Exercise 11.1 Page No: 11.4

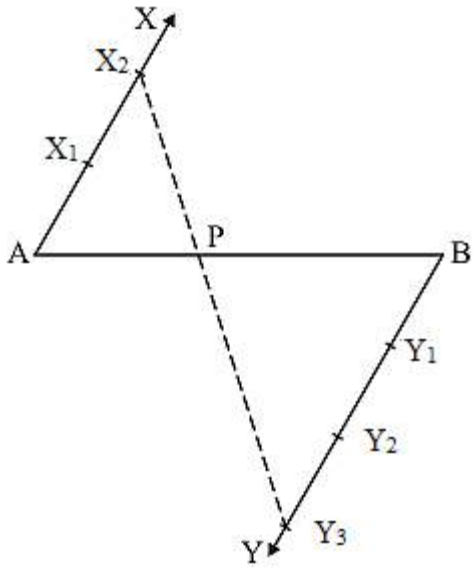
1. Determine a point which divides a line segment of length 12 cm internally in the ratio of 2: 3. Also, justify your construction.

Solution:

Steps of construction:

1. Draw a line segment AB = 12 cm by using a ruler.
2. Through the points A and B draw two parallel line on the opposite side of AB and making the same acute angles with the line segment.
3. Cut 2 equal parts on AX and 3 equal parts on BY such that $AX_1 = X_1X_2$ and $BY_1 = Y_1Y_2 = Y_2Y_3$.
4. Join X_2Y_3 which intersects AB at P

Hence, AP/PB = 2/3.



Justification:

In ΔAX_2P and ΔBY_3P, we have

$\angle APX_2 = \angle BPY_3$ [vertically opposite angle]

$\angle X_2AP = \angle Y_3BP$ [alternate interior angles}

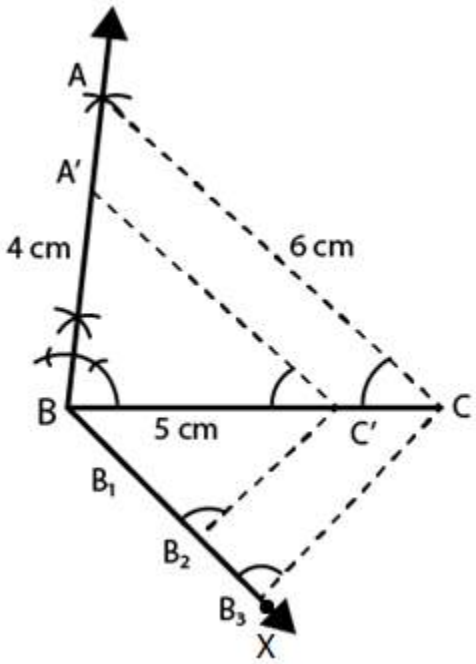
$\Delta AX_2P = \Delta BY_3P$ [Because AA similarity]

$\therefore$ $AP/BP = AX_2/BY_3 = 2/3$ [From C.P.C.T]

Exercise 11.2

1. Construct a triangle of sides 4 cm, 5 cm and 6 cm and then a triangle similar to it whose sides are (2/3) of the corresponding sides of it.

Solution:



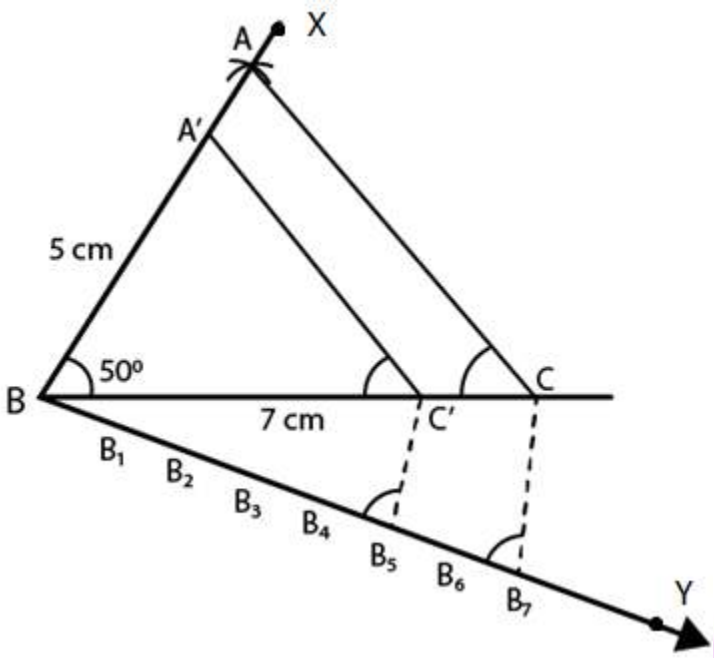
Steps of construction:

