

11. Construction

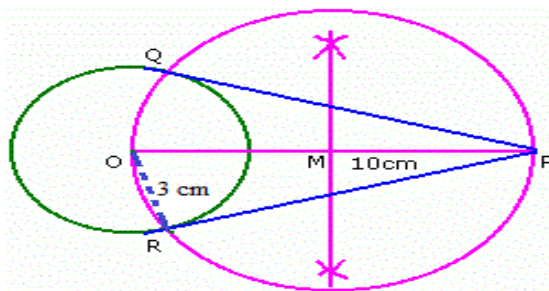
Question-1

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.

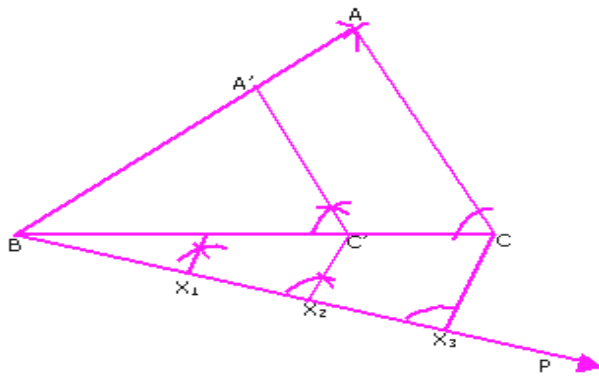
Question-2

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

Solution:

Given: ΔABC , $AB = 7.5$ cm, $BC = 7$ cm and $CA = 6.5$ cm.

Required: To construct a $\Delta A'BC'$ 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 $\angle CBP$
 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 $XX_1 = X_1X_2 = X_2X_3$
 5. Join X_3C
 6. Draw a line $C'A' \parallel CA$ intersecting BA at A' .
- Then $A'BC'$ is the required triangle.

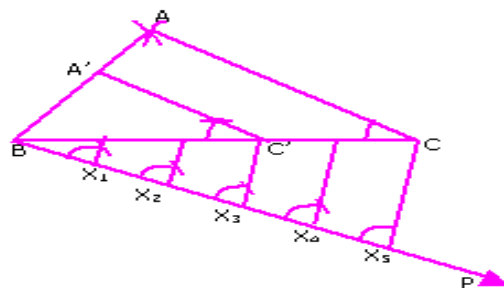
Question-3

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: $\triangle ABC$, $AB = 5$ cm, $BC = 12$ cm and $CA = 13$ cm.

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



Steps of construction:

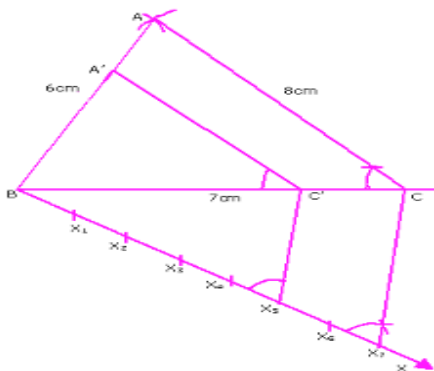
1. Draw a line segment $BC = 12$ cm
2. With B as centre and with radius 5 cm, draw an arc.
3. With C as centre and with radius 13 cm, draw another arc, intersecting the previously drawn arc at A.
4. Join AB and AC. Then, $\triangle ABC$ is the required triangle.
5. Below BC, make an acute angle $\angle CBP$.
6. Along BP, mark off seven points $X_1, X_2, X_3, \dots, X_7$ such that $XX_1 = X_1X_2 = \dots = X_6X_7$
7. Join X_5 to C and draw a line through X_3 parallel to X_5C , 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:

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**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, $\triangle ABC$ is the required triangle.
5. Below BC, make an acute angle $\angle CBX$.
6. Along BX, mark off seven points $X_1, X_2, X_3, \dots, X_7$ such that $XX_1 = X_1X_2 = \dots = X_6X_7$
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.

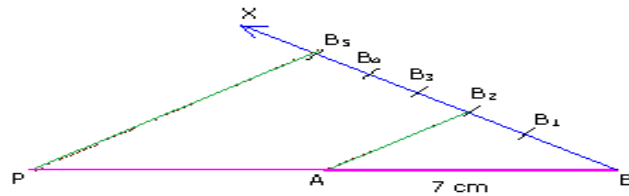
Question-5

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 $\angle ABX$.
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 $\Delta s ABB_2$ and PBB_5 ,

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

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

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

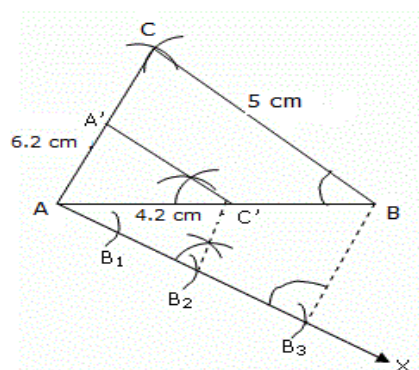
Question-6

Construct a triangle similar to a given ΔABC 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 ΔABC , $AB = 4.2$ cm, $BC = 5$ cm and $AC = 6.2$ cm.

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



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 ΔABC .
 5. Below AB, make an acute angle $\angle BAX$.
 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 $B'C' \parallel BC$, $\Delta ABC \sim \Delta AB'C'$.

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

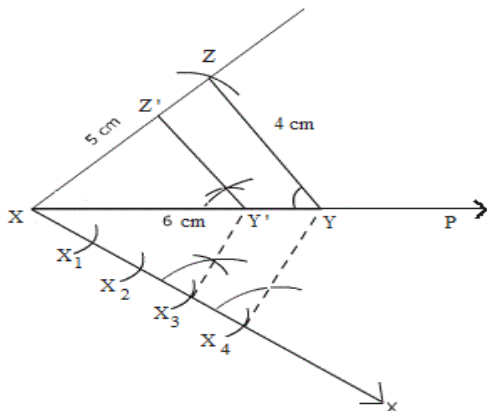
Question-7

Construct a triangle similar to a ΔXYZ 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: ΔXYZ in which $XY = 6$ cm, $XZ = 5$ cm and $ZY = 4$ cm.

Required: To construct a $\Delta XY'Z'$ in which $XY' = (\frac{3}{4})XY$, $Y'Z' = (\frac{3}{4})ZY$ and $XZ' = (\frac{3}{4})XZ$.



Steps of construction:

- (i) Draw a ray XP .
 - (ii) Construct a ΔXYZ 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.

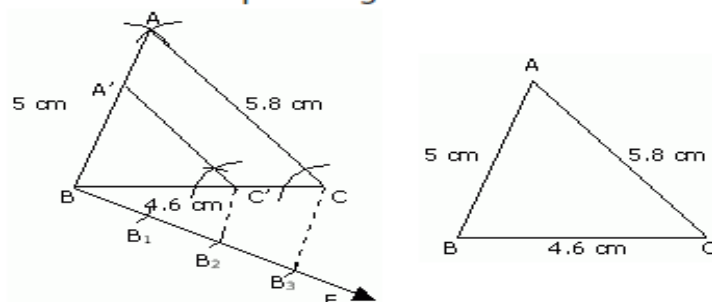
Question-8

Draw a ΔABC in which $AB = 5$ cm, $BC = 4.6$ cm, and $AC = 5.8$ cm. Construct a triangle similar to ΔABC such that each of its sides is $\frac{2}{3}$ rd of the corresponding sides of ΔABC .

Solution:

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

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



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 $\angle CBE$.

(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.