

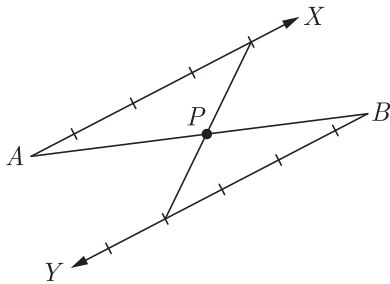
# CHAPTER 11

## Construction

### TOPIC 1 : DIVISION OF A LINE SEGMENT IN A GIVEN RATIO

#### VERY SHORT ANSWER TYPE QUESTIONS

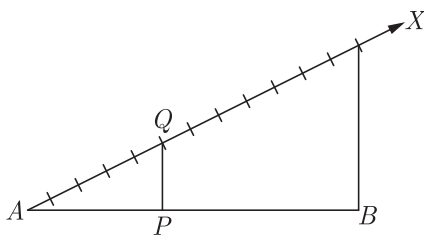
1. In given figure, in what ratio does  $P$  divides  $AB$  internally ?



**Ans :** [Board Term-2, 2012 Set (26)]  
 $P$  divides  $AB$  internally in the ratio  $4:4 \Rightarrow 1:1$ .

2. To divide a line segment  $AB$  in the ratio  $5:7$ , first  $AX$  is drawn, so that  $\angle BAX$  is an acute angle and then at equal distance, points are marked on the ray  $AX$ , find the minimum number of these points.

**Ans :** [Board Term-2, 2012 Set (13)]  
 Minimum number of points marked on  $AX = 5 + 7 = 12$

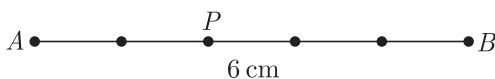


3. To divide a line segment  $AB$  in the ratio  $2:5$ , a ray  $AX$  is drawn such that  $\angle BAX$  is acute. Then points are marked at equal intervals on  $AX$ . What is the minimum number of these points ?

**Ans :** [Board Term-2, 2012 Set(1)]  
 Minimum number of points marked on  $AX = 2 + 5 = 7$

4. To find a point  $P$  on the line segment  $AB = 6$  cm, such that  $\frac{AP}{AB} = \frac{2}{5}$ , in which ratio the line segment  $AB$  is divided.

**Ans :** [Board Term-2, 2012 Set (5)]



The line segment  $AB$  is divided in the ratio  $AP : PB = 2 : (5 - 2) = 2 : 3$

5. A line Segment  $AB$  is divided at point  $P$  such that  $\frac{PB}{AB} = \frac{3}{7}$ , then find the ratio  $AP : PB$ .

**Ans :** [Board Term-2, 2012 Set (44)]

Here,  $AB = 7, PB = 3$

$$\therefore AP = AB - PB = 7 - 3 = 4$$

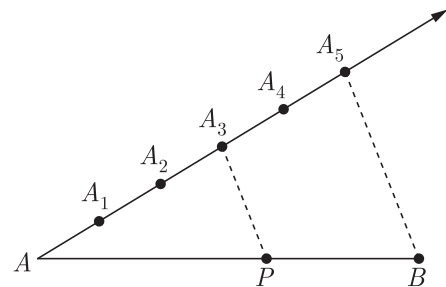
$$\therefore AP : PB = 4 : 3$$

6. To divide the line segment  $AB$  in the ratio  $2 : 3$ , a ray  $AX$  is drawn such that  $\angle BAX$  is acute,  $AX$  is then marked at equal intervals. Find minimum number of these marks.

**Ans :** [Board Term-2, 2012 Set (12)]

Minimum number of marks =  $2 + 3 = 5$

7. What is the ratio of division of the line segment  $AB$  by the point  $P$  from  $A$  ?



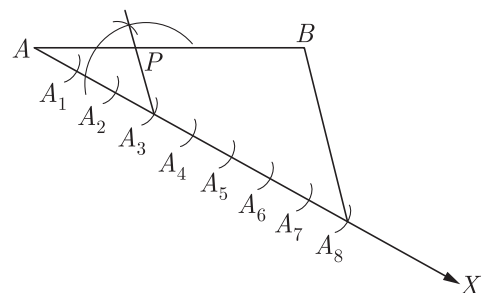
**Ans :** [Board Term-2, 2012 (22)]

The ratio of division of the line segment  $AB$  by the point  $P$  from  $A$  is  $AP : AB = 3 : 5$ .

#### SHORT ANSWER TYPE QUESTIONS - I

1. Draw a line segment of length 7 cm. Find a point  $P$  on it which divides it in the ratio  $3 : 5$ .

**Ans :** [Board Term-2, 2015]

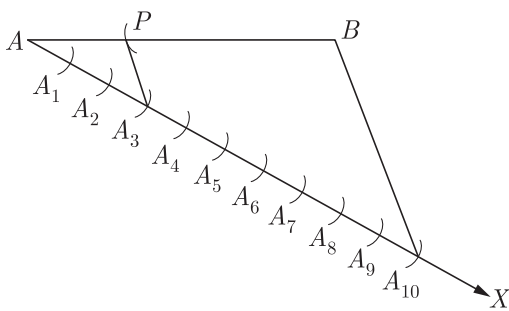


**Steps of construction :**

1. Draw a line segment  $AB = 7$  cm.
  2. Draw any ray  $AX$  making an acute angle downward with  $AB$ .
  3. Mark the point  $A_1, A_2, A_3, \dots, A_8$  on  $AX$  such that  $AA_1 = A_1A_2 = A_2A_3 = \dots, A_7A_8$ .
  4. Join  $BA_8$ .
  5. Through the point  $A_3$ , draw a line parallel to  $BA_8$ . To meet  $AB$  on  $P$ .
- Hence  $AP : PB = 3 : 5$

2. Draw a line segment of length 5 cm and divide it in the ratio  $3 : 7$ .

Ans : [Board Term-2, 2015]



**Step of Construction :**

1. Draw a line segment  $AB = 5$  cm.
2. Draw any ray  $AX$  making an acute angle downward with  $AB$ .
3. Mark the points  $A_1, A_2, A_3, \dots, A_{10}$  on  $AX$  such that  $AA_1 = A_1A_2 = \dots = A_9A_{10}$ .
4. Join  $BA_{10}$ .
5. Through the point  $A_3$  draw a line parallel to  $BA_{10}$ . To meet  $AB$  at  $P$

Hence  $AP : PB = 3 : 7$

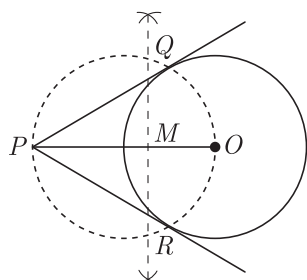
**TOPIC 2 : TANGENTS TO A CIRCLE FROM A POINT OUTSIDE IT**

**SHORT ANSWER TYPE QUESTIONS - I**

1. Draw tangents to a circle of radius 6 cm from a point  $P$  at a distance of 10 cm from its centre.

Ans : [Board Term-2, 2015]

Given : A circle with centre  $O$  and a point  $P$  outside it. To construction : Two tangents from  $P$  to the circle.