1. Draw a line segment BC = 5 cm.
2. With centre as B and radius 4 cm and with centre C and radius 6 cm, draw arcs from both points to intersect each other at A.
3. Now, join AB and AC. Then ABC is the triangle.
4. Draw a ray BX making an acute angle with BC and cut off 3 equal parts making $BB_1 = B_1B_2 = B_2B_3$.
5. Join B_3C.
6. Draw B_2 C' parallel to B_3C and C'A' parallel to CA.

Then, ΔA'BC' is the required triangle.

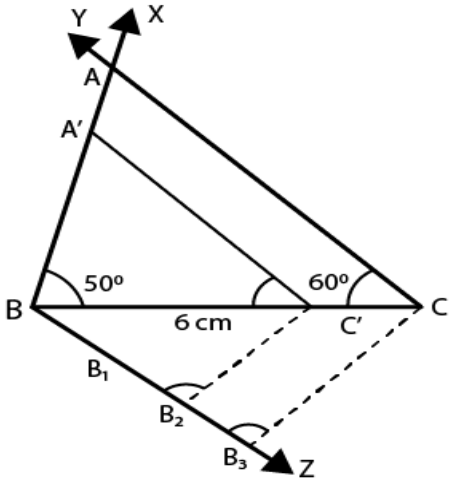
2. Construct a triangle similar to a given ΔABC such that each of its sides is $(5/7)^{th}$ of the corresponding sides of ΔABC. It is given that AB = 5 cm, BC = 7 cm and ∠ABC = 50°.

Solution:



Steps of construction:
1. Draw a line segment BC = 7 cm.
2. Draw a ray BX making an angle of 50° and cut off BA = 5 cm.
3. Join AC. Then ABC is the triangle.
4. Draw a ray BY making an acute angle with BC and cut off 7 equal parts making $BB_1 = B_1B_2 = B_2B_3 = B_3B_4 = B_4B_s = B_5B_6 = B_6B_7$
5. Now, join B_7 and C
6. Draw B_5C' parallel to B_7C and C'A' parallel to CA.
Then, ΔA'BC' is the required triangle.

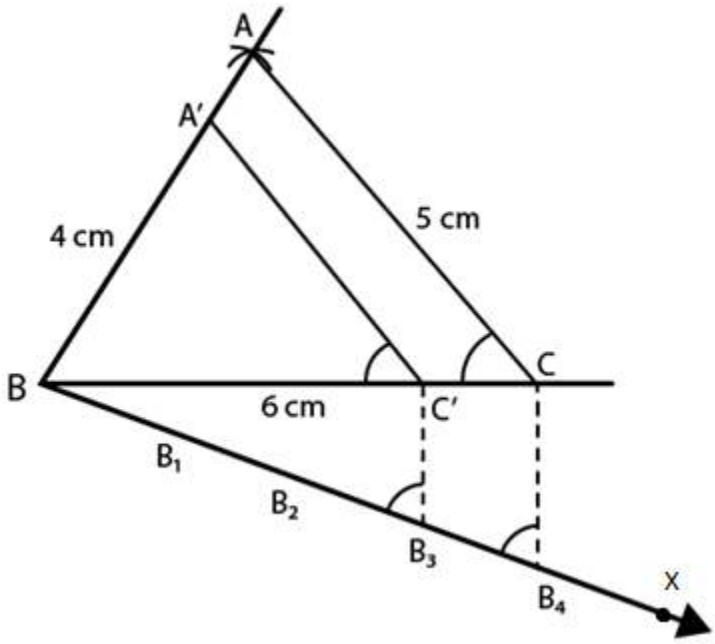
3. Construct a triangle similar to a given ΔABC such that each of its sides is (2/3)rd of the corresponding sides of ΔABC. It is given that BC = 6 cm, ∠B = 50° and ∠C = 60°.
Solution:



Steps of construction:

