NCERT Solutions for Class 10 Maths Chapter 11 - Constructions

Chapter 11 - Constructions Exercise Ex. 11.1

Solution 1

The steps of construction are as follows:

(1) Draw line segment AB of 7.6 cm and draw a ray AX making an acute angle with side AB.

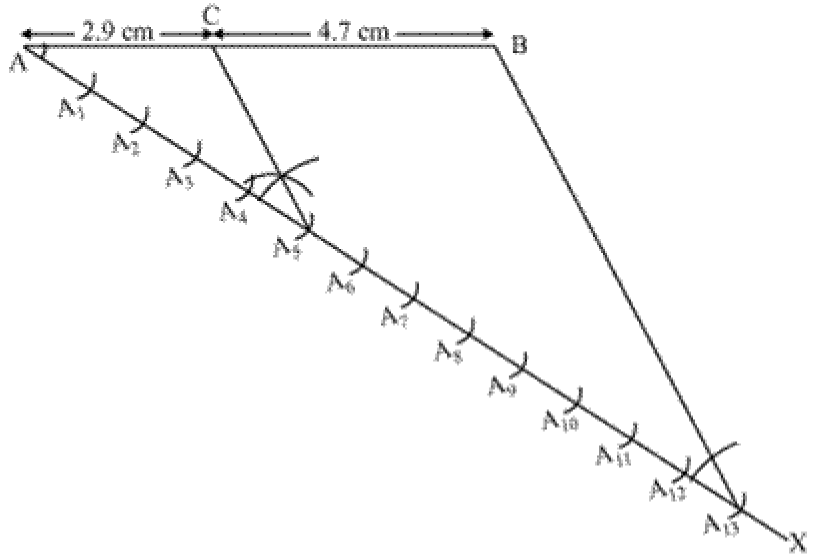
(2) Locate 13 (= 5 + 8) points A_1, A_2, A_3, A_4……..A_{13} on AX such that $AA_1 = A_1A_2 = A_2A_3 \ldots = A_{12}A_{13}$

(3) Join BA_{13}.

(4) Through the point A_5 draw a line parallel to BA_{13} (by making an angle equal to $\angle AA_{13}B$) at A_5 intersecting AB at point C.

Now C is the point dividing line segment AB of 7.6 cm in the required ratio of 5: 8.

We can measure the lengths of AC and CB. The length of AC and CB comes to 2.9 cm and 4.7 cm respectively.



Solution 2

The steps of construction are as follows:

1. Draw a line segment AB = 4 cm. Taking point A as centre draw an arc of 5 cm. radius. Similarly, taking point B as its centre, draw an arc of 6 cm radius. These arcs will intersect each other point C. Now AC = 5 cm. and BC = 6 cm and ΔABC is the required triangle.

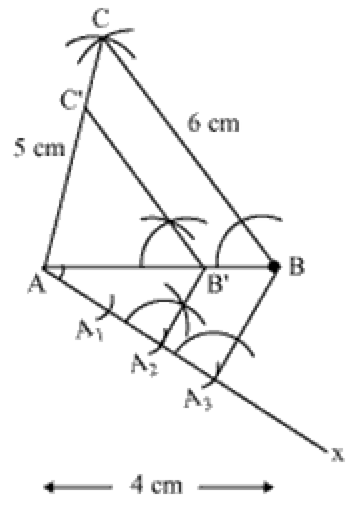
2. Draw a ray AX making acute angle with line AB on opposite side of vertex C.

3. Locate 3 points A_1, A_2, A_3 (as 3 is greater between 2 and 3) on line AX such that $AA_1 = A_1A_2 = A_2A_3$.

4. Join BA_3 and draw a line through A_2 parallel to BA_3 to intersect AB at point B'.

5. Draw a line through B' parallel to the line BC to intersect AC at C'.

ΔAB'C' is the required triangle.



