11. Construction

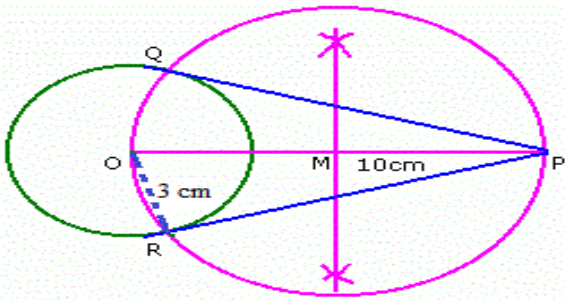
Question-1

Draw a circle of radius 3 cm. From a point 10 cm away from its centre. Construct the pair of tangents to the circle.

Solution:

Given: A circle with centre O and radius 3 cm.

Required: To construct the pair of tangents.



Steps of Construction:

(i) Draw a circle of radius 3 cm.

(ii) Take an external point P which is 10 cm away from its centre. Join OP.

(i) Bisect the line segment OP = 10 cm. Let the point of bisection be M.

(ii) Taking M as centre and OM as radius, draw a circle. Let it intersect the given circle at the points Q and R.

(iii) Join PQ and PR.

These are the required tangents.

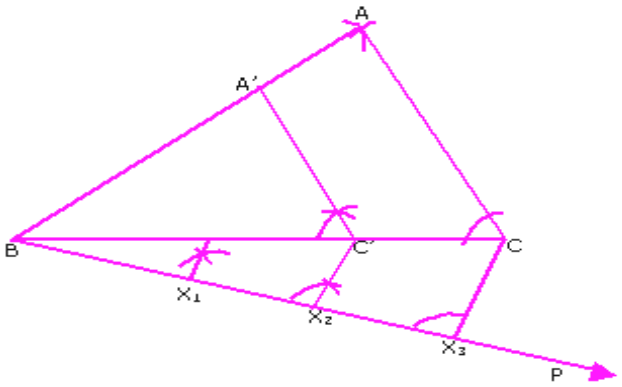
Question-2

Construct a triangle ABC whose sides are 7.5 cm, 7 cm and 6.5 cm. Construct another triangle similar to Δ ABC and with sides $\frac{2}{3}$ of the corresponding sides of triangle ABC.

Solution:

Given: Δ ABC, AB = 7.5 cm, BC = 7 cm and CA = 6.5 cm.

Required: To construct a Δ A'BC' in which A'B = $\frac{2}{3}$ AB, A'C' = $\frac{2}{3}$ AC and BC' = $\frac{2}{3}$ BC.



Steps of construction:

(i) Divide the base BC into three equal parts. Let C′ be the point on BC such that BC′ = $\frac{2}{3}$BC.

Steps of construction

1. Draw a line segment BC = 7 cm, AB = 7.5 cm and CA = 6.5 cm.
2. Below BC, make an acute angle ∠ CBP
3. Divide the base BC into three equal parts. Let C′ be the point on BC such that BC′ = $\frac{2}{3}$BC.
4. Along BP, mark off three points X_1, X_2, X_3 such that $XX_1 = X_{1X2} = X_{2X3}$
5. Join X_3C
6. Draw a line C′A′ || CA intersecting BA at A′.

Then A′BC′ is the required triangle.

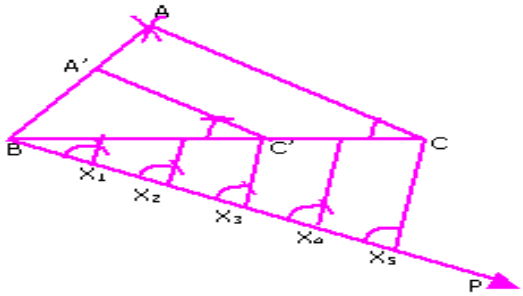
Question-3

Construct a triangle similar to a given triangle with sides 5 cm, 12 cm and 13 cm and whose sides are $\frac{3}{5}$th of the corresponding sides of the given triangle.

Solution:

Given: Δ ABC, AB = 5 cm, BC = 12 cm and CA = 13 cm.

Required: To construct a Δ A′BC′ in which A′B = $\frac{3}{5}$AB, A′C′ = $\frac{3}{5}$AC and BC′ = $\frac{3}{5}$BC.