**Steps of construction :**

1. Draw a line segment  $PO = 10$  cm.
2. From the point  $O$  draw a circle of radius = 6 cm.
3. Draw a perpendicular bisector of  $PO$ . Let  $M$  be the mid-point of  $PO$ .
4. Taking  $M$  as centre and  $OM$  as radius draw a circle points  $Q$  and  $R$ .
5. Let this circle intersect the given circle at the points  $Q$  and  $R$ .
6. Join  $PQ$  and  $PR$ .

Hence,  $PQ$  and  $PR$  are the required tangents.

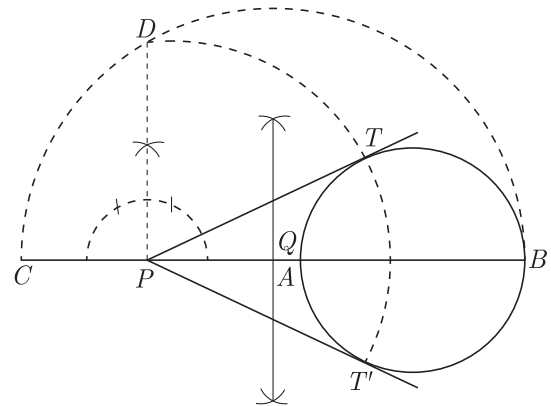
2. Draw a circle of radius 1.5 cm. Take a point  $P$  outside it. Without using the centre draw two tangents to the circle from the point  $P$ .

Ans : [Board Term II, 2012 Set (56); 2011, Set B1]

**Steps of construction :**

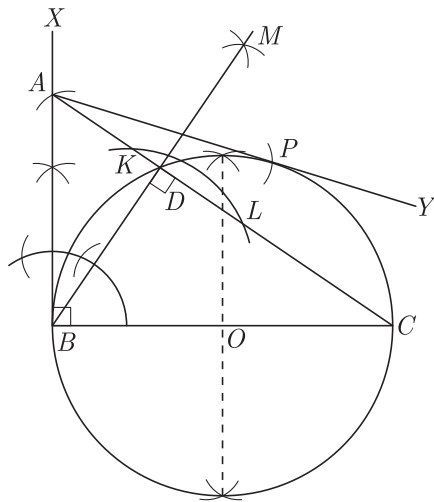
1. Draw a circle of radius 1.5 cm. Take a point  $P$  outside it.
2. Through  $P$  draw a secant  $PAB$  to meet the circle at  $A$  and  $B$ .
3. Produce  $AP$  to  $C$  such that  $PC = PA$ . Bisect  $CB$  at  $Q$ .
4. With  $CB$  as diameter and centre as  $Q$ , draw a semi circle.
5. Draw  $PD \perp CB$ , to meet semi-circle at the point  $D$ .
6. Intersect  $P$  as centre and  $PD$  as radius draw an arc to intersect the circle at  $T$  and  $T'$ .  $PT$  and  $PT'$  are the required tangents.
7. Join  $P$  to  $T$  and  $P$  to  $T'$

Hence



3. Let  $ABC$  be a right triangle in which  $AB = 6$  cm,  $BC = 8$  cm and  $\angle B = 90^\circ$ .  $BD$  is the perpendicular from  $B$  on  $AC$ . The circle through  $B, C$  and  $D$  is drawn. Construct the tangents from  $A$  to this circle.

Ans : [Board Term-2, 2011, Set A1, B1]



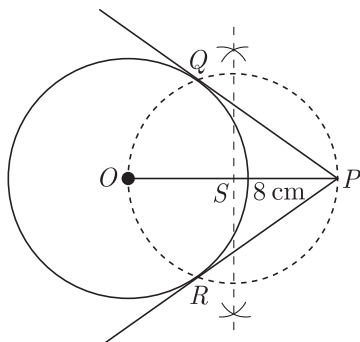
**Steps of construction :**

1. Draw a line segment  $BC = 8$  cm.
2. Make a right angle at the point  $B$  i.e.,  $\angle CBX = 90^\circ$
3. Draw a arc of radius 6 cm as centre  $B$  which intersect  $BX$  at the point  $A$ .
4. Join  $AC \therefore ABC$  is required right angle triangle.
5. Draw a arc taking centre  $B$  which intersect  $AC$  at the point  $K$  and  $L$  respectively taking  $K$  and  $L$  centre draw two arcs of same radius which intersect at the point  $M$ .
6. Join  $BM \therefore \angle BDC = 90^\circ$
7. Draw perpendicular bisector of  $BC$ .
8. Draw a circle taking radius equal to  $OB$  and centre  $O$  which is passes through  $B, D$  and  $C$ .
9. Draw a arc taking centre  $A$  and radius equal to  $AB$  intersect the circle at point  $P \therefore AP$  is the tangents.

**SHORT ANSWER TYPE QUESTIONS - II**

1. Construct a pair tangents  $PQ$  and  $PR$  to a circle of radius 4 cm from a point  $P$  outside the circle 8 cm away from the centre. Measure  $PQ$  and  $PR$ .

Ans : [Board Term-2, 2014]



**Steps of construction :**

1. Draw a line segment  $OP = 8$  cm
2. Taking  $O$  as centre and another radius 4 cm, draw a circle.

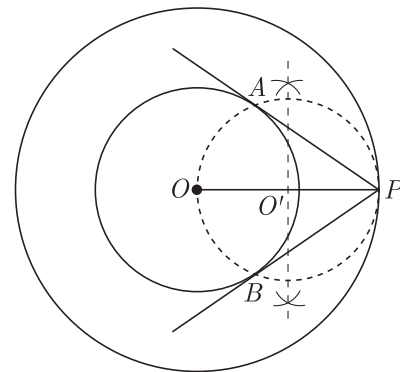
3. Taking  $OP$  as diameter draw another circle which intersects the first circle at  $Q$  and  $R$ .
4. Join  $P$  to  $Q$  and  $P$  to  $R$ .  
On measuring, we get  $PQ = PR = 5$  cm

2. Construct a tangent to a circle of radius 4 cm from a point on the concentric circle of radius 6 cm.

Ans : [Board Term-2, 2013]

**Steps of construction :**

1. Draw a circle of radius 4 cm with centre  $O$ .
2. Draw another circle of radius 6 cm with same centre  $O$ .
3. Take a point  $P$  on second circle and join  $OP$ .
4. Draw perpendicular bisector of  $OP$  which intersect  $OP$  at  $O'$ .



