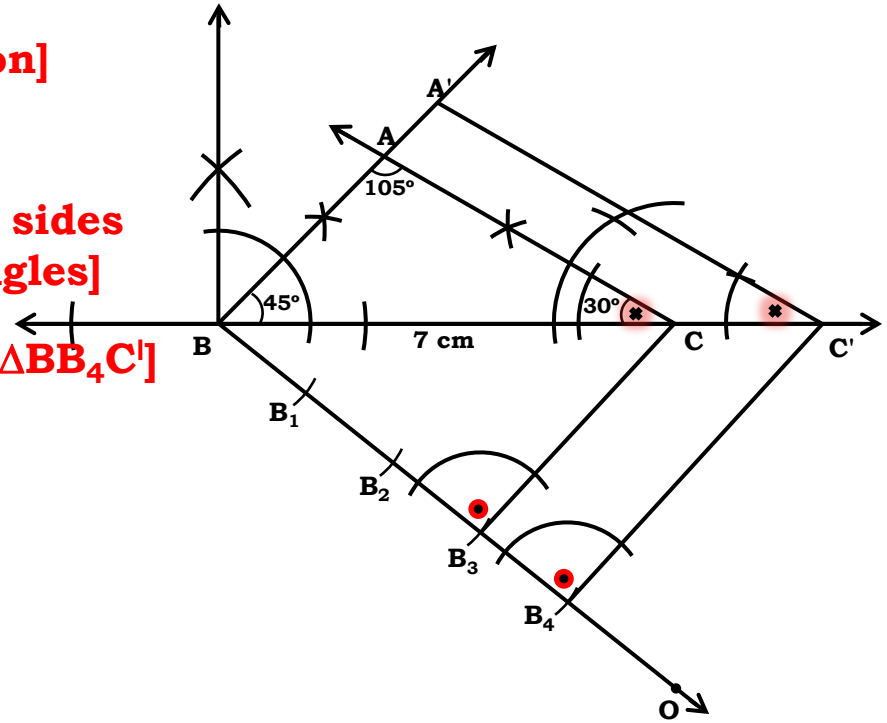
$\Delta A'BC' \sim \Delta ABC$ **[AA Similarity]**

$\frac{A'B}{AB} = \frac{BC'}{BC} = \frac{A'C'}{AC}$ **[corresponding sides of similar triangles]**

but $\frac{BC'}{BC} = \frac{BB_4}{BB_3} = \frac{4}{3}$ **[since $\Delta BB_3C \sim \Delta BB_4C'$]**

$\therefore$ $\frac{BC'}{BC} = \frac{4}{3}$

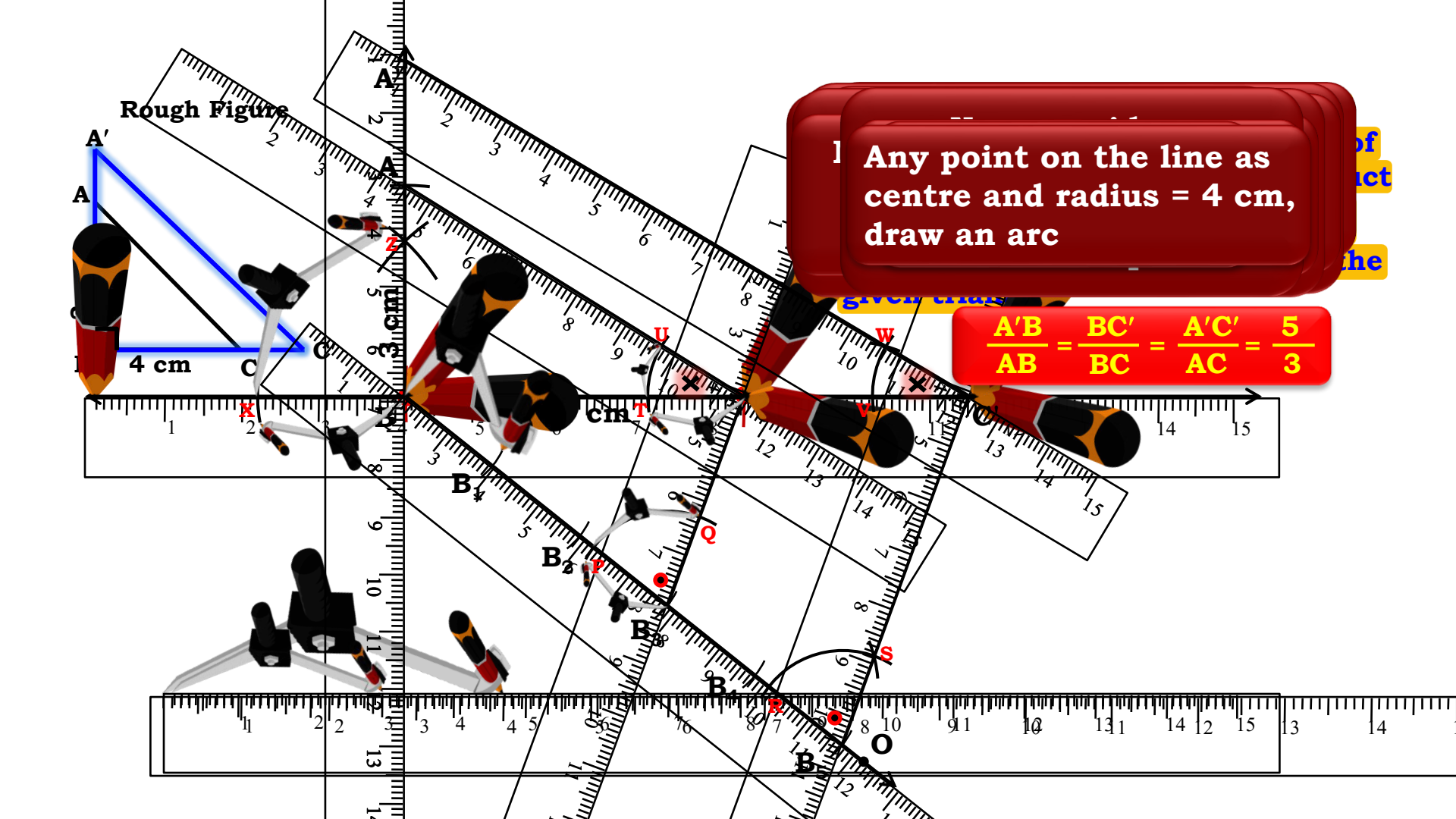
$\therefore$ $\frac{A'B}{AB} = \frac{BC'}{BC} = \frac{A'C'}{AC} = \frac{4}{3}$



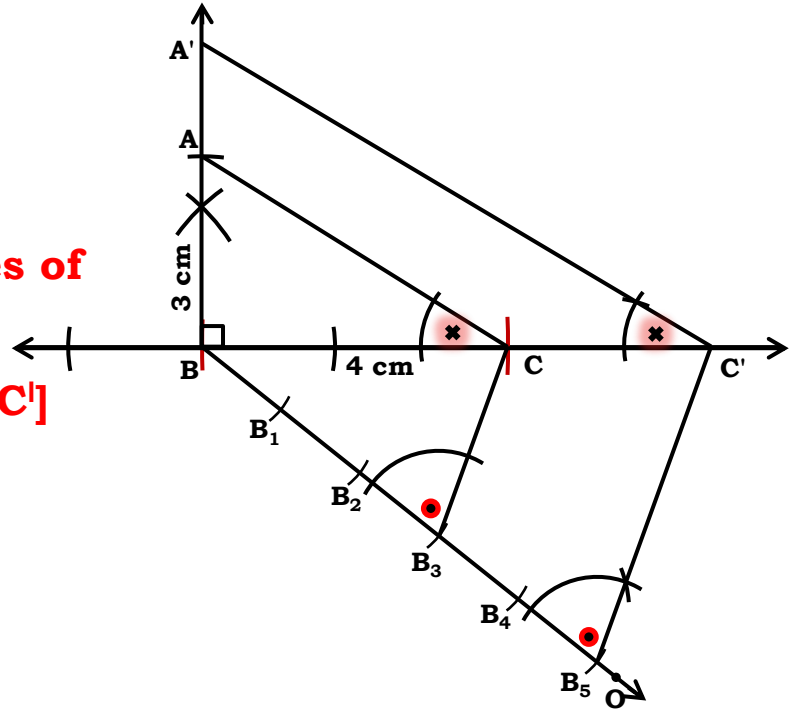
Module 9

CONSTRUCTIONS

- To construct triangle similar to given triangle


Rough Figure
A′
A
4 cm
C
A
A
3 cm
B₁
B₂
B₃
B₄
B₅
O
Any point on the line as centre and radius = 4 cm, draw an arc
A′B/AB = BC′/BC = A′C′/AC = 5/3

Q. Draw a right triangle in which the sides (other than hypotenuse) are of length 4cm and 3cm. Then construct another triangle whose sides are $\frac{5}{3}$ times the corresponding sides of the given triangle.