Solution 3

The steps of construction are as follows:

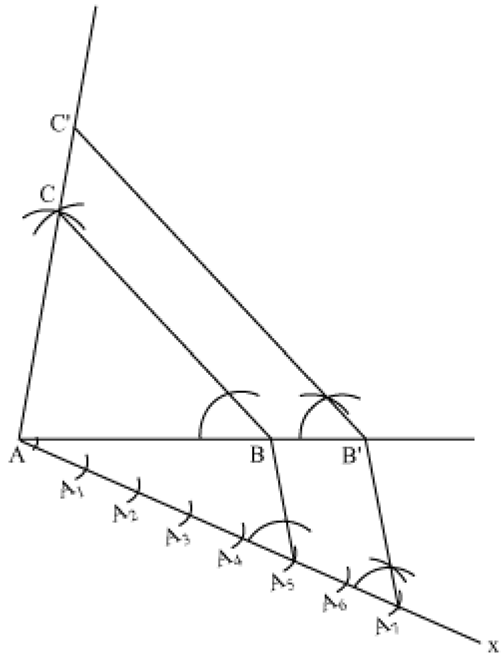
1. Draw a line segment AB of 5 cm. Taking A and B as centre, draw arcs of 6 cm and 7 cm radius respectably. Let these arcs intersect each other at point C. ΔABC is the required triangle having length of sides as 5 cm, 6 cm and 7 cm respectively.

2. Draw a ray AX making acute angle with line AB on opposite side of vertex C.

3. Locate 7 points A_1, A_2, A_3, A_4 A_5, A_6, A_7 (as 7 is greater between 5and 7) on line AX such that $AA_1 = A_1A_2 = A_2A_3 = A_3A_4 = A_4A_5 = A_5A_6 = A_6A_7$.

4. Join BA_5 and draw a line through A_7 parallel to BA_5 to intersect extended line segment AB at point B'.

5. Draw a line through B' parallel to BC intersecting the extended line segment AC at C' ΔAB'C' is required triangle.



Solution 4

Let ΔABC be an isosceles triangle having CA and CB of equal lengths, base AB is 8 cm and AD is the attitude of length 4 cm.

Now, the steps of construction are as follows:

1. Draw a line segment AB of 8 cm. Draw arcs of same radius on both sides of line segment while taking point A and B as its centre. Let these arcs intersect each other at O and O'. Join OO'. Let OO' intersect AB at D.

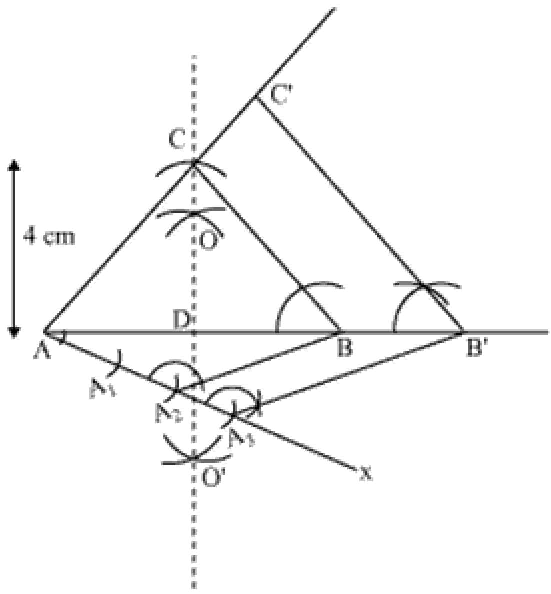
2. Take D as centre and draw an arc of 4 cm radius which cuts the extended line segment OO' at point C. Now an isosceles ΔABC is formed, having CD (attitude) as 4 cm and AB (base) as 8 cm.

3. Draw a ray AX making an acute angle with line segment AB on opposite side of vertex C.

4. Locate 3 points (as 3 is greater between 3 and 2) on AX such that $AA_1 = A_1A_2 = A_2A_3$.

5. Join BA_2 and draw a line through A_3 parallel to BA_2 to intersect extended line segment AB at point B'.

6. Draw a line through B' parallel to BC intersecting the extended line segment AC at C' ΔAB'C' is the required triangle.



Solution 5

The steps of construction are as follows:

1. Draw a line segment BC of length 6 cm. Draw an arc of any radius while taking B as centre. Let it intersect line BC at point O. Now taking

O as centre draw another arc to cut the previous arc at point O'. Joint BO' which is the ray making 60° with line BC.

