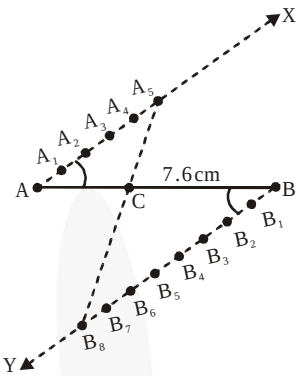
NCERT SOLUTIONS

Constructions

Ex - 11.1

Q1. Draw a line segment of length 7.6 cm and divide it in the ratio 5 : 8. Measure the two parts.

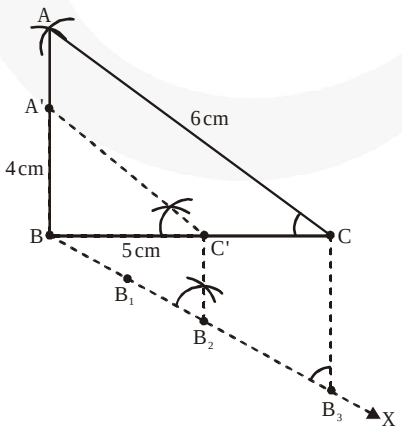
Sol. Steps of construction :



1. Draw AB = 7.6 cm.
2. AX is any ray making an acute angle with AB above the line AB.
3. Draw ray BY below the line AB and parallel to the ray AX by constructing $\angle ABY = \angle BAX$.
4. Mark points A_1, A_2, ..., A_5 on AX and B_1, B_2, ..., B_8 on BY such that $AA_1 = A_1A_2 = ... = A_4A_5 = BB_1 = B_1B_2 = ... = B_7B_8$.
5. Join A_5B_8. It intersects AB at C.
   Now, C divides AB in the ratio 5 : 8.

Q2. 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 correspoding sides of the first triangle.

Sol. Steps of construction :

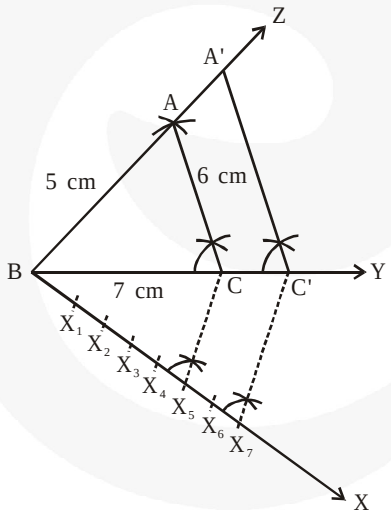


1. Construct ΔABC, such that AB = 4 cm,
   BC = 5 cm and CA = 6 cm.
2. Draw any ray BX making an acute angle with BC (below the side BC).
3. Mark three points B_1, B_2, B_3 on BX such that
   $BB_1 = B_1B_2 = B_2B_3$.
4. Join B_3C
5. Through B_2 draw $B_2C' \parallel B_3C$ and let it intersect
   BC at C'.
6. Through C' draw C'A' || CA and let it intersect
   BA at A'.
   ΔA'BC' is the required triangle similar to the given ΔABC whose side are 2/3 of the corresponding sides of the ΔABC.

Q3. Construct a triangle with sides 5 cm, 6 cm and 7 cm and then another triangle whose sides are $\frac{7}{5}$ of the corresponding sides of the first triangle.

Sol. **Steps of Construction :**

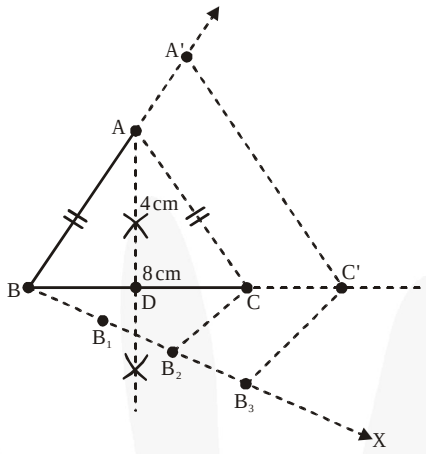
1. Construct a ΔABC such that AB = 5 cm,
   BC = 7 cm and AC = 6 cm.



2. Draw a ray BX such that ∠CBX is an acute angle.
3. Mark 7 points X_1, X_2, X_3, X_4, X_5, X_6 and X_7 on BX such that $BX_1 = X_1X_2 = X_2X_3 = X_3X_4 = X_4X_5 = X_5X_6 = X_6X_7$
4. Join X_5 to C.
5. Draw a line through X_7 intersecting BC (produced) at C' such that $X_5C \| X_7C'$
6. Draw a line through C' parallel to CA to intersect BA (produced) at A'.
   Thus, ΔA'BC' is the required triangle.

