Chapter : 13. CONSTRUCTIONS

Exercise : 13A

Question: 1

Solution:

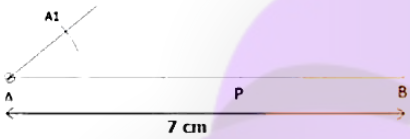
Steps of Construction:

1. Draw a line segment AB of given length 7cm.

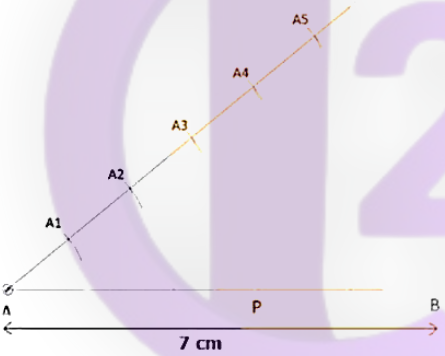
2. Draw a line originating from A and making an acute angle with line segment AB.

3. As we have to get 3 parts out of 5 parts of AB. We will divide the line from A into 5 parts.

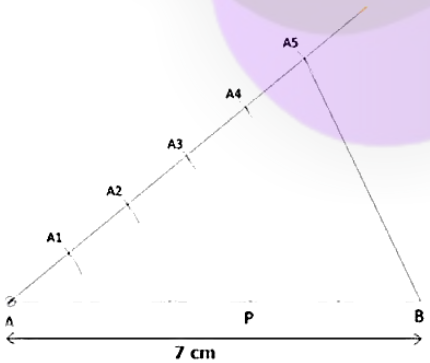
4. Taking A as center draw an arc cutting at A_1 on the line.



5. With the same radius and taking A1 as a center, draw another arc cutting line at A_2. Repeat the same till A_5, as shown below:

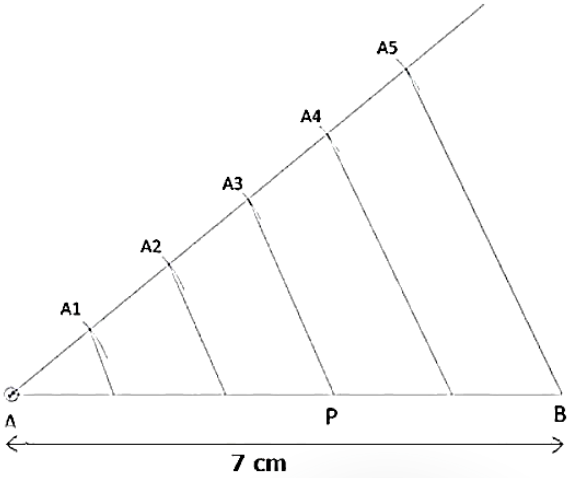


6. Join A_5 and B by drawing a line:



7. Draw lines parallel to A_5B from A_4, A_3, A_3 and A_1 cutting line AB.

8. The Point where the parallel line from A_3 cuts AB is P.



9. Hence P is the required point such that AP/AB = 3/5.

Question: 2

Solution:

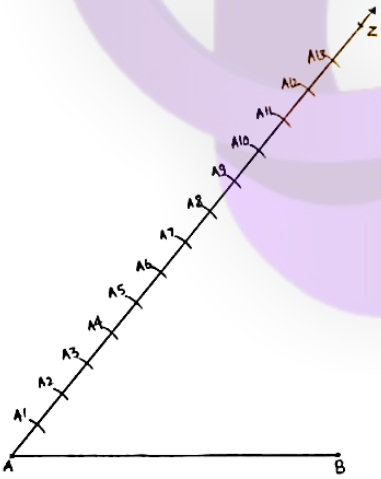
Steps of Construction:

1. Draw a line segment AB of length 7. 6cm.

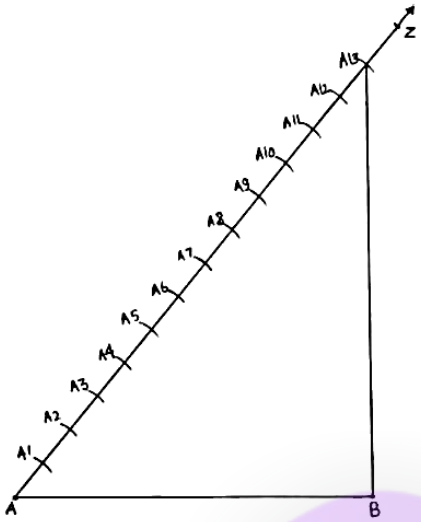
2. Draw a ray AZ making an acute angle with the line AB.