Justification :

$\because$ $A'C' \parallel AC$ **[By construction]**

$\Delta A'BC' \sim \Delta ABC$ **[AA Similarity]**

$\frac{A'B}{AB} = \frac{BC'}{BC} = \frac{A'C'}{AC}$ **[Corresponding sides of similar triangles]**

but $\frac{BC'}{BC} = \frac{BB_5}{BB_3} = \frac{5}{3}$ **[since $\Delta BB_3C \sim \Delta BB_5C'$]**

$\therefore$ $\frac{BC'}{BC} = \frac{5}{3}$

$\therefore$ $\frac{A'B}{AB} = \frac{BC'}{BC} = \frac{A'C'}{AC} = \frac{5}{3}$

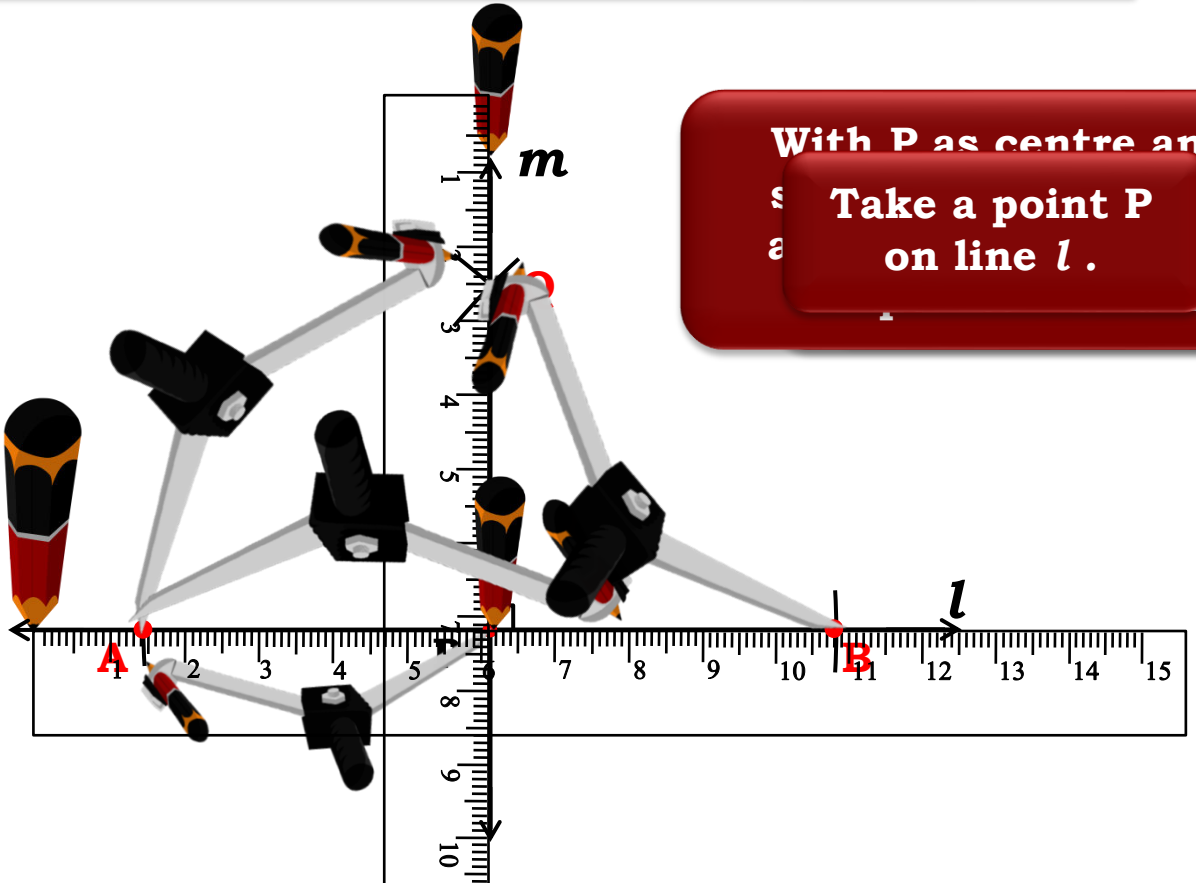
Module 10

CONSTRUCTIONS

- **To construct perpendicular from a point on a given line**
- **To construct tangents to a circle from a point on the circle.**

BASIC CONSRUCTIONS

To construct a perpendicular from a point on a given line.



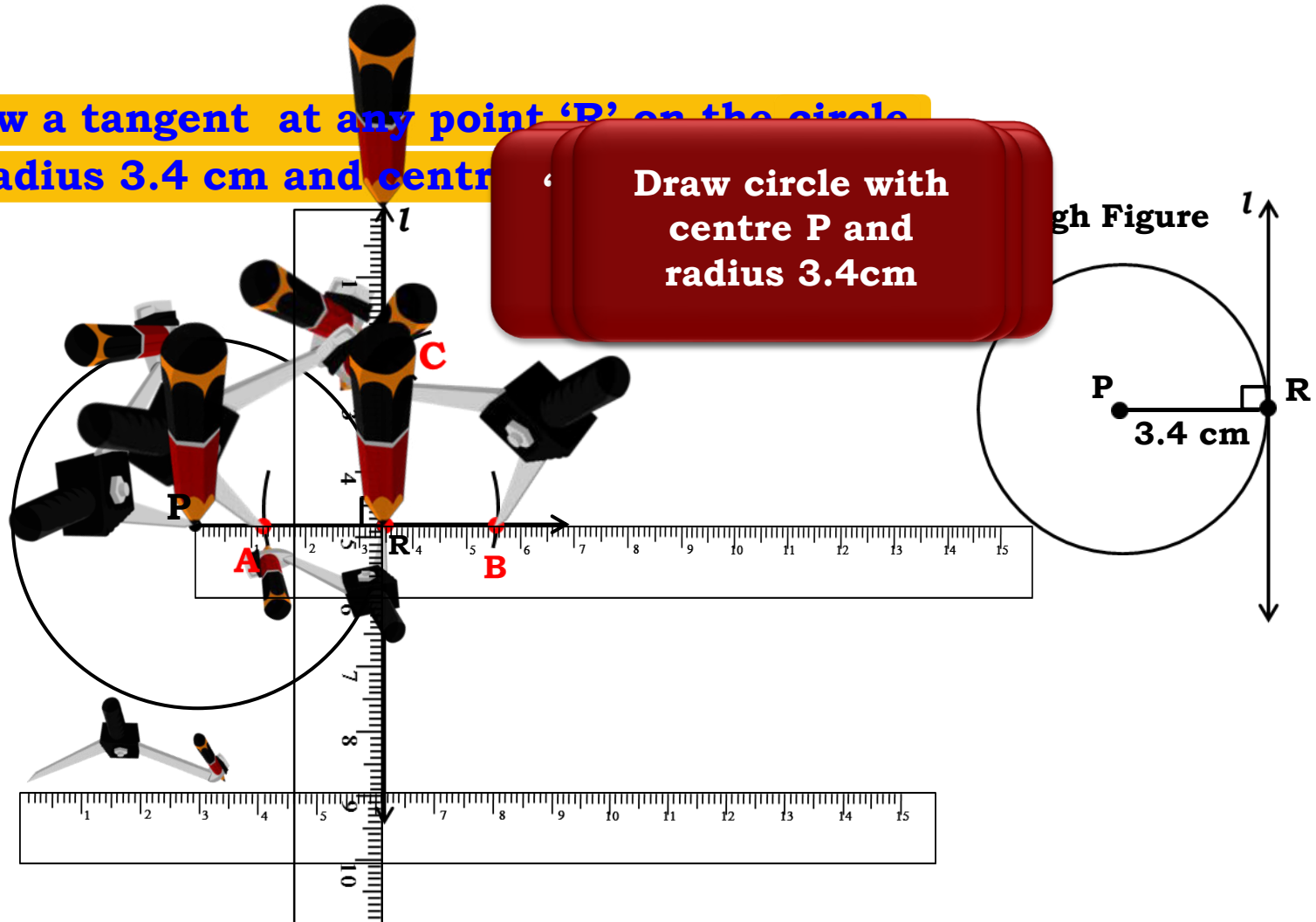
Take a point P on line l .