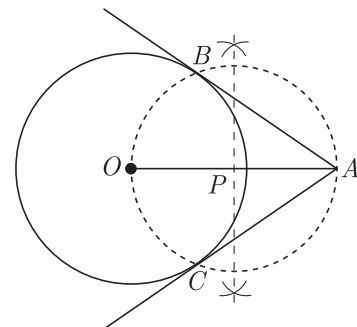
5. Draw a circle with centre  $O'$  which intersects inner circle at points  $A$  and  $B$ .
6. Join  $AP$  and  $BP$ .  
 $\therefore AP$  and  $BP$  are required tangents.

3. Draw a circle of radius 5 cm. Marks a point  $A$  which is 8 cm away from its centre  $O$ , construct the tangents  $AB$  and  $AC$ . Measure the lengths of  $AB$  and  $AC$ .

Ans :

**Steps of construction :**

1. Draw a line segment  $OA = 8$  cm.
2.  $O$  as centre and radius 5 cm, draw circle.
3. Taking  $OA$  as diameter draw another circle which intersects the given circle at  $B$  and  $C$ .
4. Join  $A$  to  $B$  and  $A$  to  $C$ .



$\therefore AB$  and  $AC$  are required tangents.  
 $AB = AC = 6.2$  cm.

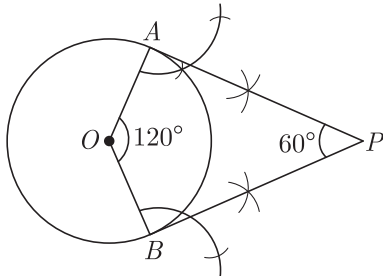
**LONG ANSWER TYPE QUESTIONS**

1. Draw a circle of radius 4 cm. Draw two tangents to the circle inclined at an angle of  $60^\circ$  to each other.

Ans : [O.D. Set I, 2016] [Foreign SEt I, II, III 2015]

**Steps of construction :**

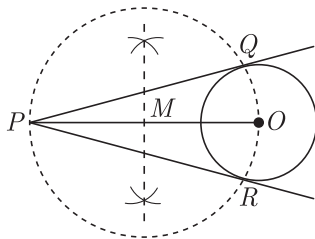
1. Draw a circle of radius 4 cm with O as centre.
2. Draw two radii OA and OB inclined to each other at an angle of  $120^\circ$ .



3. Draw  $AP \perp OA$  at A and  $BP \perp OB$  at B. Which meet at P.
4. PA and PB are the required tangents inclined to each other an angle of  $60^\circ$ .

2. Draw a circle of radius 3 cm. From a point P, 7 cm away from centre draw two tangents to the circle. Measure the length of each tangent.

Ans : [Foreign Set I, 2015]



**Step of construction :**

1. Draw a line segment  $PO = 7$  cm.
2. From the point O, draw a circle of radius = 3 cm.
3. Draw a perpendicular bisector of PO. Let M be the mid-point of PO.
4. Taking M as centre and OM as radius draw a circle.
5. Let this circle intersects the given circle at the point Q and R.
6. Join PQ and PR.

On measuring we get

$$PQ = PR = 6.3 \text{ cm}$$

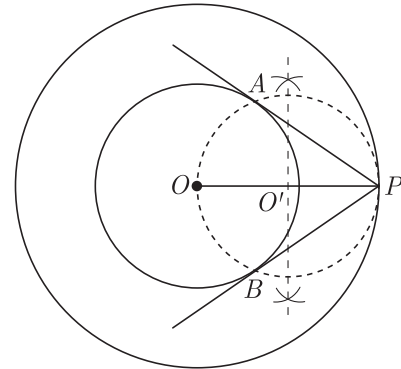
3. Draw two concentric circle of radii 3 cm and 5 cm. Taking a point on the outer circle, construct the pair of tangents to the inner circle.

Ans : [Foreign Set I 2017]

**Steps of construction :**

1. Draw a circle with radius 3 cm and centre O.
2. Draw another circle with radius 5 cm and same centre O.
3. Take a point P on the circumference of larger circle and join O to P.

4. Taking OP as diameter draw another circle which intersect the smallest circle at A and B.
  5. Join A to P and B to P.
- Hence AP and BP are the required tangents.



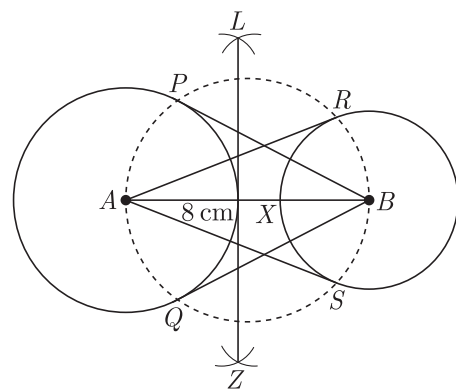
4. Draw a line segment AB of length 8 cm. Taking A as centre, draw a circle of radius 4 cm, and taking B as centre draw another circle of radius 3 cm. Construct tangents to each circle from the centre of the other circle.

Ans : [Foreign Set II 2017, Outside Delhi 2014]

**Steps of construction :**

1. Construct a line segment  $AB = 8$  cm.
2. With A as centre and radius 4 cm draw a circle.
3. With B as centre and radius 3 cm draw another circle.
4. Taking AB as diameter draw another circle. Which intersects first two circles at P and Q, and R and S.
5. Join B to P, B to Q, A to R and A to S.

Hence BP, BQ, AR and AS are the required tangents.



**TOPIC 3 : CONSTRUCTION OF A TRIANGLE SIMILAR TO A GIVEN TRIANGLE**

**VERY SHORT ANSWER TYPE QUESTIONS**

1. In drawing a triangle, if  $AB = 3$  cm,  $BC = 2$  cm and  $AC = 6$  cm. What is the possibility that a triangle cannot be drawn.

Ans : [KVS 2014]

When  $AB + BC < AC$  triangle cannot be drawn.

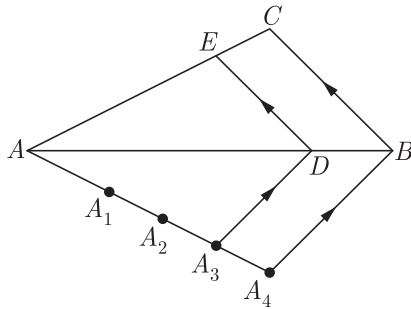
$$3\text{cm} + 2\text{cm} < 6\text{cm}$$

Hence  $\Delta ABC$  can not be drawn.

2. When construction of a triangle similar to a given triangle in the scale factor  $\frac{5}{3}$ , then what is the nature of given triangle ?

Ans : [Board Term-2, 2014]  
Triangle is bigger than to original  $\Delta$ .