Q4. Construct an isosceles triangle whose base is 8 cm and altitude 4 cm and then another triangle whose sides are $1\frac{1}{2}$ times the corresponding sides of the isosceles triangle.

Sol. Steps of construction :



1. Construct isosceles ΔABC such that BC = 8 cm and altitude AD = 4 cm.
2. Draw any ray BX making an acute angle with BC
3. Take B_1, B_2, B_3 on BX such that $BB_1 = B_1B_2 = B_2B_3$.
4. Join B_2C.
5. Through B_3 draw $B_3C' \| B_2C$ and let it intersect BC (produced) at C'.
6. Through C' draw, C'A' || CA and let it intersect BA (produced) at A'.

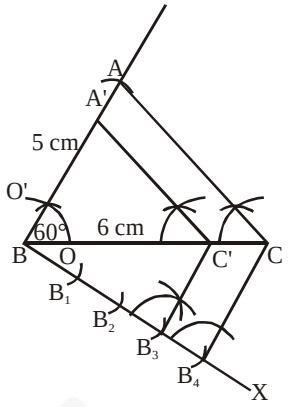
Now, ΔA'BC' is the required triangle whose side are $1\frac{1}{2}$ times the corresponding sides of the ΔABC.

Q5. Draw a triangle ABC with side BC = 6 cm, AB = 5 cm and ∠ABC = 60°.

Then construct a triangle whose sides are $\frac{3}{4}$ of the corresponding sides of the triangle ABC.

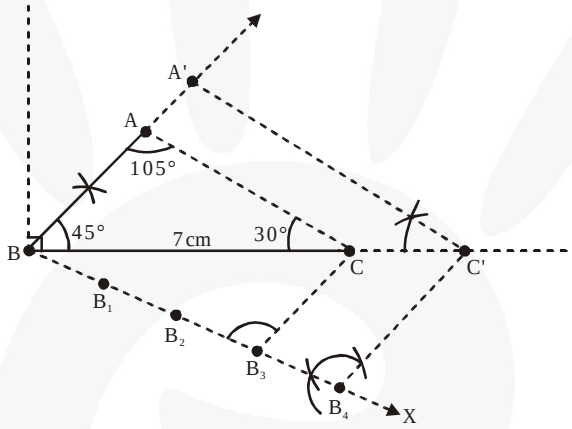
Sol. Steps of construction :

1. Draw a ΔABC with side BC = 6 cm, AB = 5 cm and ∠ABC = 60°.
2. Draw a ray BX making an acute angle with BC on the opposite side of vertex A.
3. Mark 4 points (as 4 is greater in 3 and 4), B_1, B_2, B_3, B_4, on line segment BX such that $BB_1 = B_1B_2 = B_2B_3 = B_3B_4$.
4. Join B_4C and draw a line through B_3, parallel to B_4C intersecting BC at C'.
5. Draw a line through C' parallel to AC intersecting AB at A'. ΔA'BC' is the required triangle.



Q6. Draw a triangle ABC with side BC = 7 cm, ∠B = 45°, ∠A = 105°. Then construct a triangle whose sides are $\frac{4}{3}$ times the corresponding sides of ΔABC.

Sol. Steps of construction :



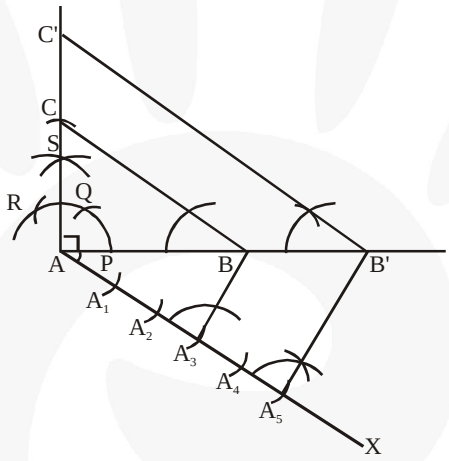
1. Construction ΔABC such that BC = 7 cm, ∠ABC = 45° and ∠ACB = 30° (i.e., ∠BAC = 105°).
2. Draw any ray BX making an acute angle with BC.
3. Take points B_1, B_2, B_3, B_4 on BX such that $BB_1 = B_1B_2$, $B_2B_3 = B_3B_4$.
4. Join B_3C.
5. Through B_4 draw $B_4C' \| B_3C$ and let it intersect BC (produced) at C'.
6. Through C' draw, C'A' || CA and let it intersect BA (produced) at A'.