Steps of construction:

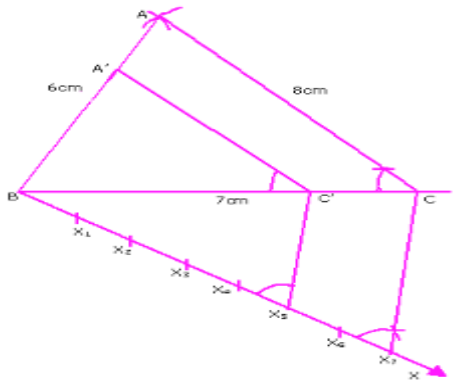
1. Draw a line segment BC = 12 cm
2. With B as centre and with radius 5 cm, draw an arc.
3. With C as centre and with radius 13 cm, draw another arc, intersecting the previously drawn arc at A.
4. Join AB and AC. Then, Δ ABC is the required triangle.
5. Below BC, make an acute angle ∠ CBP.
6. Along BP, mark off seven points X_1, X_2, X_3.....X_7 such that XX_1 = X_{1X2}..... X_6X_7
7. Join X_5 to C and draw a line through X_3 parallel to X_5 C, intersecting the extended line segment BC at C'.
8. Draw a line through C' parallel to CA intersecting the line segment BA at A'. Then A'BC' is the required triangle.

Question-4

Construct a triangle similar to a given triangle with sides 6 cm, 7 cm and 8 cm and whose sides are $\frac{5}{7}$ th of the corresponding sides of the given triangle.

Solution:

align="center">



Steps of construction:

1. Draw a line segment BC = 7 cm
2. With B as centre and with radius 6 cm, draw an arc.
3. With C as centre and with radius 8 cm, draw another arc, intersecting the previously drawn arc at A.
4. Join AB and AC. Then, Δ ABC is the required triangle.
5. Below BC, make an acute angle ∠ CBX.
6. Along BX, mark off seven points X_1, X_2, X_3.....X_7 such that XX_1 = X_{1X2}..... X_6X_7
7. Join X_7 to C and draw a line through X_5 parallel to X_7C, intersecting the extended line segment BC at C'.
8. Draw a line through C' parallel to CA intersecting the line segment BA at A'. Then A'BC' is the required triangle.

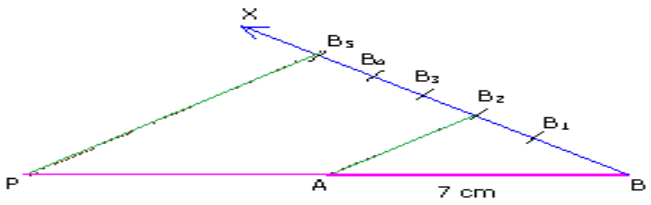
Question-5

Divide a line segment of 7 cm length externally in the ratio of 3 : 5.

Solution:

Given: AB is a line segment of 7 cm length.

Required: To divide a line segment of 7 cm length externally in the ratio of 3 : 5.



Steps of Construction:

1. Draw the line segment AB = 7 cm.

2. Draw ray BX making an acute ∠ ABX .
3. Along BX, mark off five points B_1, B_2, B_3, B_4 and B_5. Join B_2 to A.
4. Through B_5 draw $B_5P \parallel B_2A$, intersecting BA produced at P.

5. The point P so obtained is the required point which divides AB externally in the ratio
3 : 5.

Proof: In Δs ABB_2 and PBB_5,

$B_5P \parallel B_2A \Rightarrow ABB_2 \sim PBB_5$

$\therefore \frac{AB}{PB} = \frac{B_2B}{B_5B} = \frac{AB_2}{PB_5} = \frac{2}{7}$ (Property of similarty).

$\Rightarrow \frac{AP}{PB} = \frac{3}{5}$

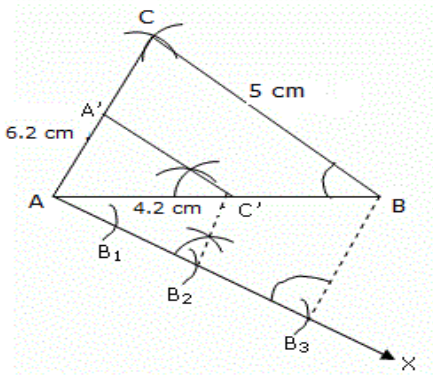
Question-6

Construct a triangle similar to a given Δ ABC such that each of its sides is $\frac{2}{3}$rd of the corresponding sides of the ΔABC. Given AB = 4.2 cm, BC = 5 cm and AC = 6.2 cm.

Solution:

Given: In Δ ABC, AB = 4.2 cm, BC = 5 cm and AC = 6.2 cm.

Required: To construct Δ AB'C' such that each of its sides is $\frac{2}{3}$rd of the corresponding sides of the Δ ABC.