With P as centre and any
w two
e l at
.

Q. Draw a tangent at any point 'P' on the circle of radius 3.4 cm and centr

Draw circle with centre P and radius 3.4cm

gh Figure



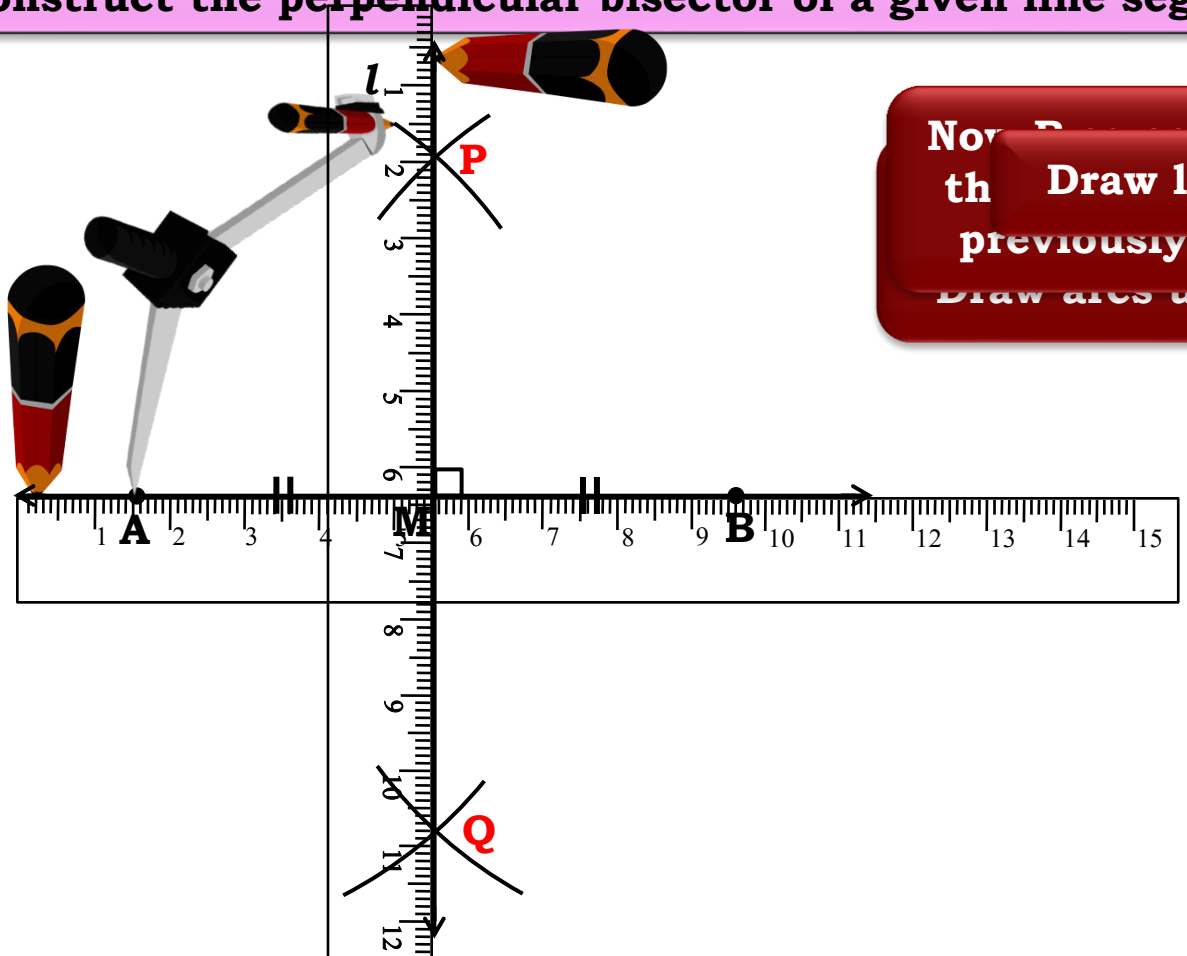
Module 11

CONSTRUCTIONS

- **To construct perpendicular bisector of a given line-segment.**
- **To construct tangents to a circle from an external point.**

BASIC CONSRUCTIONS

To construct the perpendicular bisector of a given line segment



Draw line PQ

…struct tangents to the circle from

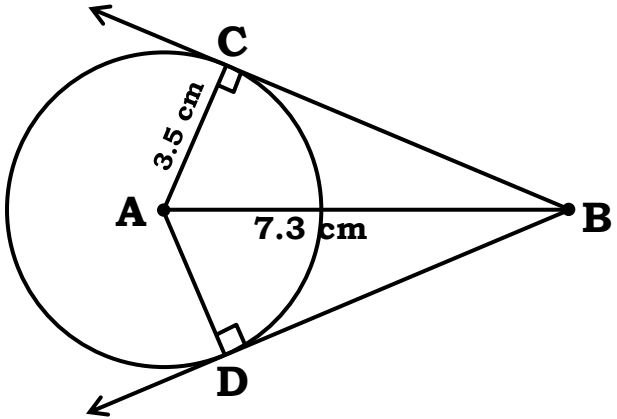
…point… …tre A.

…the

…ce…

Draw radius AC = AD = 3.5cm

Rough figure



Q . Construct tangents to the circle from point B with radius 3.5 cm and centre A. Point B is at a distance 7.3 cm from the centre.

Justification :

Join AC then ∠ACB is an angle in a semicircle.

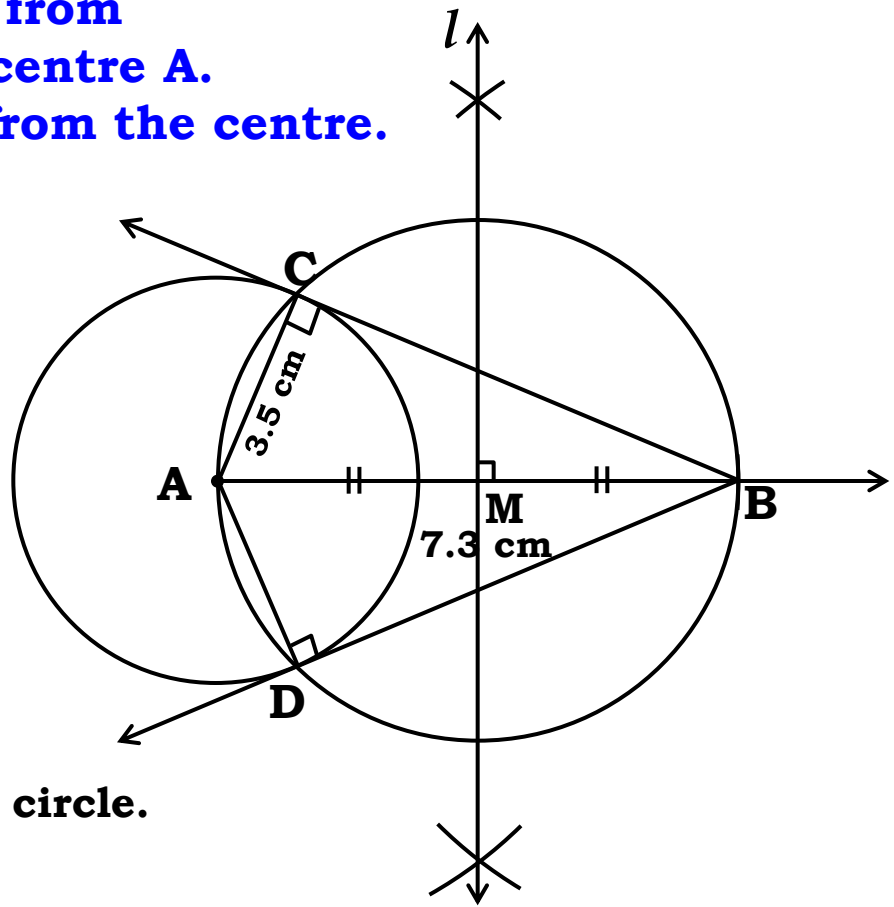
∴ ∠ACB = 90°

∴ line BC ⊥ radius AC

∴ BC has to be a tangent to circle

[A line perpendicular to radius to a circle at its outer end is a tangent]

Similarly BD is also a tangent to the circle.