3. In figure,  $\Delta ADE$  is constructed similar to  $\Delta ABC$ , write down the scale factor.



Ans : [Board Term-2, 2012 Set (50)]  
Scale factor =  $\frac{3}{4}$

4. When are the two triangles said to be similar?

Ans : [Board Term-2, 2012 Set(26)]  
Two triangles are said to be similar when their corresponding sides are proportional or angles are equal.

5. Triangle  $PQR$  is constructed similar to triangle  $ABC$  with scale factor  $\frac{2}{3}$ . Find triangle  $PQR$ .

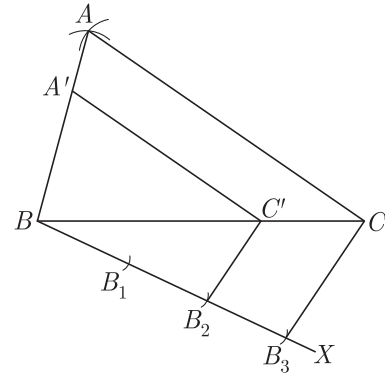
Ans : [Board Term-2, 2011 Set (59)]  
Triangle  $PQR$  is smaller to triangle  $ABC$ .  
( $\therefore$  Reduced scale factor figures are smaller in size)

6. Give three sides such that construction of a triangle is possible.

Ans : [Board Term-2, 2011 Set (25)]  
To construct a triangle sum of two sides of a triangle must be greater than largest side.  
Let the sides are 2.5 cm, 4.5cm and 6.5 cm

4. Join  $AB$  and  $AC$  to obtain  $\Delta ABC$ .
5. Below  $BC$ , make an acute angle  $\angle CBX$ .
6. Along  $BX$  mark off three points  $B_1, B_2, B_3$  such that  $BB_1 = B_1B_2 = B_2B_3$ .
7. Join  $B_3C$ .
8. From  $B_2$ , draw  $B_2C' \parallel B_3C$ .
9. From  $C$ , draw  $CA' \parallel CA$ , meeting  $BA$  at the point  $A'$ .

Then  $A'BC'$  is the required triangle.



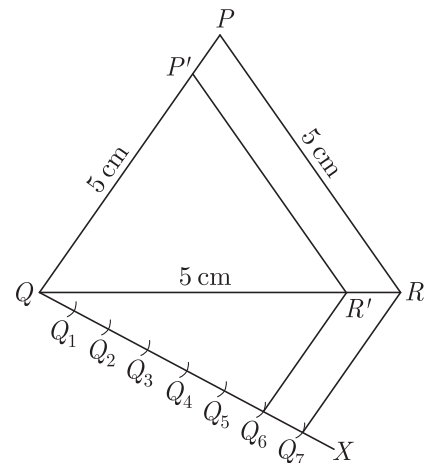
2. Construct a triangle similar to a given equilateral  $\Delta PQR$  with side 5cm such that each of its side is  $\frac{6}{7}$  of the corresponding sides of  $\Delta PQR$ .

Ans : [Foreign Set II, 2014] [Board Term-2, 2011, Set B1]

**Steps of construction :**

1. Draw a line segment  $QR = 5$  cm.
2. With  $Q$  as centre and radius =  $PQ = 5$ cm, draw an arc.
3. With  $R$  as centre and radius =  $PR = 5$  cm, draw another arc meeting the arc drawn in step 2 at the point  $P$ .
4. Join  $PQ$  and  $PR$  to obtain  $\Delta PQR$ .
5. Below  $QR$ , construct an acute  $\angle RQX$ .
6. Along  $QX$ , mark off seven points  $Q_1, Q_2, \dots, Q_7$  such that  $QQ_1 = Q_1Q_2 = Q_2Q_3 = \dots = Q_6Q_7$ .
7. Join  $Q_7R$ .
8. Draw  $Q_6R' \parallel Q_7R$ .
9. From,  $R'$  draw  $R'P' \parallel RP$ .

Hence,  $P'QR'$  is the required triangle.



**SHORT ANSWER TYPE QUESTIONS - I**

1. Construct a  $\Delta ABC$  in which  $AB = 4$  cm,  $BC = 5$  cm and  $AC = 6$ cm. Then construct another triangle whose sides are  $\frac{2}{3}$  times the corresponding sides of  $\Delta ABC$ .

Ans : [Foreign Set I, 2014]  
[Board Term-2, 2011, 2012 Set (22); A1]

**Steps of construction :**

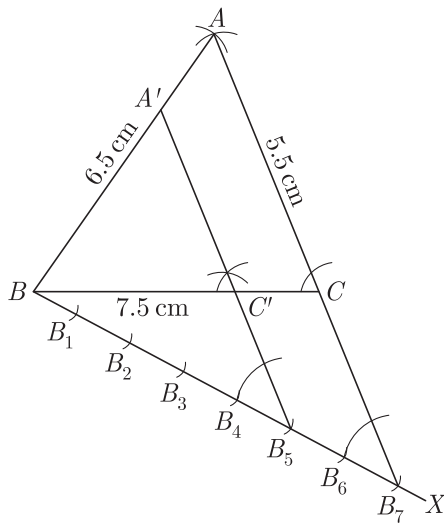
1. Draw a line segment  $BC = 5$ cm.
2. With  $B$  as centre and radius =  $AB = 4$ cm, draw an arc.
3. With  $C$  as centre and radius =  $AC = 6$ cm, draw another arc, intersecting the arc drawn in step 2 at the point  $A$ .

**SHORT ANSWER TYPE QUESTIONS - II**

- Construct a triangle of sides 6.5 cm, 7.5 cm and 5.5 cm and then a triangle similar to it whose sides are  $\frac{5}{7}$  of the corresponding sides of the first triangle.

**Steps of construction :**

- Draw a triangle  $ABC$  in which given sides are  $AB = 6.5$  cm,  $BC = 7.5$  cm and  $CA = 5.5$  cm.
- Draw a ray  $BX$  making an acute angle with  $BC$ .
- Locate 7 points  $B_1, B_2, B_3, B_4, B_5, B_6, B_7$  on line segment  $BX$ .
- Join  $B_7C$ . Draw a parallel line through  $B_5$  to  $B_7C$  intersecting extended line segment  $BC$  at  $A'$ .
- Through  $C'$  draw a line parallel to  $AC$  intersecting extended line segment  $AB$  at  $A'$ .
- $\Delta A'BC'$  is the required triangle.