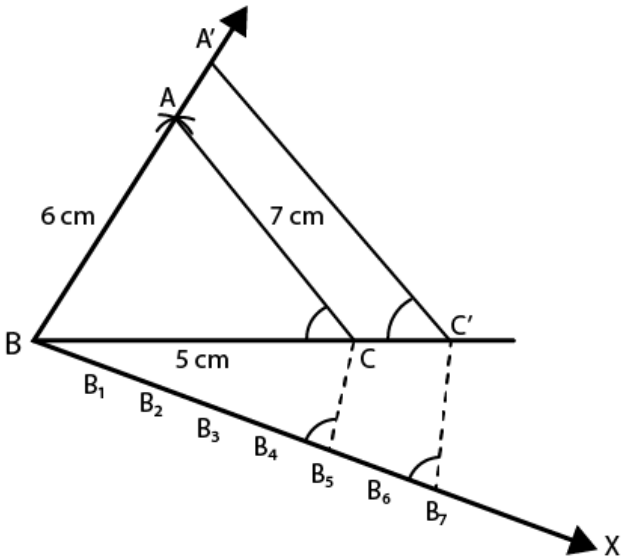
1. Draw a line segment BC = 6 cm.
2. Draw a ray BX making an angle of 50° and CY making 60° with BC which intersect each other at A. Then, ABC is the triangle.
3. From B, draw another ray BZ making an acute angle below BC and then cut off 3 equal parts making $BB_1 = B_1B_2 = B_2B_3$
4. Now, join B_3C.
5. From B_2, draw B_2C' parallel to B_3C and $C'A'$ parallel to CA.
Then $\Delta A'BC'$ is the required triangle.

4. Draw a ΔABC in which BC = 6 cm, AB = 4 cm and AC = 5 cm. Draw a triangle similar to ΔABC with its sides equal to $(3/4)^{th}$ of the corresponding sides of ΔABC.
Solution:



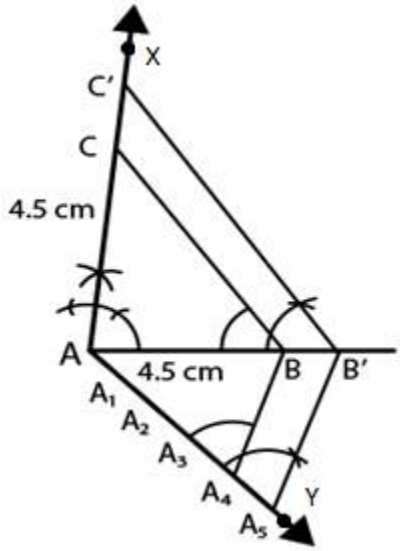
Steps of construction:
1. Draw a line segment BC = 6 cm.
2. With centre as B and radius 4 cm and with C as centre and radius 5 cm, draw arcs intersecting each other at A.
3. Join AB and AC. Then, ABC is the triangle.
4. Draw a ray BX making an acute angle with BC and cut off 4 equal parts making $BB_1 = B_1B_2 = B_2B_3 = B_3B_4$.
5. Join B_4 and C.
6. From B_3 draw C' parallel to B_4C and from C', draw C'A' parallel to CA.
Then $\Delta A'BC'$ is the required triangle.

5. Construct a triangle with sides 5 cm, 6 cm and 7 cm and then another triangle whose sides are $(7/5)^{th}$ of the corresponding sides of the first triangle.
Solution:



Steps of construction:
1. Draw a line segment BC = 5 cm.
2. With B as centre and radius 6 cm and with C as centre and radius 7 cm, draw arcs intersecting each other at A.
3. Now, join AB and AC. Then, ABC is the triangle.
4. Draw a ray BX making an acute angle with BC and cut off 7 equal parts making $BB_1 = B_1B_2 = B_2B_3 = B_3B_4 = B_4B_5 = B_5B_6 = B_6B_7$.
5. Join B_5 and C.
6. From B_7, draw B_7C' parallel to B_5C and $C'A'$ parallel CA.
Then, $\Delta A'BC'$ is the required triangle.