Module 12

CONSTRUCTIONS

- **To construct tangents to a circle from an external point.**

Q. Draw a circle of radius 6cm. From a point 10cm away from its centre, construct the pair of tangents to the circle and measure their lengths.

PQ and PR are required tangents from external

PQ = PR = 8 cm

Q. Draw a circle of radius 6cm. From a point 10cm away from its centre, construct the pair of tangents to the circle and measure their lengths.

Justification :

Join OQ then ∠PQO is an angle in a semicircle.

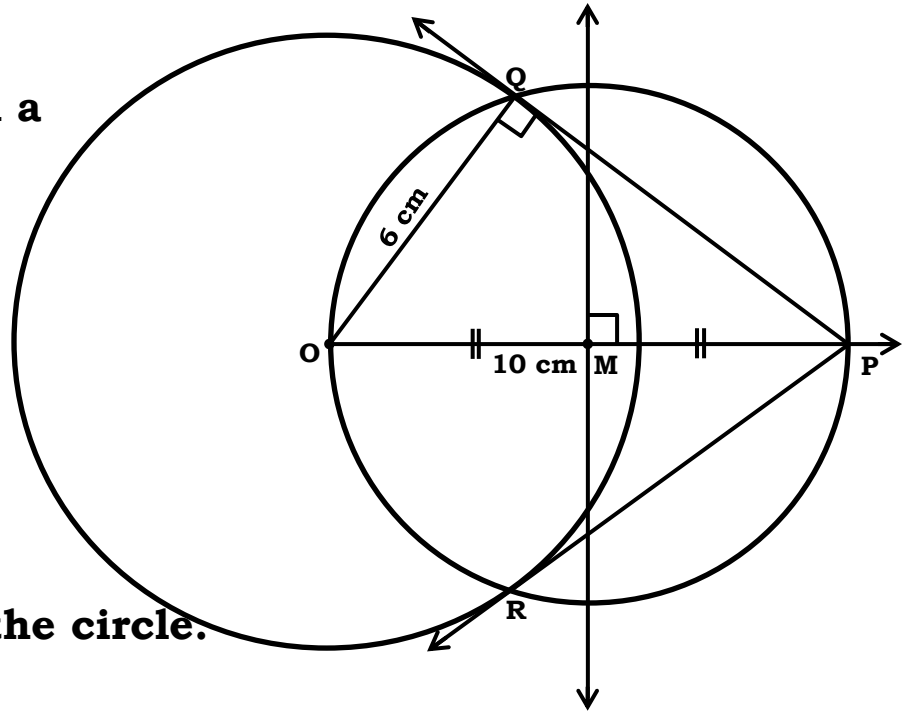
∴ ∠PQO = 90°

∴ line PQ ⊥ radius OQ

∴ PQ has to be a tangent to circle

[A line perpendicular to radius to a circle at its outer end is a tangent]

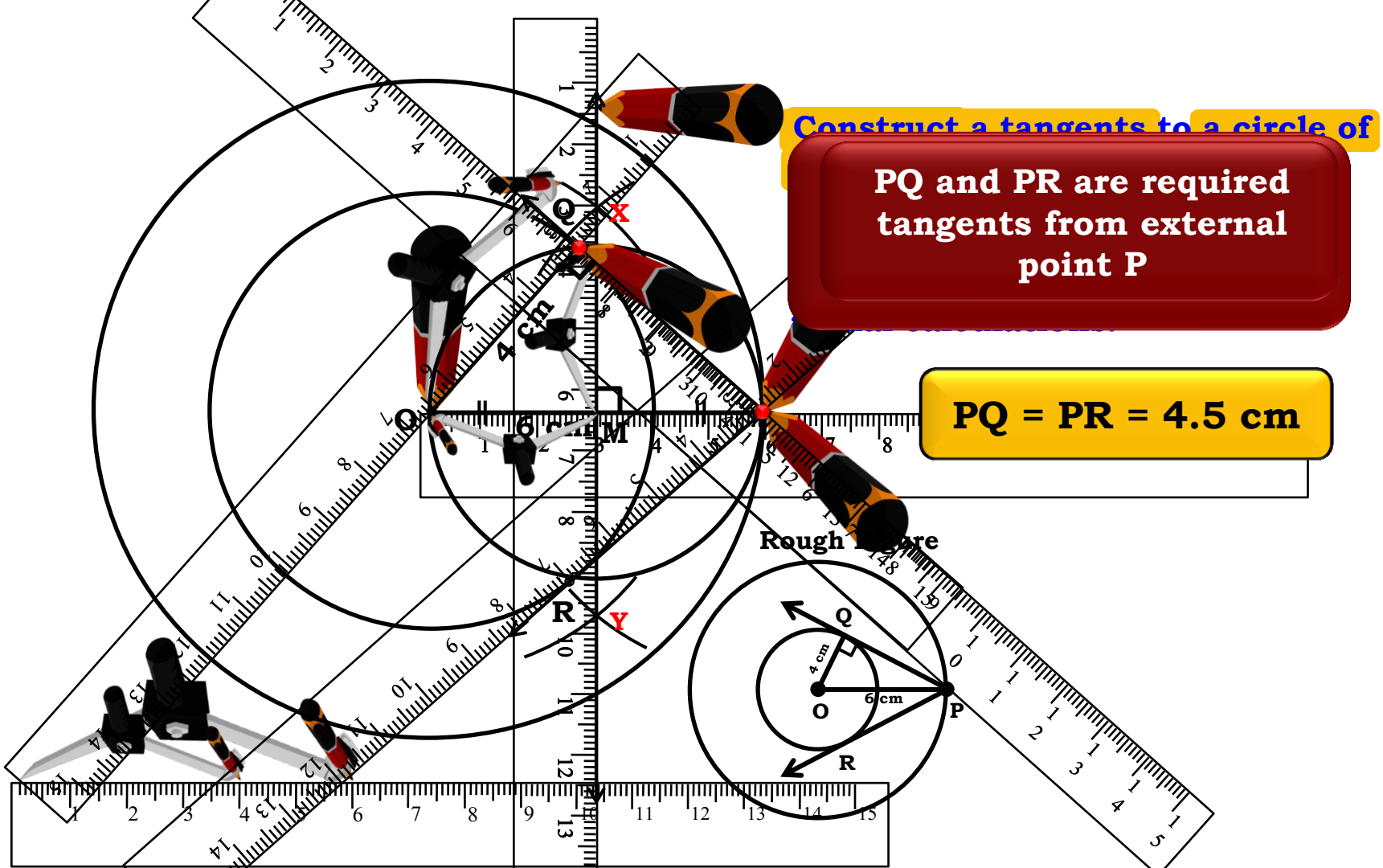
Similarly PR is also a tangent to the circle.



Module 13

CONSTRUCTIONS

- **To construct tangents to a circle from an external point.**


Construct a tangents to a circle of
PQ and PR are required tangents from external point P
PQ = PR = 4.5 cm
Rough Figure
Q
X
4 cm
O
6 cm
M
R
Y
P
4 cm
6 cm

Module 14

CONSTRUCTIONS

- **To construct tangents to a circle from an external point.**
  [continuation of the previous module]

Q. Construct a tangent to a circle of radius 4cm from a point on the concentric circle of radius 6cm and measure its length. Also verify the measurement by actual calculations.