Now, ΔA'BC' is the required triangle whose sides are $\frac{4}{3}$ times the corresponding sides of the ΔABC.

Q7. Draw a right triangle in which the sides (other than hypotenuse) are of lengths 4 cm and 3 cm. Then construct another triangle whose sides are $\frac{5}{3}$ times the corresponding sides of the given triangle.

Sol. Steps of construction :

1. Draw a line segment AB = 4 cm. Draw a ray SA making 90° with it.
2. Draw an arc of 3 cm radius while taking A as its centre to intersect SA at C. Join BC. ΔABC is the required triangle.
3. Draw a ray AX making an acute angle with AB, opposite to vertex C.
4. Mark 5 points (as 5 is greater in 5 and 3), A_1, A_2, A_3, A_4, A_5, on line segment AX such that $AA_1 = A_1A_2 = A_2A_3 = A_3A_4 = A_4A_5$.
5. Join A_3B. Draw a line through A_5 parallel to A_3B intersecting extended line segment AB at B'.
6. Through B', draw a line parallel to BC intersecting extended line segment AC at C'. ΔAB'C' is the required triangle.

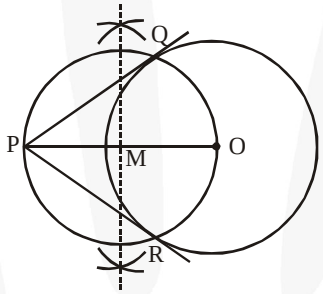


Ex - 11.2

Q1. Draw a circle of radius 6 cm. From a point 10 cm away from its centre, construct the pair of tangents to the circle and measure their lengths.

Sol. Steps of construction :

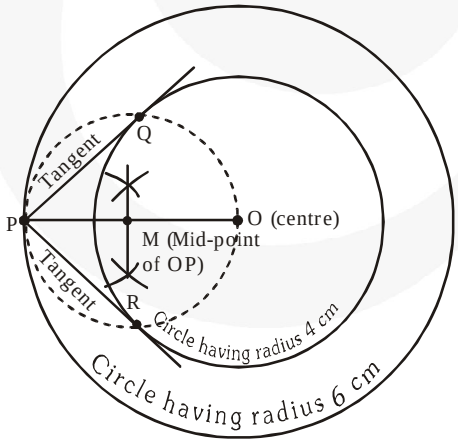
1. Taking any point O of the given plane as centre, draw a circle of 6 cm radius. Locate a point P, 10 cm away from O. Join OP.
2. Bisect OP. Let M be the mid-point of PO.
3. Taking M as centre and MO as radius, draw a circle.
4. Let this circle intersect the previous circle at point Q and R.
5. Join PQ and PR. PQ and PR are the required tangents.



The lengths of tangents PQ and PR are 8 cm each.

Q2. Construct a tangent to a circle of radius 4 cm from a point on the concentric circle of radius 6 cm and measure its length. Also verify the measurement by actual calculation.

Sol. Steps of construction :



1. Draw two concentric circles having radii 4 cm and 6 cm. O is the centre of the circles.
2. Take any point P on the larger circle.
3. Join OP and mark mid-point M of OP.
4. Taking M as centre and radius = MP = MO, draw circle which intersects the smaller circle in two points Q and R.

5. Join PQ and PR.

   Now PQ and PR are the required tangents.

   By measurement, we have length of the tangents = 4.4 cm (approx.).

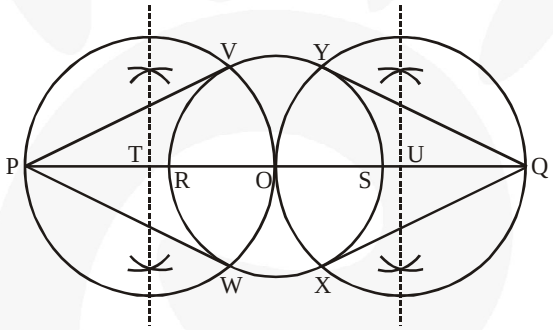
   By calculation, we have length of the tangents

   $= \sqrt{OP^2 - OQ^2} = \sqrt{36 - 16} = \sqrt{20} = 2\sqrt{5}$ cm

Q3. 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 two points P and Q.