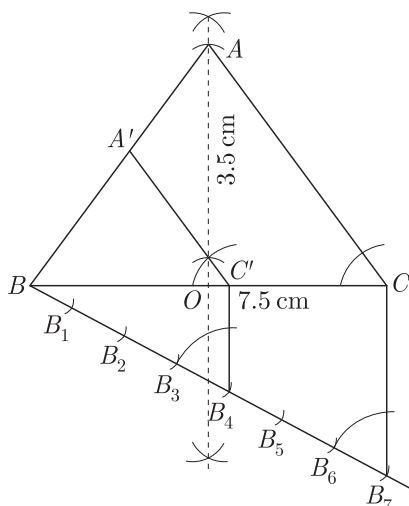


- Construct an isosceles triangle whose base is 7.5 cm and altitude 3.5 cm then another triangle whose sides are  $\frac{4}{7}$  times the corresponding sides of the isosceles triangle.

Ans :

**Steps of construction :**

- Draw a line  $BC = 7.5$  cm.
- Draw a perpendicular bisector of  $BC$  which intersects the line  $BC$  at  $O$ .
- Cut the line  $OA = 3.5$  cm.



- Join  $A$  to  $B$  and  $A$  to  $C$ .
- Draw a ray  $BX$  making an acute angle with  $BC$ .
- Locate 7 points at equal distance among  $B_1, B_2, \dots, B_7$  on line segment  $BX$ .
- Join  $B_7C$ . Draw a parallel line through  $B_4$  to  $B_7C$  intersecting line segment  $BC$  at  $C'$ .
- Through  $C$  draw a line parallel to  $AC$  intersecting line segment  $AB$  at  $A'$ .
- Hence,  $\Delta A'BC$  is a required triangle.

**LONG ANSWER TYPE QUESTIONS**

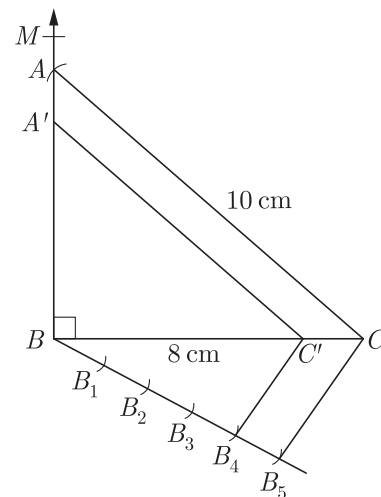
- Construct a right triangle whose hypotenuse and one side measure 10 cm and 8 cm respectively. Then construct another triangle whose sides are  $\frac{4}{5}$  times the corresponding sides of this triangle.

Ans :

[Board Term-2, 2015]

**Steps of construction :**

- Draw a line segment  $BC = 8$  cm.
- Construct  $AM \perp BC$ .
- Taking  $C$  as centre and radius as 10 cm, draw an arc that intersects the ray  $BM$  at  $A'$ .



- Join  $CA$  to obtain  $\Delta ABC$ .
- Below  $BC$ , make an acute angle  $CBX$ .
- Along  $BX$  mark off 5 points  $B_1, B_2, B_3, B_4, B_5$  such that  $BB_1 = B_1B_2 = B_2B_3 = \dots = B_4B_5$ .
- Join  $B_5C$ .
- From  $B_4$ , Draw  $B_4C' \parallel B_5C$ .
- From the point  $C'$  draw  $C'A' \parallel CA$  meeting  $BA$  at point  $A'$ .

Hence  $A'BC'$  is the required triangle.

- Construct an isosceles triangle whose base is 6 cm and altitude 4 cm. Then construct another triangle with sides are  $\frac{3}{4}$  times the corresponding sides of the isosceles triangle.

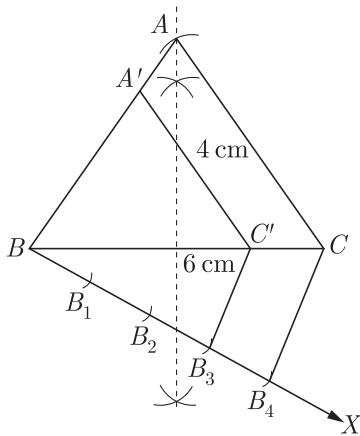
Ans :

[Delhi CBSE Board Term-2, 2015, (Set II)]

**Steps of Constructions :**

- Draw a line segment  $BC = 6$  cm.
- Draw a perpendicular bisector of  $BC$  which intersects the line  $BC$  at  $Q$ .

3. Mark A on the line such that  $OA = 4$  cm.
4. Join A to B and C.

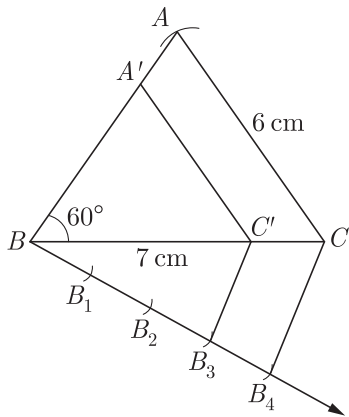


6. Draw a ray  $BX$  making an acute angle with  $BC$ .
7. Mark four points  $B_1, B_2, B_3$  and  $B_4$  on the ray  $BX$ . Such that  $BB_1 = B_1B_2 = B_2B_3 = B_3B_4$ .
8. Join  $B_4C$ . Draw a line parallel to  $B_4C$  through  $B_3$  intersecting line segment  $AB$  at  $A'$ . Hence  $\Delta A'BC$  is the required triangle.

3. Construct a triangle  $ABC$  with  $BC = 7$  cm,  $\angle B = 60^\circ$  and  $AB = 6$  cm. Construct another triangle whose sides are  $\frac{3}{4}$  times of the corresponding sides of  $\Delta ABC$ .
- Ans : [Delhi CBSE Board Term-2, 2015 (Set I)]

**Steps of construction :**

1. Draw a line segment  $BC = 7$  cm.

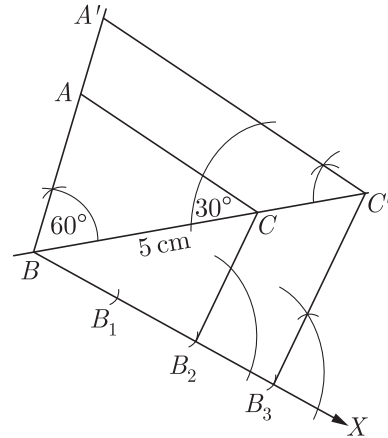


2. At point B draw a line  $BA$  making an angle of  $60^\circ$ .
3. With centre C mark an arc of length 6 cm.
4. Join  $CA$ .
5. Draw a ray  $BX$  making an acute angle with  $BC$ .
6. Locate four points  $B_1, B_2, B_3$  and  $B_4$  on the line segment  $BX$  at equal distance.
7. Join  $B_4C$ . Draw a parallel line through  $B_3$  to  $B_4C$  intersecting line segment  $BC$  at  $C'$ .
8. Through  $C'$  draw a line parallel to  $AC$  intersecting extended line segment  $AB$  at  $A'$ . Hence  $\Delta A'BC'$  is the required triangle.