Calculation :

In ΔOQP, $\angle OQP = 90^\circ$

$OP^2 = OQ^2 + PQ^2$

$\therefore PQ^2 = OP^2 - OQ^2$

$\therefore PQ^2 = (6)^2 - (4)^2$

$\therefore PQ^2 = 36 - 16$

$\therefore PQ^2 = 20$

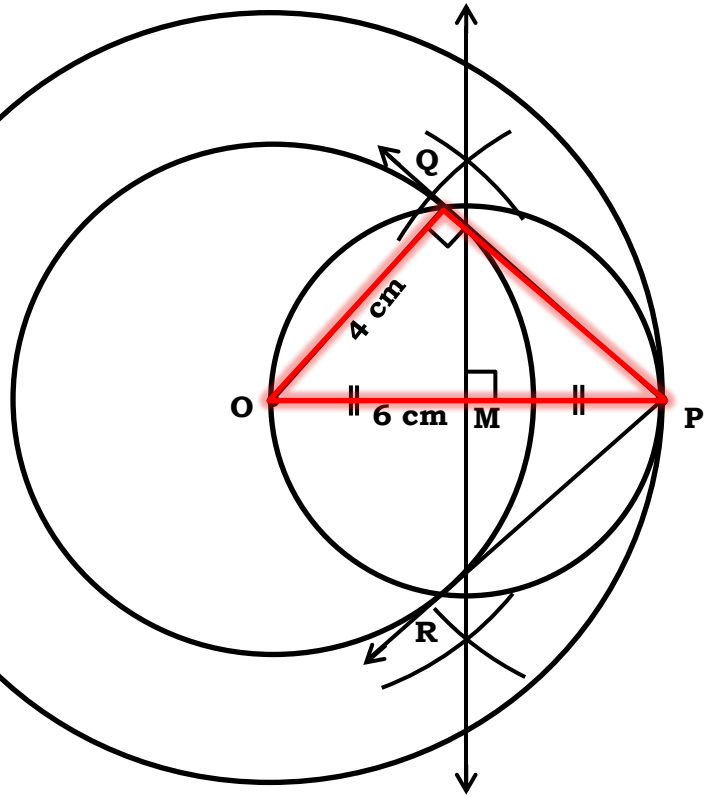
$\therefore PQ = \sqrt{20}$

$\therefore PQ = 2\sqrt{5}$

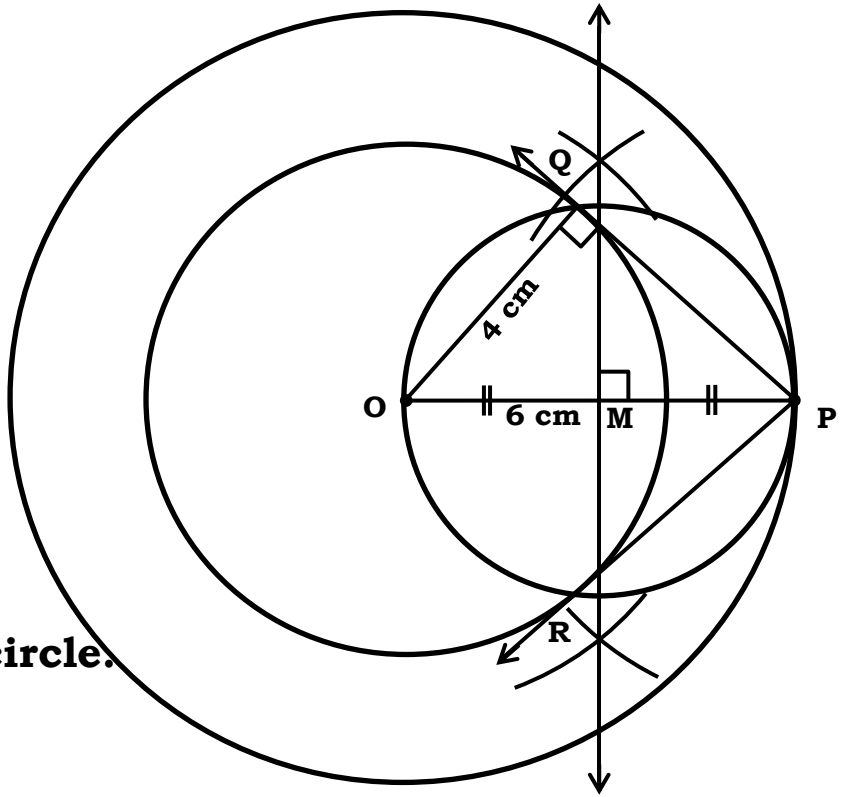
$\therefore PQ = 2 \times 2.23$

$\therefore PQ = 4.5$ ...approx.

	2.23
2	5.0000
+ 2	− 4
42	100
+ 2	− 84
443	1600
+ 3	− 1329
446	271



Q. Construct a tangent to a circle of radius 4cm from a point on the concentric circle of radius 6cm and measure its length. Also verify the measurement by actual calculations.



Justification :

Join OQ then ∠PQO is an angle in a semicircle.

∴ ∠PQO = 90°

∴ line PQ ⊥ radius OQ

∴ PQ has to be a tangent to circle

[A line ⊥ to radius to a circle at its outer end is a tangent]

Similarly PR is also a tangent to the circle.

Thank You

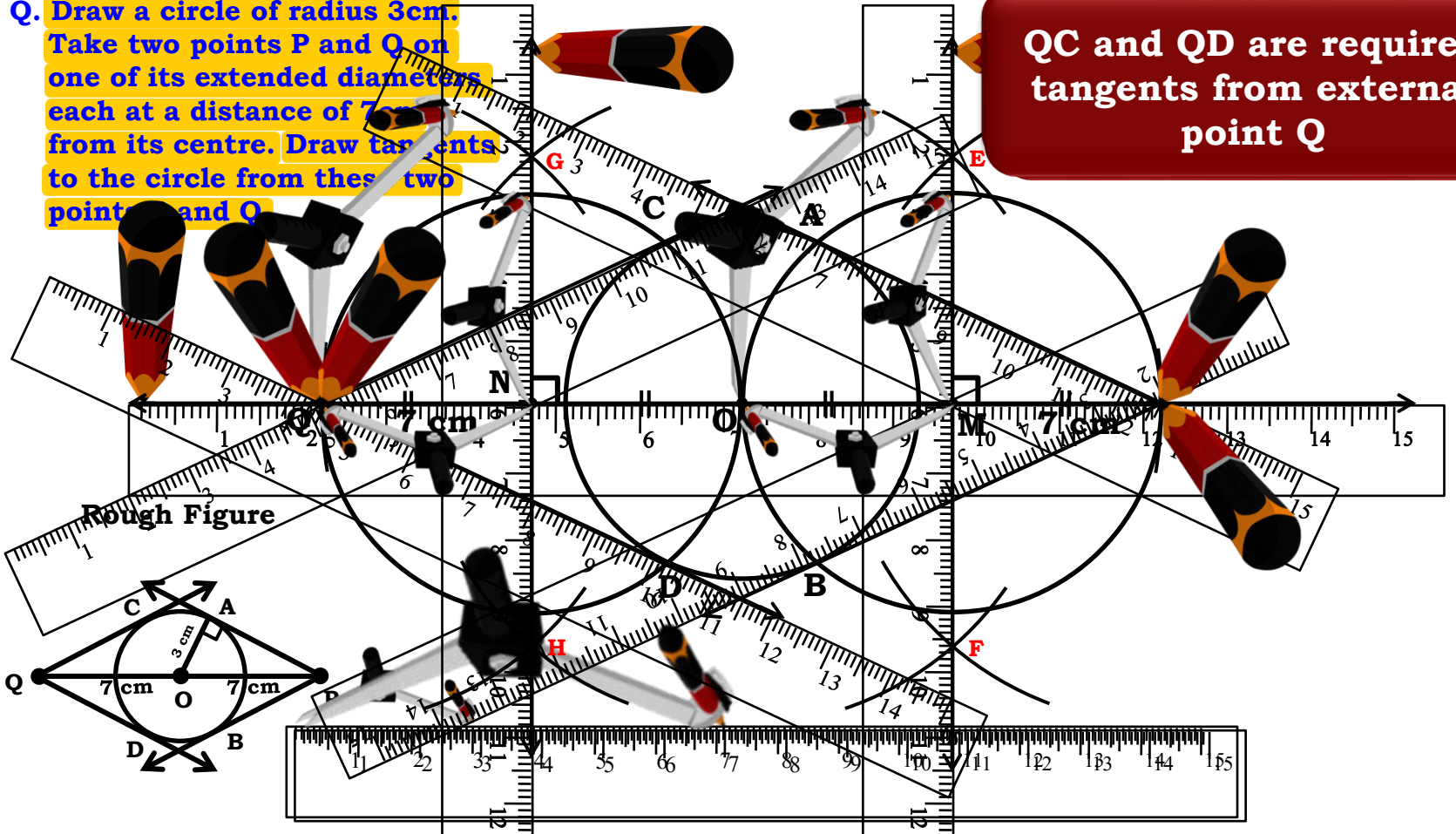
Module 15

CONSTRUCTIONS

- **To construct tangents to a circle from an external point.**

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

QC and QD are required tangents from external point Q



Rough Figure

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

Justification :

Join OA then ∠OAP is an angle in a semicircle.