6. Draw a right triangle ABC in which AC = AB = 4.5 cm and ∠A = 90°. Draw a triangle similar to ΔABC with its sides equal to (5/4)th of the corresponding sides of ΔABC.
Solution:



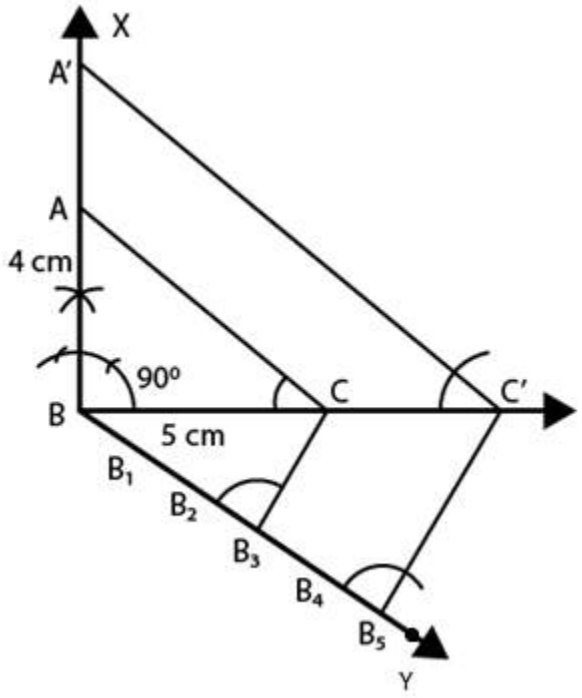
Steps of construction:

1. Draw a line segment AB = 4.5 cm.
2. At A, draw a ray AX perpendicular to AB and cut off AC = AB = 4.5 cm.
3. Now, join BC. Then, ABC is the triangle.
4. Draw a ray AY making an acute angle with AB and cut off 5 equal parts making $AA_1 = A_1A_2 = A_2A_3 = A_3A_4 = A_4A_5$
5. Join A_4 and B.
6. From A_5, draw A_5B' parallel to A_4B and $B'C'$ parallel to BC.

Then, $\Delta AB'C'$ is the required triangle.

7. Draw a right triangle in which the sides (other than hypotenuse) are of lengths 5 cm and 4 cm. Then construct another triangle whose sides are 5/3 times the corresponding sides of the given triangle.

Solution:



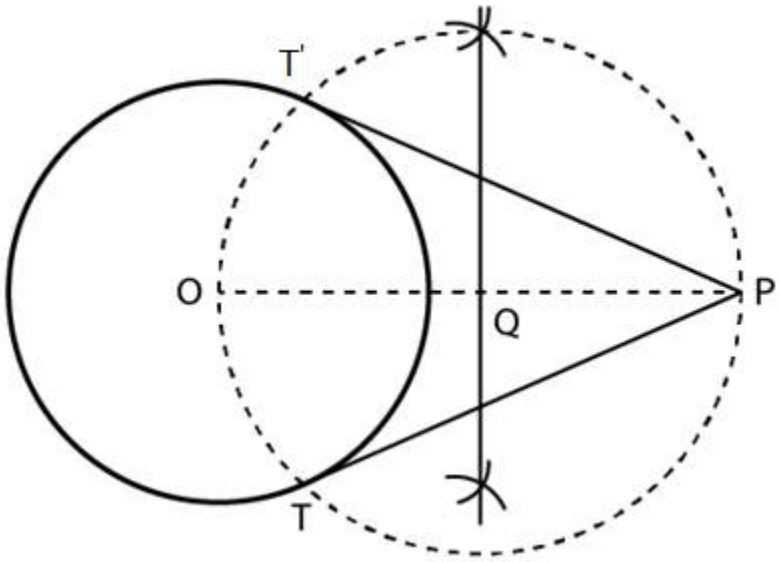
Steps of construction:

1. Draw a line segment BC = 5 cm.
2. At B, draw perpendicular BX and cut off BA = 4 cm.
3. Now, join AC. Then, ABC is the triangle
4. Draw a ray BY making an acute angle with BC and cut off 5 equal parts making $BB_1 = B_1B_2 = B_2B_3 = B_3B_4 = B_4B_5$
5. Join B_3 and C.
6. From B_5, draw B_5C' parallel to B_3C and $C'A'$ parallel to CA.

Then, $\Delta A'BC'$ is the required triangle.