4. Draw triangle  $ABC$  such that  $BC = 5$  cm,  $\angle ABC = 60^\circ$ ,  $\angle ACB = 30^\circ$ . Now construct  $\Delta A'BC'$  corresponds to  $\Delta ABC$  with  $A'B : AB = 3 : 2$ .

Ans :

[Board Term-2, 2015]



**Steps of Construction :**

1. Draw a line segment  $BC$  of length 5 cm.
2. Draw the angles of  $60^\circ$  and  $30^\circ$  on the points B and C respectively. Which intersect each other at A.
3.  $\Delta ABC$  is the given triangle.
4. Draw a ray  $BX$  making an acute angle with  $BC$ .
5. Locate three points  $B_1, B_2$  and  $B_3$  on line segment  $BX$ . Such that  $BB_1 = B_1B_2 = B_2B_3$ .
6. Join  $B_2C$ .
7. Draw  $B_3C \parallel B_2C$  to intersect the extended line  $BC$  at  $C'$ .
8. Through  $C'$  draw a line parallel to  $AC$  intersecting extended line segment  $BA$  at  $A'$ .  $\Delta A'BC'$  is the required triangle.

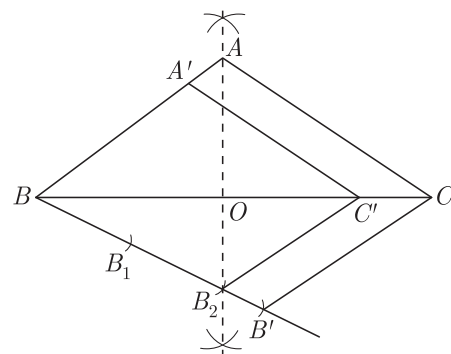
5. Draw an isosceles triangle  $ABC$  in which the base is 8 cm long and its altitude  $AD$  through A is 4 cm long. Then draw another triangle whose sides are  $\frac{2}{3}$  of the corresponding sides of  $\Delta ABC$ .

Ans : [Outside Delhi Compt. Set-I 2017; Delhi Compt. Set I 2017]

**Steps of Construction :**

1. Draw a line segment  $BC = 8$  cm.
2. Draw perpendicular bisector of  $BC$  which intersects  $BC$  at  $O$ .
3. Mark A on bisector such that  $AO = 4$  cm.
4. Join A to B and A to C.
5. Draw an acute angle  $BCX$  at B of  $BC$ , down word.
6. Mark  $B_1, B_2, B_3$  on  $BX$ , such that  $BB_1 = B_1B_2 = B_2B_3$ .
7. Join  $B_3$  to C.
8. Draw  $B_2C \parallel B_3C$ . to meet  $BC$  at  $C'$ .
9. From  $C'$  draw  $CA' \parallel CA$ , to meet  $AB$  at  $A'$ .

Hence  $A'BC'$  is the required triangle.



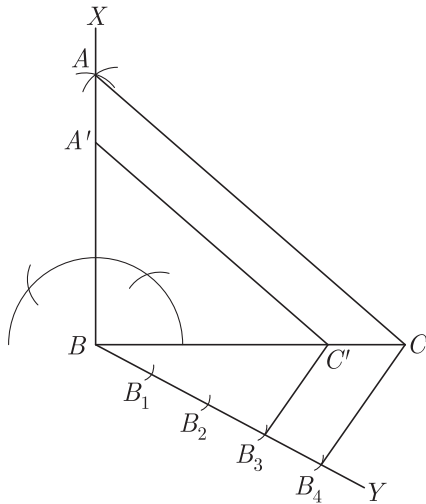
6. Draw a triangle with sides 4 cm, 5 cm and 6 cm then construct another triangle whose sides are  $\frac{2}{3}$  of the corresponding sides of the first circle.

Ans : [Delhi Compt. Set-II 2017]

**Steps of Construction :**

1. Draw a line segment  $BC = 5$  cm.
2. Taking  $B$  as centre and radius 4 cm an arc.
3. Taking  $C$  as centre and radius 6 cm draw another arc which intersects the first arc at say  $A$ .
4. Join  $A$  to  $B$  and  $A$  to  $C$ .
5. Draw a line segment  $BX$  making an acute angle with  $BC$  from  $B$ .
6. Mark three arcs on  $BX, B_1, B_2, B_3$  such that  $BB_1 = B_1B_2 = B_2B_3$ .
7. Join  $B_3$  to  $C$ .
8. Draw  $B_2C \parallel B_3C$  to meet  $BC$  at  $C'$ .
9. From  $C$ , draw line-segment  $CA' \parallel AC$  to meet  $BC$  at  $A'$ .

Hence,  $A'BC$  is the required triangle.

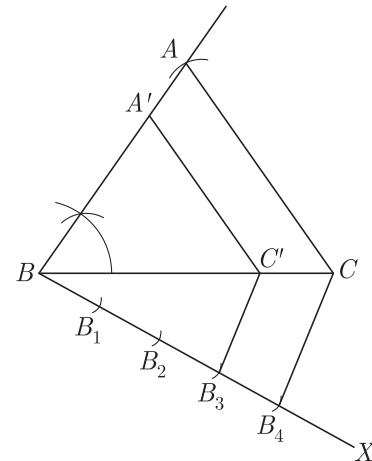


7. Draw a right triangle in which sides (other than hypotenuse) are 8 cm and 6 cm. Then construct another triangle whose sides are  $\frac{3}{4}$  times the (corresponding) sides of given triangle.

Ans : [Delhi Compt. Set-I 2017]

**Steps of construction :**

1. Draw a line segment  $BC = 8$  cm.
2. Draw line segment  $BX$  making an angle of  $90^\circ$  at the point  $B$  of  $BC$ .
3. From  $B$  mark an arc on  $BX$  at a distance of 6 cm, Let it is  $A$ .
4. Join  $A$  to  $C$ .
5. Making an acute angle draw a line segment  $BY$  from  $B$ .
6. Mark  $B_1, B_2, B_3, B_4$  on  $BX$  such that  $BB_1 = B_1B_2 = B_2B_3 = B_3B_4$ .
7. Join  $B_4$  to  $C$ .
8. Draw a line segment  $B_3C' \parallel B_4C$  to meet  $BC$  at  $C'$ .
9. Draw line segment  $CA' \parallel CA$  to meet  $AB$  at  $A'$ .  $A'BC$  is the required triangle.



8. Draw a  $\Delta ABC$  in which  $BC = 6$  cm,  $AB = 5$  cm and  $\angle ABC = 60^\circ$ . Then construct another triangle whose sides are  $\frac{3}{4}$  of the corresponding sides of  $\Delta ABC$ .