Steps of Construction:

1. Draw a line segment AB = 4.2 cm.
2. With A as centre and radius = AC = 6.2 cm, draw an arc.
3. With B as centre and radius = BC = 5 cm, draw another arc, intersecting the previous arc at C.
4. Join AC and BC to obtain Δ ABC.
5. Below AB, make an acute angle ∠ BAX.
6. Along AX, mark off three points A_1 , A_2 , A_3 such that $AA_1 = A_1A_2 = A_2A_3$
7. Join A_3B.
8. Draw $A_2B' \parallel A_3B$, meeting AB at B'.
9. From B', draw $B'C' \parallel BC$ meeting AC at C'.

AB'C' is the required Δ .

Proof: Since $B'C' \parallel BC$, $\Delta ABC \sim \Delta AB'C'$.

$B'C'/BC = AC'/AC = AB'/AB = 2/3$.

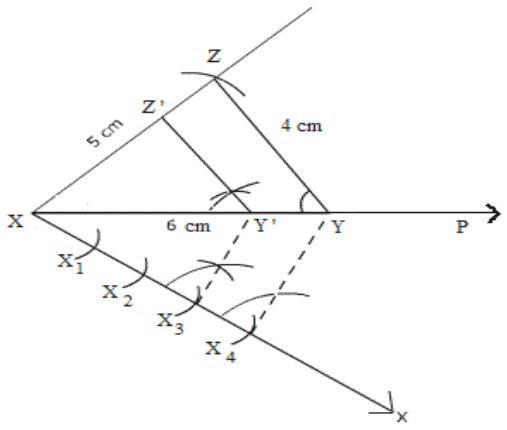
Question-7

Construct a triangle similar to a Δ XYZ with its sides equal to $(\frac{3}{4})$th of the corresponding sides of ΔXYZ. It is given that XY = 6 cm, XZ = 5 cm and ZY = 4 cm. Write the steps of construction.

Solution:

Given: D XYZ in which XY = 6 cm, XZ = 5 cm and ZY = 4 cm.

Required: To construct a Δ XY'Z' in which XY' = (3/4)XY, Y'Z' = (3/4)ZY and XZ' = (3/4)XZ.



Steps of construction:

(i) Draw a ray XP.

(ii) Construct a Δ XYZ in which XY = 6 cm, XZ = 5 cm and ZY = 4 cm.

(iii) Draw any ray XP inclined at certain angle with X.

(iv) Starting from X, cut off seven equal line – segment XX_1, X_1X_2, X_2X_3, X_3X_4 on XQ.

(v) Join YX_4 and draw a line – segment X_3Y' parallel to X_4Y to intersect XP at Y'.

Draw a line Y'Z' parallel to YZ which intersects XP in Y'

Then XY'Z' is the required quadrilateral.

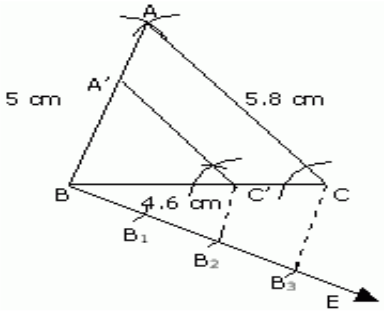
Question-8

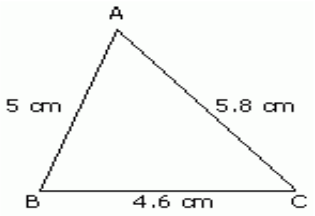
Draw a Δ ABC in which AB = 5 cm, BC = 4.6 cm, and AC = 5.8 cm. Construct a triangle similar to Δ ABC such that each of its sides is 2/3rd of the corresponding sides of Δ ABC.

Solution:

Given: In Δ ABC, in which AB = 5 cm, BC = 4.6 cm, and AC = 5.8 cm.

Required: To construct a triangle similar to Δ ABC such that each of its sides is two-third of the corresponding sides of Δ ABC.





Steps of Construction:

(i) Draw BC = 4.6 cm.

(ii) With B as centre and radius equal to 5 cm draw an arc and with C as centre and radius equal
to 5.8 cm draw another arc to cut the previous arc at A.

(iii) Join AB and AC.

(iv) Make an acute angle ∠ CBE.

(v) Set off three equal distances along BE at B_1, B_2 and B_3.

(vi) Join B_3C.

(vii) From B_2 draw $B_2C' \parallel B_3C$, meeting BC at C'.

(viii) Join AC'.

Then, ABC' is the required triangle.