Exercise 11.3 Page No: 11.17

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

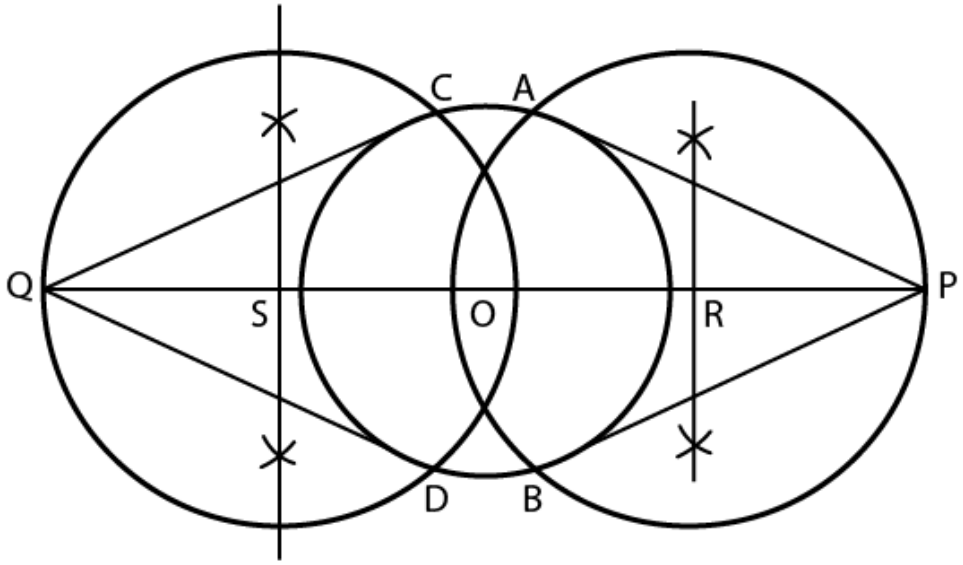


Steps of construction:
1. Firstly, we draw a circle with centre O and radius 6 cm.
2. Mark a point P at a distance of OP = 10 cm, and join OP.
3. Draw a right bisector of OP, intersecting OP at Q.
4. Now, taking Q as centre and radius OQ = PQ, draw a circle to intersect the given circle at T and T'.
5. Join PT and PT' to obtain the required tangents.
Thus, PT and PT' are the required tangents.

To find the length of the tangents.
We know that OT ⊥ PT and ΔOTP is the right triangle.
Therefore, OT = 6 cm (radius) and PO = 10 cm.

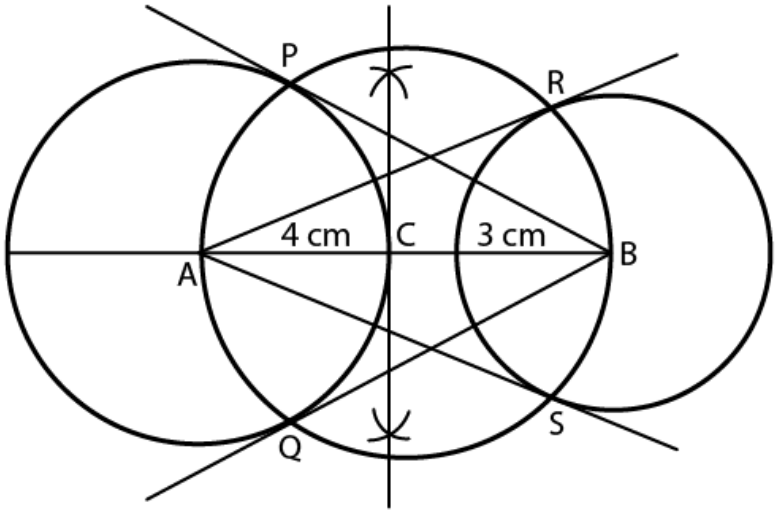
So, in ΔOTP,
$PT^2 = OP^2 - OT^2$ [By Pythagoras theorem]
$= (10)^2 - (6)^2$
$= 100 - 36$
$= 64$
$= 8$ cm
Therefore, the length of tangents is 8 cm each.

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



Steps of construction:
1. Draw a line segment PQ of 14 cm.
2. Now, mark the midpoint O of PQ.
3. Draw the perpendicular bisectors of PO and OQ which intersects at points R and S on PQ.
4. With centre R and radius RP draw a circle.
5. With centre S and radius, SQ draw a circle.
6. And now, with centre O and radius 3 cm draw another circle which intersects the previous circles at the points A, B, C, and D.
7. Finally, join PA, PB, QC and QD. Thus, PA, PB, QC, and QD are the required tangents.

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



Steps of construction:
1. Draw a line segment AB = 8 cm.
2. Draw the perpendicular of AB which intersects it at C.
3. With the centre, C and radius CA draw a circle.
4. Now, with A & B as centres and radii 4 cm and 3 cm respectively, draw two circles which intersects the previous circles at the points P, Q, R and S.
5. Finally, join AR, AS, BP and BQ.
Thus, AR, AS, BP and BQ are the required tangents.