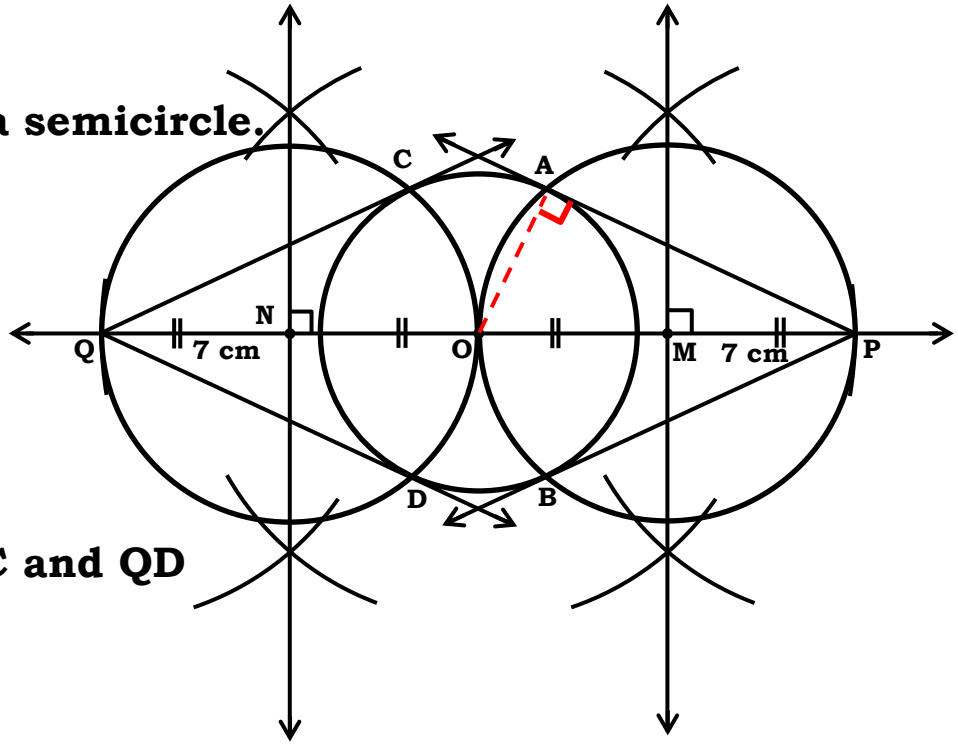
∴ ∠OAP = 90°

∴ line PA ⊥ radius OA.

∴ PA has to be a tangent to circle

[A line ⊥ to radius to a circle at its outer end is a tangent]

Similarly, we can show that PB, QC and QD are the tangents.



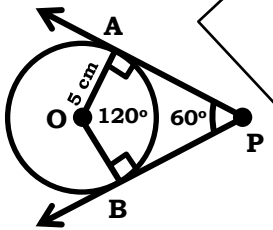
Module 16

CONSTRUCTIONS

- **To construct tangents to a circle from an external point.**

Q. Draw a pair of tangents to a circle of radius 5cm which are inclined to each other at an angle of 60°.

Rough Figure



In □AOBP,

∠AOB + ∠OAP + ∠P + ∠OBP = 360°

∴ ∠AOB + 90 + 60 + 90 = 360

∴ ∠AOB + 240 = 360

∴ ∠AOB = 360 – 240

∴ ∠AOB = 120°

Draw line BL

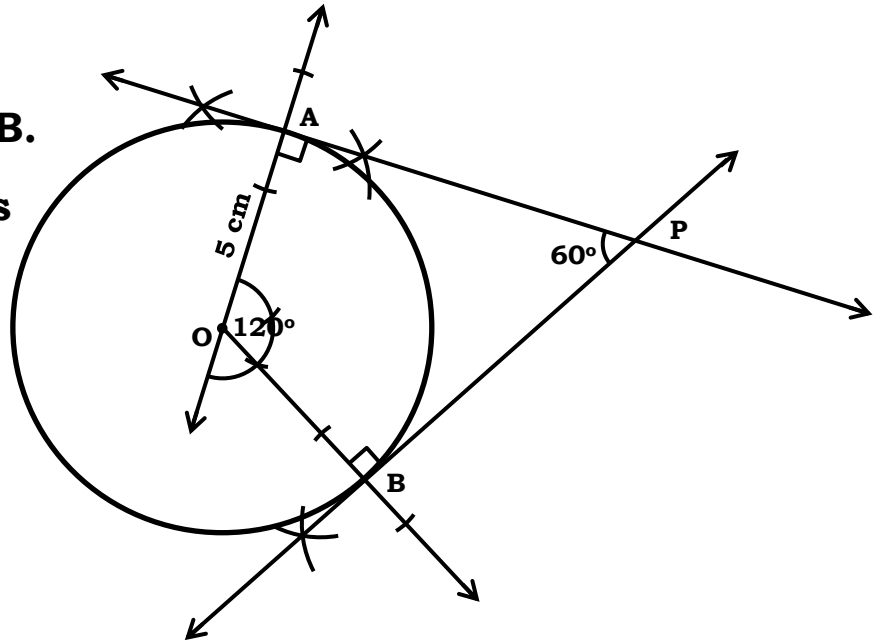
Now K as centre and with th… cut pr… arc

Q. Draw a pair of tangents to a circle of radius 5cm which are inclined to each other at an angle of 60°.

Justification :

∵ **PA and PB are ⊥ to radii OA and OB.**

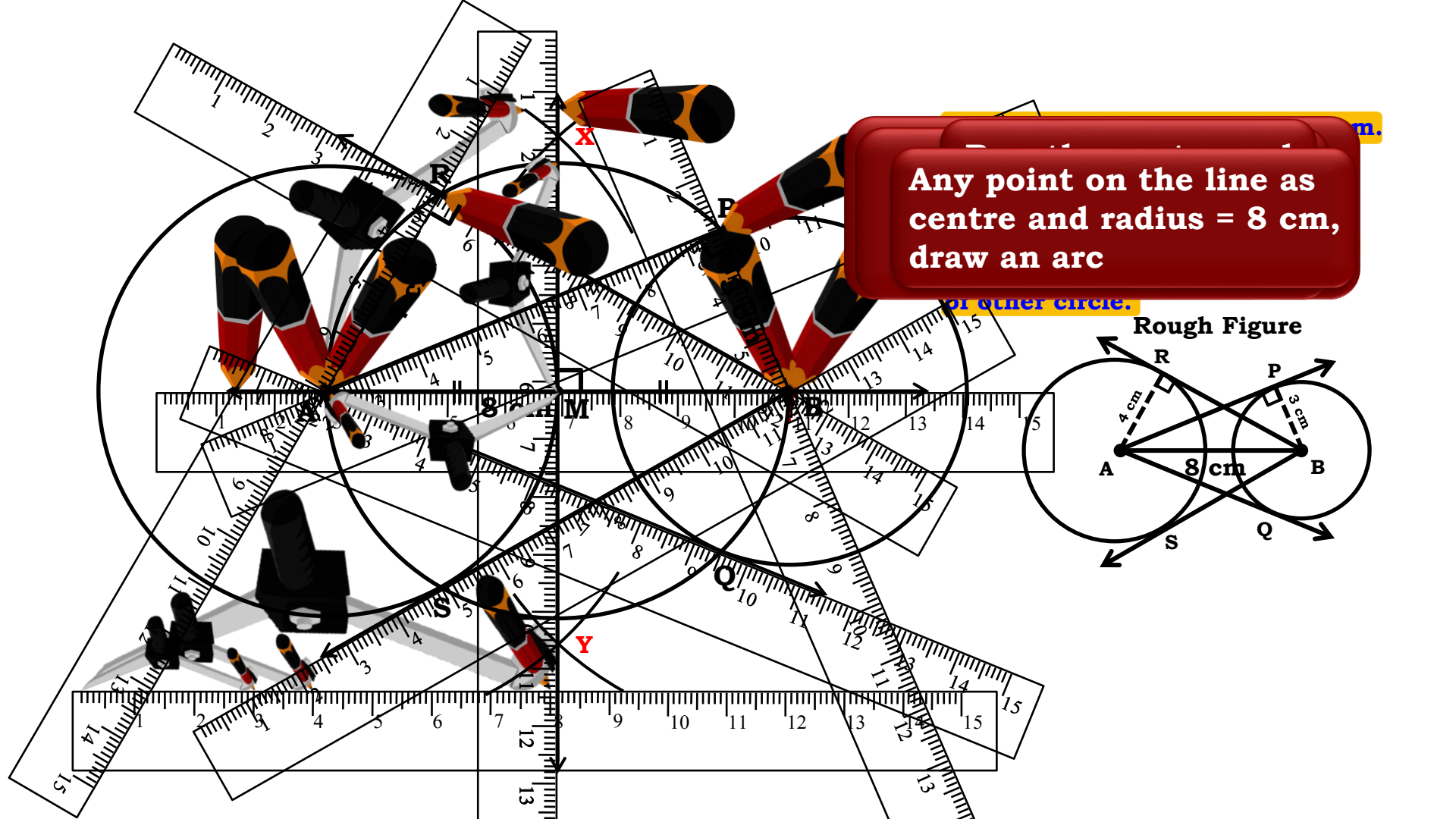
Hence PA and PB are the tangents to the circle.