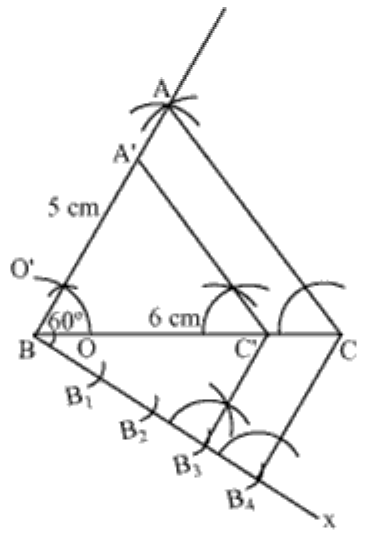
2. Now draw an arc of 5 cm. radius, while taking, B as centre, intersecting extended line segment BO' at point A. Join AC. ΔABC is having AB = 5 cm. BC = 6 cm and ∠ABC = 60°.

3. Draw a ray BX making an acute angle with BC on opposite side of vertex A.

4. Locate 4 points (as 4 is greater in 3 and 4). B_1, B_2, B_3, B_4 on line segment BX.

5. Join B_4C and draw a line through B_3, parallel to B_4C intersecting BC at C'.

6. Draw a line through C' parallel to AC intersecting AB at A'. ΔA'BC' is the required triangle.



Solution 6

$\angle B = 45°$, $\angle A = 105°$

It is known that the sum of all interior angles in a triangle is 180°.

$\angle A + \angle B + \angle C = 180°$.

$105° + 45° + \angle C = 180°$

$\angle C = 180° - 150° = 30°$

Now, the steps of construction are as follows:

1. Draw a line segment BC = 7 cm. Draw an arc of any radius while taking B as centre. Let it intersects BC at P. Draw an arc from P, of same radius as before, to intersect this arc at Q. From Q, again draw an arc, of same radius as before, to cut the arc at R. Now from points Q and R draw arcs of same radius as before, to intersect each other at S. Join BS.

Let BS intersect the arc at T. from T and P draw arcs of same radius as before to intersect each other at U. Join BU which is making 45° with BC.

2. Draw an arc of any radius taking C as its centre. Let it intersects BC at O. Taking O as centre, draw an arc of same radius intersecting the previous arc at O'. Now taking O and O' as centre, draw arcs of same radius as before, to intersect each other at Y. Join CY which is making 30° to BC.

3. Extend line segment CY and BU. Let they intersect each other at A. ΔABC is the triangle having $\angle A = 105°$, $\angle B = 45°$ and BC = 7 cm.

4. Draw a ray BX making an acute angle with BC on opposite side of vertex A.

5. Locate 4 points (as 4 is greater in 4 and 3) B_1, B_2, B_3, B_4 on BX.

6. Join B_3C. Draw a line through B_4 parallel to B_3C intersecting extended BC at C'.

7. Through C' draw a line parallel to AC intersecting extended line segment at C'. $\Delta A'BC'$ is required triangle.

Solution 7

The steps of construction are as follows:

(1) Draw a line segment AB = 4 cm draw a ray SA making 90° with it.

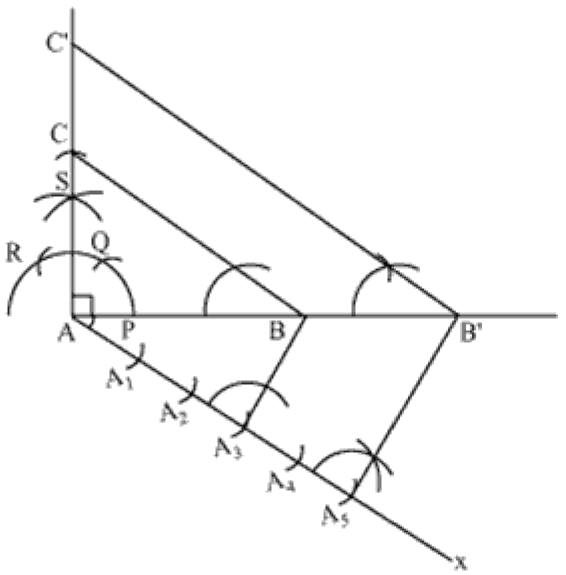
(2) Draw an arc of 3 cm radius while taking A as its centre to intersect SA at C. Join BC. ΔABC is required triangle.

(3) Draw a ray AX making an acute angle with AB, opposite to vertex C.

(4) Locate 5 points (as 5 is greater in 5 and 3) A_1, A_2, A_3, A_4, A_5 on line segment AX.

(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'. ΔA'BC' is required triangle.



Chapter 11 - Constructions Exercise Ex. 11.2

Solution 1

The steps of construction are as follows:

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.