Ans : [Delhi Compt. Set-I 2017]

**Steps of Construction :**

1. Draw a line segment  $BC = 6$  cm.
2. On the point  $B$  draw a line segment  $AB = 5$  cm making an angle of  $60^\circ$  with  $BC$ .
3. Join  $A$  to  $C$ .
4. Making an acute angle downward at  $B$ , draw a line segment  $BX$ .
5. Mark  $B_1, B_2, B_3, B_4$  on  $BX$  such that  $BB_1 = B_1B_2 = B_2B_3 = B_3B_4$  and Join  $B_4$  to  $C$ .
6. Draw a line segment  $B_3C' \parallel B_4C$  to meet  $BC$  on  $C'$ .
7. From  $C$  draw line segment  $CA' \parallel CA$  to meet  $AB$  at  $A'$ . Hence  $A'BC$  is the required  $\Delta$ .

9. Construct a triangle  $ABC$  with side  $BC = 7$  cm.  $\angle B = 45^\circ, \angle A = 105^\circ$ . Then construct another triangle whose sides are  $\frac{3}{2}$  times of the corresponding sides of the  $\Delta ABC$ .

Ans : [Topper Answer 2017]

In  $\Delta ABC$ ,

$$\angle A + \angle B + \angle C = 1800 \quad \text{Angle sum property}$$



$$105^\circ + 45^\circ + \angle C = 180^\circ$$

$$\therefore \angle C = 30^\circ$$

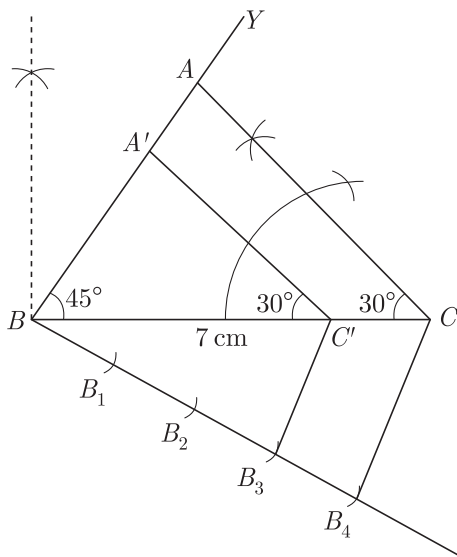
Steps of construction :

1. Draw  $BC = 7$  cm.,  $\angle CBy = 45^\circ$  and  $\angle BCZ = 30^\circ$   
Let rays  $By$  and  $CZ$  intersect at  $A$ .  $\Delta ABC$  is given  $\Delta$
2. From  $B$  along it mark 4 points  $B_1, B_2, B_3, B_4$  such that  $BB_1 = B_1B_2 = \dots = B_3B_4$
3. Join  $B_4C$ . Make  $\angle BB_4C$  at  $B_3$  such that the ray intersects  $BC$  at  $C'$ .  $\angle BB_4C = \angle BB_3C'$   
So,  $B_4C \parallel B_3C'$
4. From  $C'$  make  $\angle BCA' = \angle BCA$  so that  $CA' \parallel CA$   
 $\Delta A'BC$  is the required triangle.

**Justification :**

$$\angle A = B \quad \text{and} \quad \angle BCA' = \angle BCA \quad \text{construction}$$

$$\Delta A'BC \sim \Delta ABC \text{ by AA so, } \frac{A'B}{AB} = \frac{A'C}{AC} = \frac{BC}{BC} = \frac{3}{4}$$



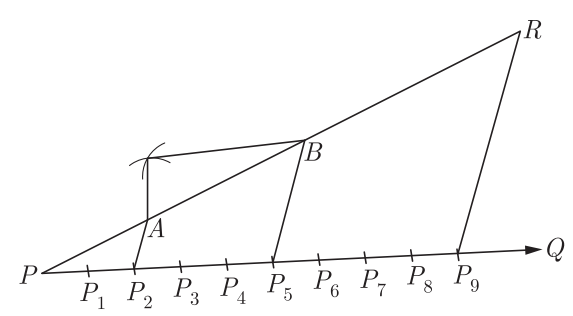
3. Bisect the line  $AB$ . Let mid-point of  $AB$  be  $C$ .
4. Taking  $C$  as centre draw a circle of radius  $AC$  with intersects the two circles at point  $P, Q, R$  and  $S$ .
5. Join  $BP, BQ, AS$  and  $AR$ .  
 $BP, BQ$  and  $AR, AS$  are the required tangents.

2. Construct a triangle whose perimeter is 13.5 cm and the ratio of the three sides is 2:3:4.

**Ans :** [Board Ter-2, 2012 Set (1); 2011, Set C1]

**Steps of construction :**

1. Draw a line segment  $PR$  of length 13.5 cm.
2. At the point  $P$  draw a ray  $PQ$  making an acute angle  $RPQ$  with  $PR$ .
3. On  $PQ$  mark  $(2 + 3 + 4)$  a points  $P_1, P_2, P_3, P_4, P_5, P_6, P_7, P_8, P_9$  such that  $PP_1 = P_1P_2 = P_2P_3 = P_3P_4 = P_4P_5 = P_5P_6 = P_6P_7 = P_7P_8 = P_8P_9$ .
4. Join  $P_9R$
5. Through  $P_2$  and  $P_5$  draw lines  $P_2A$  and  $P_5B$  respectively parallel to  $P_9R$  intersecting  $PR$  at  $A$  and  $B$  respectively.
6. With  $A$  as centre and radius  $AP$  draw an arc.
7. With  $B$  as centre and radius  $BR$  draw another arc to intersect first arc.
8. Join  $A$  to  $C$  and  $B$  to  $C$ .



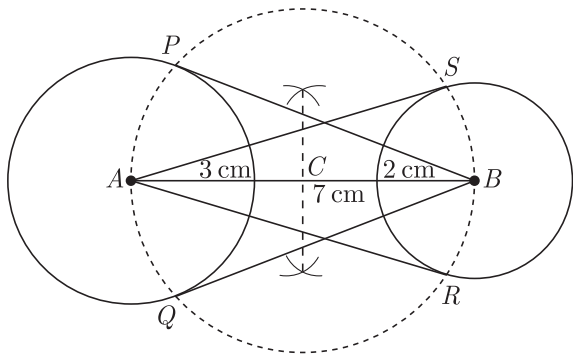
**HOTS QUESTIONS**

1. Draw a line segment  $AB$  of length 7 cm. Taking  $A$  as centre, draw a circle of radius 3 cm and taking  $B$  as centre, draw another circle of radius 2 cm. Construct tangents to each circle from the centre of the other circle.

**Ans :** [Delhi CBSE Term-2, 2015 (Set III)]

**Steps of Construction :**

1. Draw a line segment  $AB$  of 7 cm.
2. Taking  $A$  and  $B$  as centre draw two circle of 3 cm and 2 cm radius respectively.