3. As we have to divide the line in the ratio of 5:8. So we will make 5+8 = 13 points along AX.

4. Along AX we mark 13 arcs taking A as starting point for the first, A1 as starting point for second and so on till A_{13}.

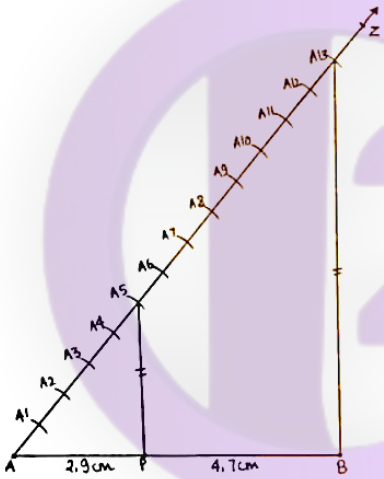


5. Join the $A_{13}B$.



6. With the help of these arcs, this line can be divided into 13 equal points.

7. In our case of 5:8, we join the 5^{th} point i. e. A5 with the line AB such that the line A_5P is parallel to line $A_{13}B$.



8. P is the required point, the point that divides the line in a ratio of 5:8.

Length of AP = 2. 9cm (approximately)

Length of PB = 4. 7cm (approximately)

AP+PB = 2. 9+4. 7 = 7. 6 = AB.

Question: 3

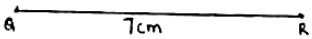
Solution:

Steps of Construction:

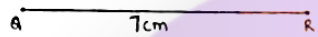
1. First, we draw the triangle ABC of given dimensions.

2. Draw a line segment QR of length 7cm.

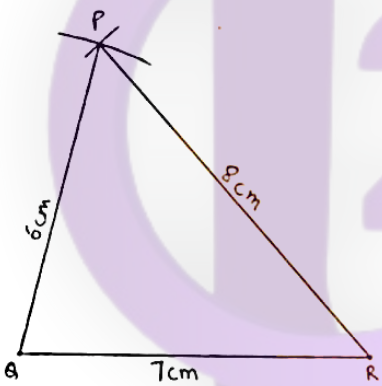
3. With Q as center draw an arc of radius 6cm(length of PQ).



4. With R as center draw an arc of radius 8cm(length of PR).



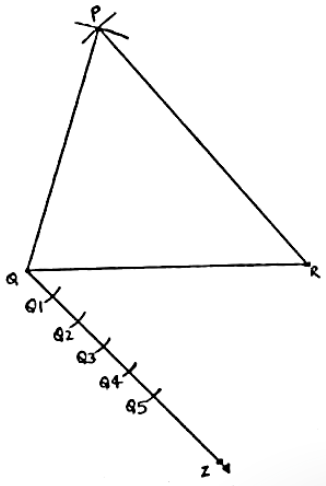
5. The point where the arcs intersect each other is P. Join PQ and PR.



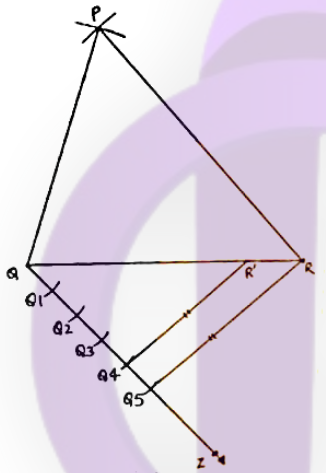
6. Now we construct the triangle having dimensions of 4/5 of this triangle.