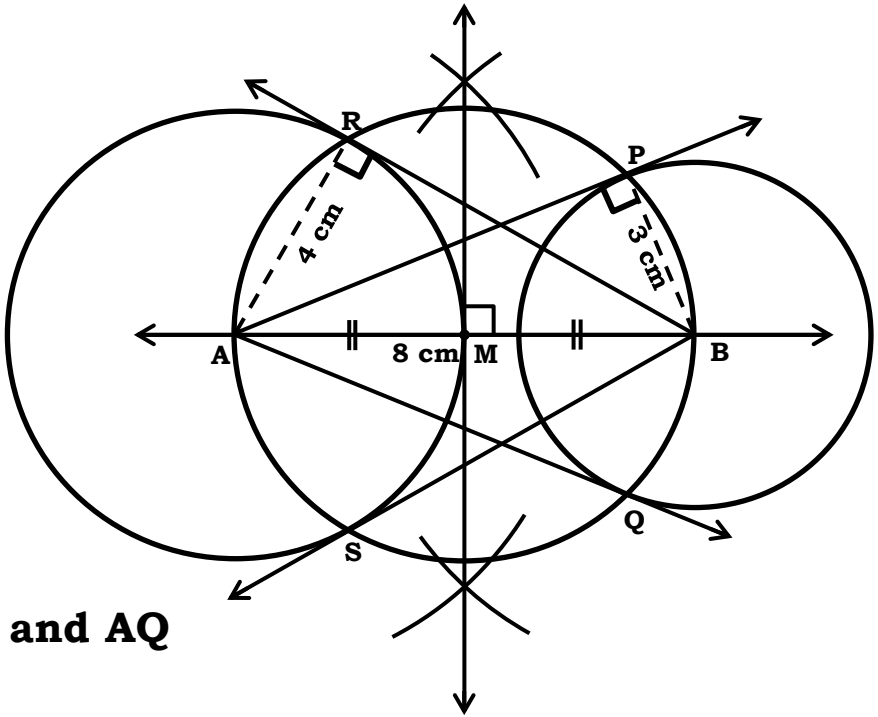
Module 17

CONSTRUCTIONS

- **To construct tangents to a circle from an external point.**


Any point on the line as centre and radius = 8 cm, draw an arc
Rough Figure
R
P
4 cm
3 cm
A
8 cm
B
S
Q
X
Y
M

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



Justification :

Draw AR

∠ARB is an angle in a semicircle.

∴ ∠ARB = 90°

∴ BR ⊥ radius AR

∴ BR is a tangent to circle

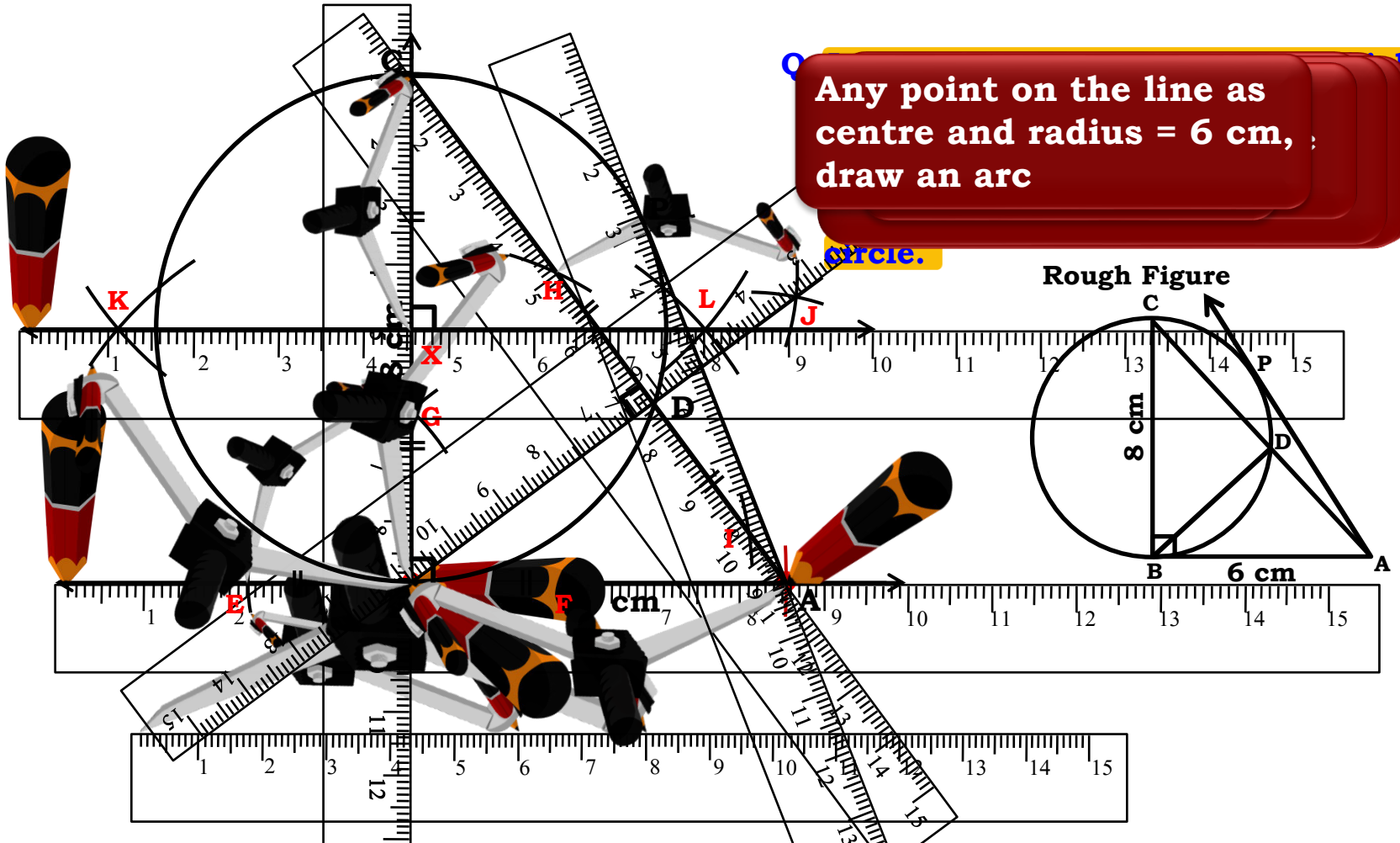
[A line ⊥ to radius to a circle at its outer end is a tangent]

Similarly, we can show that BS, AP and AQ are the tangents.

Module 18

CONSTRUCTIONS

- **To construct tangents to a circle from an external point.**


Any point on the line as centre and radius = 6 cm, draw an arc
Rough Figure
C
P
D
8 cm
B
6 cm
A
K
H
L
J
X
G
E
F
cm
I

Q. Let ABC be a right triangle in which AB = 6 cm, BC = 8 cm and ∠B = 90°. BD is the perpendicular from B on AC. The circle through B,C,D is drawn. Construct tangents from A to this circle.