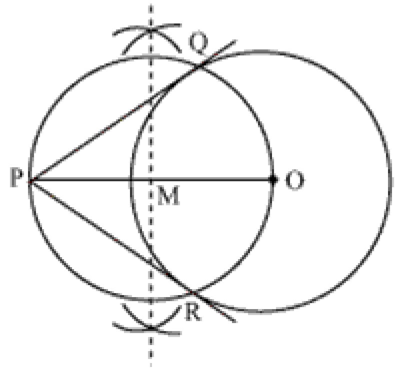
2. Bisect OP. Let M be the midpoint of PO.

3. Taking M as centre and MO as radius draw a circle.

4. Let this circle intersect our circle at point Q and R.

5. Join PQ and PR. PQ and PR are the required tangents.

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



Solution 2

The steps of construction are as follows:

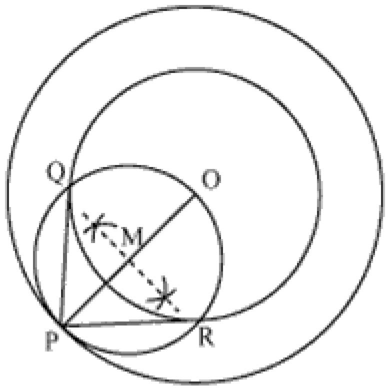
1. Draw a circle of 4 cm radius with centre as O on the given plane.

2. Draw a circle of 6 cm radius taking O as its centre. Locate a point P on this circle and join OP.

3. Bisect OP. Let M be the midpoint of PO.

4. Taking M as its centre and MO as its radius draw a circle. Let it intersects the given circle at the points Q and R.

5. Join PQ and PR. PQ and PR are the required tangents.



Now, PQ and PR are of length 4.47 cm each.

In ΔPQO, since PQ is tangent, $\angle PQO = 90°$.

$PO = 6$ cm

$QO = 4$ cm

Applying Pythagoras theorem in ΔPQO,

$PQ^2 + QO^2 = PQ^2$

$PQ^2 + (4)^2 = (6)^2$

$PQ^2 = 20$

$PQ = 2\sqrt{5} = 4.47$ cm

Solution 3

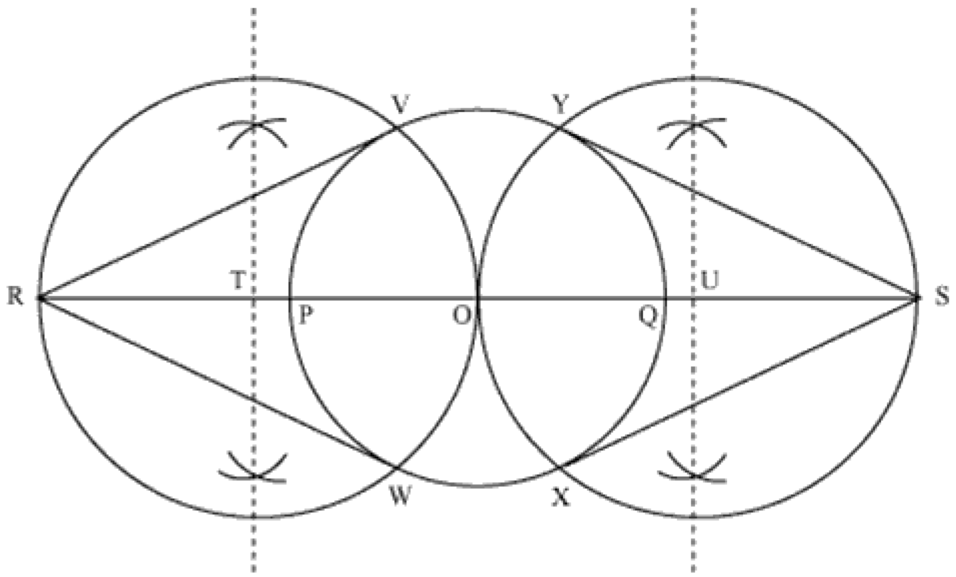
The steps of construction are as follows:

1. Taking any point O on given plane as centre draw a circle of 3 cm radius.

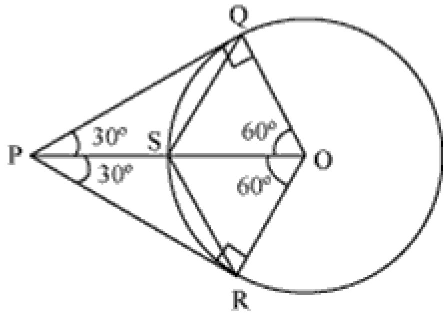
2. Take one of its diameters, PQ, extend it on both sides. Locate two points on this diameter such that OR = OS = 7 cm.