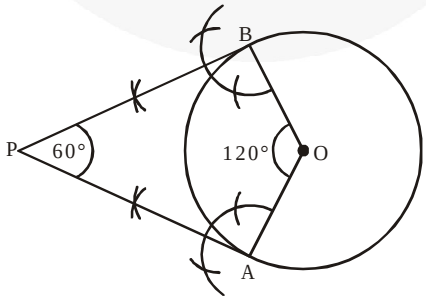
Sol. Steps of construction :

1. Taking any point O on the given plane as centre, draw a circle of 3 cm radius.
2. Take one of its diameters, RS, and extend it on both sides. Locate two points on this diameter such that OP = OQ = 7 cm
3. Bisect OP and OQ. Let T and U be the mid-points of OP and OQ respectively.
4. Taking T and U as its centre and with TO and UO as radius, draw two circles. These two circles will intersect the circle at point V, W, X, Y respectively. Join PV, PW, QX, and QY. These are the required tangents.



Q4. Draw a pair of tangents to a circle of radius 5 cm which are inclined to each other at an angle of 60°.

Sol. Steps of construction :



1. Draw circle with centre at O and radius 5 cm.
2. Construct radii OA and OB such that ∠AOB = 120°.

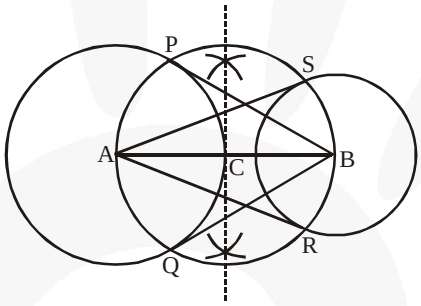
3. Draw perpendiculars to OA and OB at A and B respectively and let they intersect at P.

   Now, PA and PB is a pair of tangents inclined to each other at an angle of 60°.

Q5. Draw a line segment AB of length 8 cm. Taking A as centre, draw a circle of radius 4 cm and taking B as centre, draw another circle of radius 3 cm. Constuct tangents to each circle from the centre of the other circle.

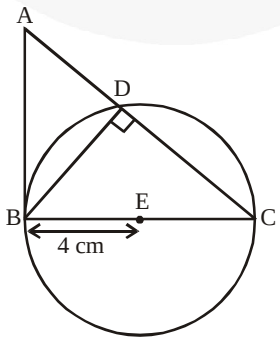
Sol. Steps of construction :

1. Draw a line segment AB of 8 cm. Taking A and B as centre, draw two circles of 4 cm and 3 cm radius.
2. Bisect the line AB. Let the mid-point of AB be C. Taking C as centre, draw a circle of AC radius which will intersect the circles at points P, Q, R, and S. Join BP, BQ, AS, and AR. These are the required tangents.



Q6. 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 the tangents from A to this circle.

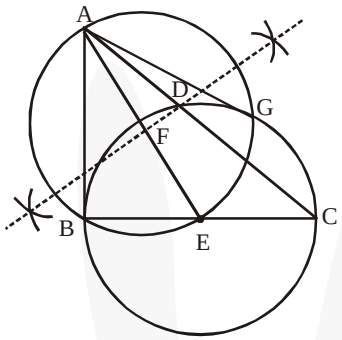
Sol. Consider the following situation. If a circle is drawn through B, D, and C, BC will be its diameter as ∠BDC is of measure 90°. The centre E of this circle will be the midpoint of BC.



The required tangents can be constructed on the given circle as follows.

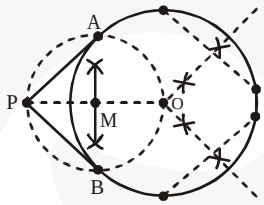
Steps of construction :

1. Join AE and bisect it. Let F be the mid-point of AE.
2. Taking F as centre and FE as its radius, draw a circle which will intersect the circle at point B and G. Join AG.
   AB and AG are the required tangents.



Q7. Draw a circle with the help of a bangle. Take a point outside the circle. Construct the pair of tangents from this point to the circle.

Sol. Steps of construction :



1. Locate the centre O of the circle by drawing right bisectors of two non-parallel chords of the circle. These right bisectors intersect each other at the centre of the circle. (i.e., at O).
2. Take point P outside the circle and join OP.
3. Locate mid-point M of OP.
4. Taking M as centre and radius equal to MP, draw circle. It intersects the given circle at A and B.
5. Joint PA and PB.
   Now, PA and PB are the required tangents drawn from P to the circle.