Justification :

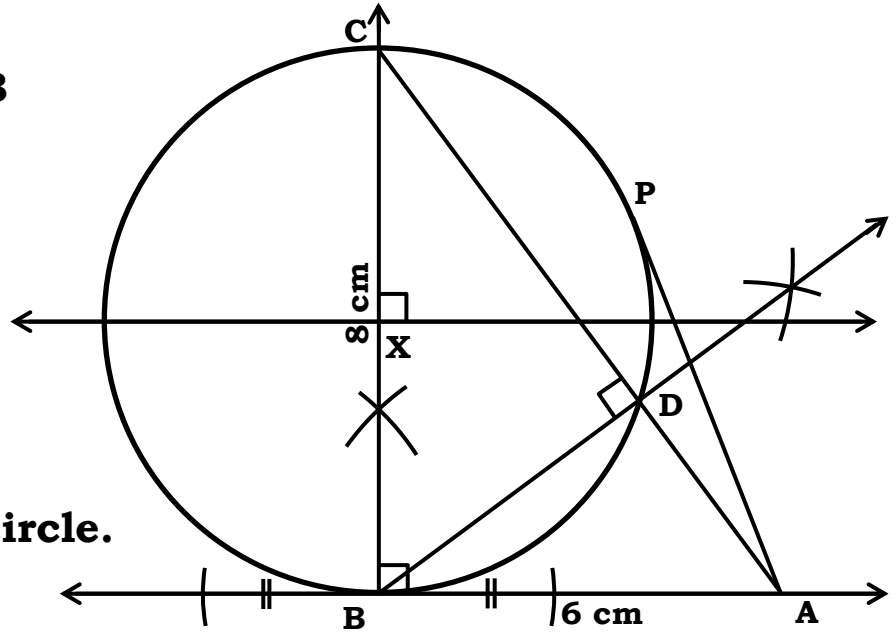
∠ABX = 90° hence AB ⊥ radius XB

∴ AB is a tangent to circle

[A line ⊥ to radius to a circle at its outer end is a tangent]

Length of the tangents drawn to a circle from an external point are always equal.

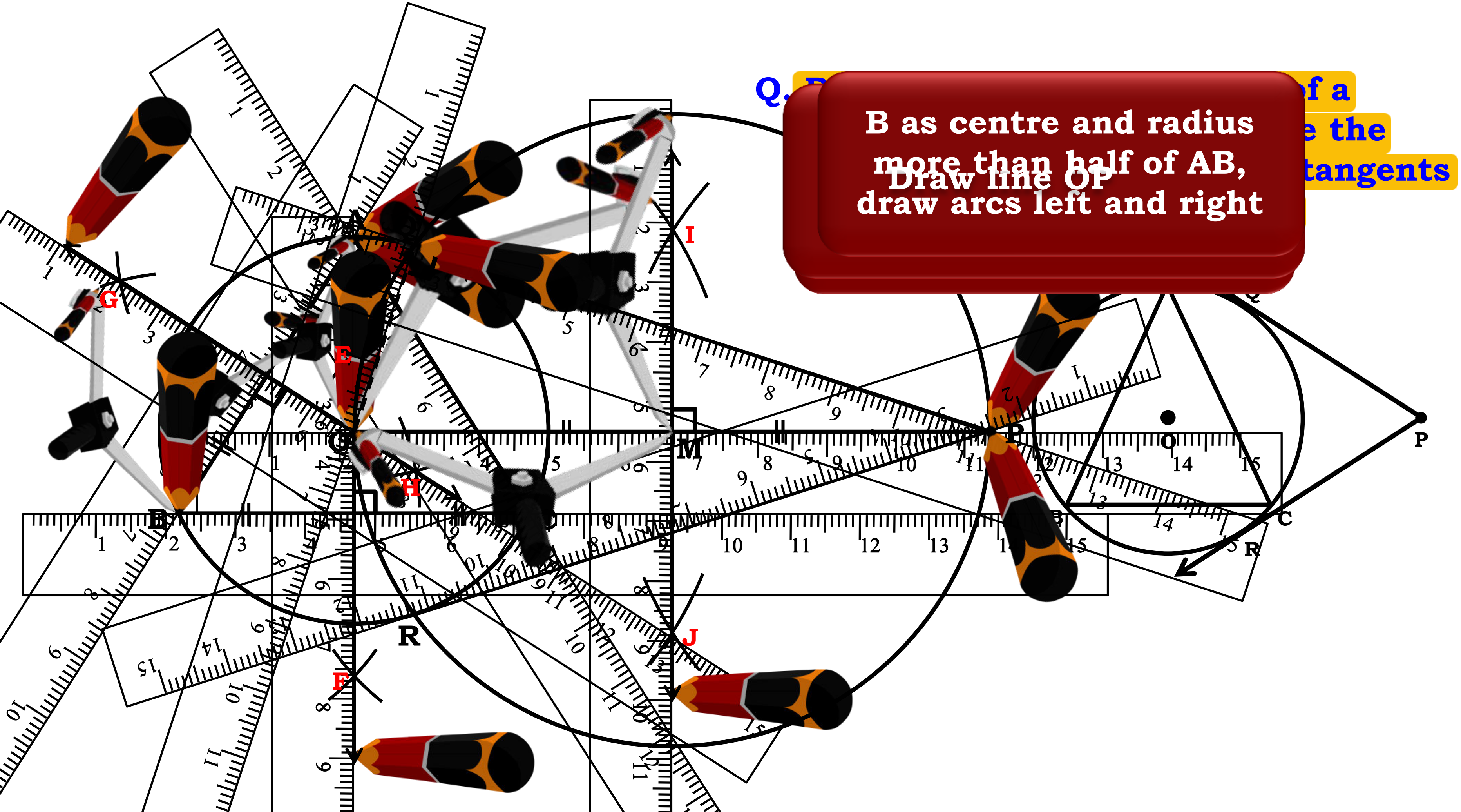
Hence, AP is other tangent to the circle.



Module 19

CONSTRUCTIONS

- To construct circumcircle of the given triangle.
- To construct tangents from an external point to this circumcircle.


Q.
of a
e the
tangents
B as centre and radius
more than half of AB,
draw arcs left and right
Draw line OP
A
B
C
G
E
H
I
J
F
M
R
O
P
Q

Q. Draw a circle with the help of a triangle. Take a point outside the circle. Construct the pair of tangent from this point to the circle.

Justification :

Join OQ then ∠OQP is an angle in a semicircle.

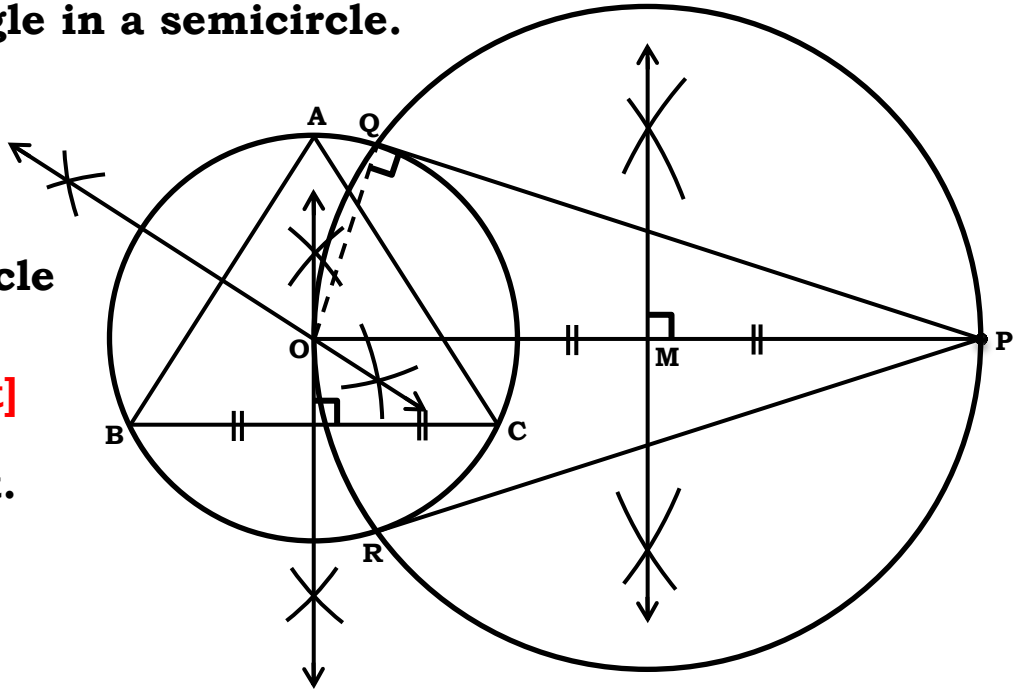
∴ ∠OQP = 90°

∴ PQ ⊥ radius OQ.

∴ PQ has to be a tangent to circle

[A line ⊥ to radius to a circle at its outer end is a tangent]

Similarly PR is other tangent.



Thank You