3. Bisect OR and OS. Let T and U be the midpoints of OR and OS respectively.

4. Taking T and U as its centre, with TO and UO as radius draw two circles. These two circles will intersect our circle at point V, W, X, Y respectively. Join RV, RW, SX, and SY. These are required tangents.



Solution 4



Consider the above figure. PQ and PR are the tangents to the given circle.

If they are inclined at 60°, then $\angle QPO = \angle OPR = 30°$

Hence, $\angle POQ = \angle POR = 60°$

Consider ΔQSO,

$\angle QOS = 60°$

OQ = OS (radius)

So, $\angle OQS = \angle OSQ = 60°$

$\therefore \Delta QSO$ is an equilateral triangle

So, QS = SO = QO = radius

$\angle PQS = 90° - \angle OQS = 90° - 60° = 30°$

$\angle QPS = 30°$

PS = SQ (isosceles triangle)

Hence, PS = SQ = OS (radius)

Now, the steps of construction are as follows:

1. Draw a circle of 5 cm radius and with centre O.

2. Take a point P on circumference of this circle. Extend OP to Q such that OP = PQ.

3. Midpoint of OQ is P. Draw a circle with radius OP with centre as P.

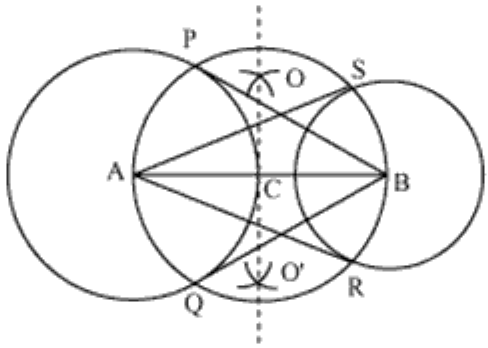
Let it intersect our circle at R and S. Join QR and QS. QR and QS are required tangents.

Solution 5

The steps of construction are as follows:

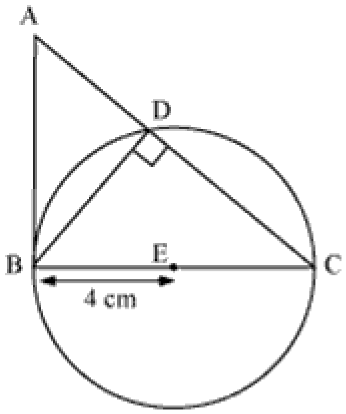
1. Draw a line segment AB of 8 cm. Taking A and B as centre draw two circles of 4 cm and 3 cm radius.

2. Bisect the line AB. Let midpoint of AB is C. Taking C as centre draw a circle of AC radius which will intersect our circles at point P, Q, R and S. Join BP, BQ, AS and AR.These are our required tangents.



Solution 6

In the following figure, it can be seen that if a circle is drawn through B, D and C, then BC will be its diameter as $\angle BDC$ is of 90°. The centre E of this circle will be the midpoint of BC.

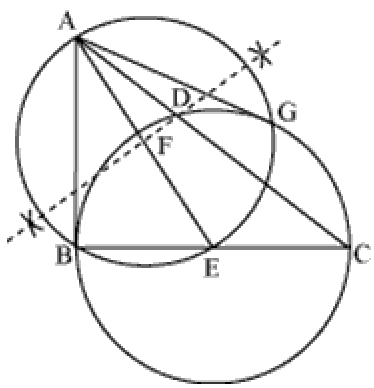


The steps of construction are as follows:

1. Join AE and bisect it. Let F be the midpoint of the AE.

2. Now taking F as centre and FE as its radius draw a circle which will intersect our circle at point B and G. Join AG.

AB and AG are the required tangents.



Solution 7

The steps of construction are as follows:

1. Draw a circle, with the help of bangle.

2. Take a point P outside this circle and take two chords QR and ST.

3. Draw perpendicular bisectors of these chords. Let they intersect each other at point O.

4. Join PO and bisect it. Let U be the midpoint of PO. Taking U as centre, draw a circle of radius OU, which will intersect our circle at V and W. Join PV and PW.

PV and PW are required tangents.