3. Construct a right-angled triangle whose base is 5 cm and sum of its hypotenuse and other side is 10cm. Construct another triangle whose sides are 1.4 times the corresponding sides of the previously drawn triangle. Give the justification of the construction.

**Ans :** [Board Term-2, 2012 Set(38): 2011, SetB1]

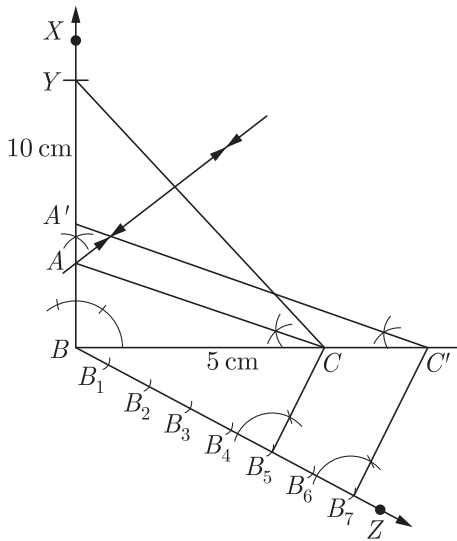
Let us assume that  $\Delta ABC$  is right-angled at  $B$ , with base  $BC = 5$  cm and  $AC + AB = 10$  cm.

A  $\Delta A'BC'$  whose sides are  $1.4 = \frac{7}{5}$  times of  $\Delta ABC$ ,

**Steps of construction :**

1. Draw a line segment  $BC$  of length 5 cm.
2. At  $B$ , draw  $\angle XBC = 90^\circ$ . Taking  $B$  as centre and radius as 10 cm, draw an arc that intersects the ray  $BX$  at  $Y$ .
3. Join  $CY$  and draw its perpendicular bisector to intersect  $BY$  at  $A$ . Join  $AC$ .
4. Draw a ray  $BZ$  making an acute angle with line segment  $BC$  on the opposite side of vertex  $A$ .
5. Locate 7 points  $B_1, B_2, B_3, B_4, B_5, B_6$  and  $B_7$  on  $BZ$  such that  $BB_1 = B_1B_2 = B_2B_3 = B_3B_4 = B_4B_5 = B_5B_6 = B_6B_7$ .
6. Join  $BC_5$  and draw a line  $CB_7$  parallel to  $CB_5$  to intersect extended line segment  $BC$  at point  $C'$ .

7. Draw a line through  $C$  parallel to  $AC$  intersecting the ray  $BX$  at  $A'$ .  
 $\Delta A'BC$  is the required triangle.



**Justification :**

The construction can be justified by proving that :

$$A'B = \frac{7}{5} AB, BC = \frac{7}{5} BC, A'C = \frac{7}{5} AC$$

$$\angle BB_5C = \angle BB_7C$$

(Corresponding angles)

$$\therefore \Delta BB_5C \sim \Delta BB_7C$$

(AA Similarity criterion)

$$\Rightarrow \frac{BC}{B_5C} = \frac{BB_2}{BB_7}$$

$$\frac{BC}{B_5C} = \frac{5}{7}$$

On comparing equations (i) and (ii), we obtain

$$\Rightarrow \frac{AB}{A'B} = \frac{BC}{B_5C}$$

$$= \frac{AC}{A'C} = \frac{5}{7}$$

$$\Rightarrow A'B = \frac{5}{7} AC,$$

$$B_5C = \frac{5}{7} BC,$$

$$A'C = \frac{7}{5} AC$$

4. Construct a rhombus  $ABCD$  in which  $AB = 4$  cm and  $\angle ABC = 60^\circ$ . Divide it into two triangles  $ABC$  and  $ADC$ . Construct the triangle  $AB'C$  similar to  $\Delta ABC$  with scale factor  $\frac{2}{3}$ . Draw a line segment  $CD'$  parallel to  $CD$ , where  $D'$  lies on  $AD$ . Is  $AB'CD'$  a rhombus? Give reasons.

Ans : [Board Term II, 2012 Set (43); 2011, Set C1]

**The steps of construction :**

- The rhombus  $ABCD$  is drawn in which  $AB = 4$  cm and  $\angle ABC = 60^\circ$ .
- Join  $AC$ .  $ABCD$  is divided into two triangles  $ABC$  and  $ADC$ .
- Construct triangle  $AB'C$  similar to  $ABC$  with scale factor  $\frac{2}{3}$ .

4. Draw the line segment  $CD'$  parallel to  $CD$ .  
 It can be observed that :

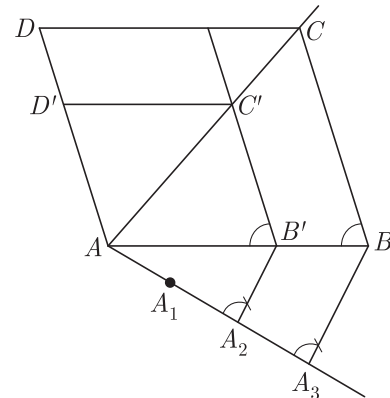
$$\frac{AB'}{AB} = \frac{2}{3} = \frac{AC'}{AC}$$

Also,

$$\frac{AC'}{AC} = \frac{CD'}{CD}$$

$$= \frac{AD'}{AD} = \frac{2}{3}$$

Therefore,  $AB' = B'C = CD' = AD' = \frac{2}{3} AB$ .



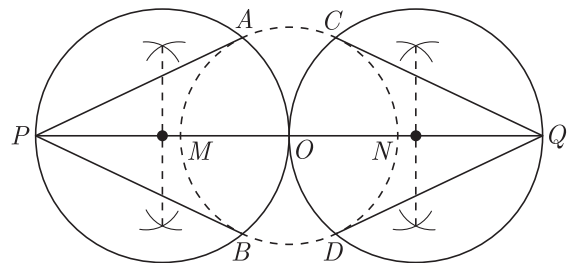
Thus,  $AB'CD'$  is a rhombus.

5. Draw a circle of radius of 3 cm. Take two points  $P$  and  $Q$  one of its diameter extended on both sides, each at a distance of 7 cm on opposite sides of its centre. Draw tangents to the circle from these two points.

Ans : [Foreign Set-III 2017]

**Steps of construction :**

- Draw a circle with centre  $O$  and radius 3 cm.
- Draw its diameter  $MON$  and extend it to both the sides to  $P$  and  $Q$ . Such that  $OP = OQ = 7$  cm.
- Taking diameter as  $OP$  and  $OQ$  draw two circles each of which intersects the first circle at the points  $A, B$  and  $C, D$  respectively.
- Join  $PA, PB, QC$  and  $QO$  to get the required tangents



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