7. Draw a ray AZ at an acute angle to the line QR in the other direction of P.

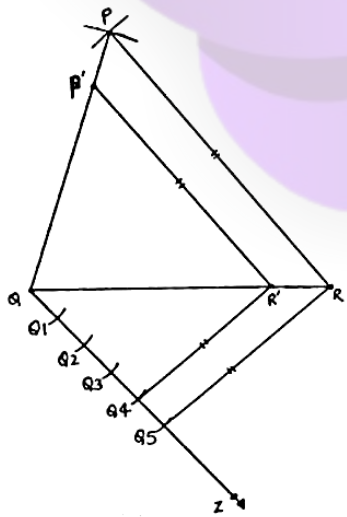
8. Make 5 equal arcs along QZ, taking Q as starting point for the first arc, Q_1 for second and so on till Q5. Join Q_5R.



9. As we have to get the 4/5 dimensions of this triangle. We draw a line parallel to QR from Q4 till QR. This point is R'.



10. Now from R', draw another line parallel to PR cutting PQ at P'.



11. P'QR' is the required triangle.

Question: 4

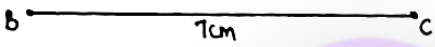
Solution:

Steps of Construction:

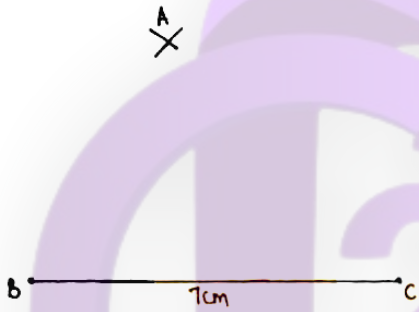
1. First, we have drawn a triangle of given dimensions, let's say the triangle is A

2. Draw a line segment BC of length 7cm.

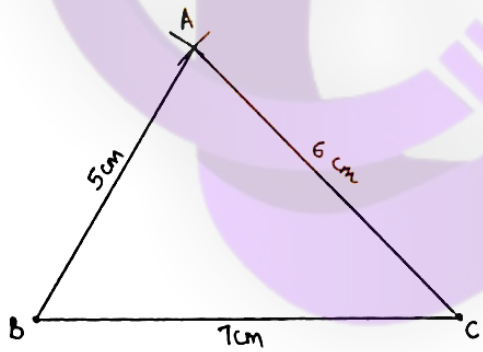
3. Make an arc of radius 5cm taking B as a center.



4. Similarly, draw an arc of 6 cm taking C as center cutting the first arc at A.

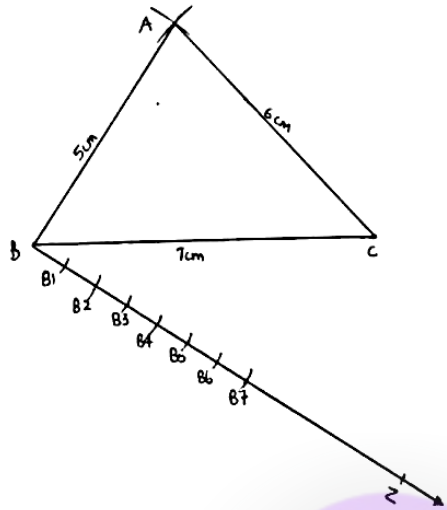


5. Join AB and AC.

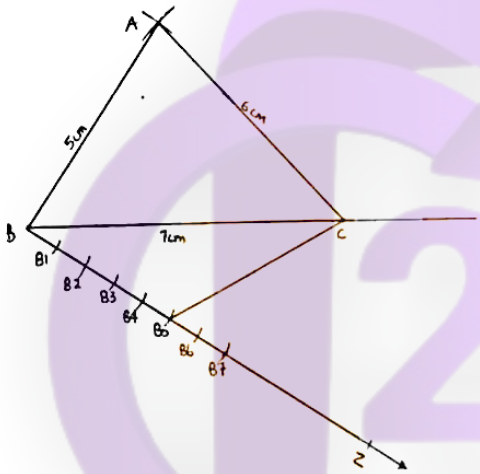


6. Now we have to make a triangle which is 7/5 times of this triangle. That is we have to make a bigger triangle.

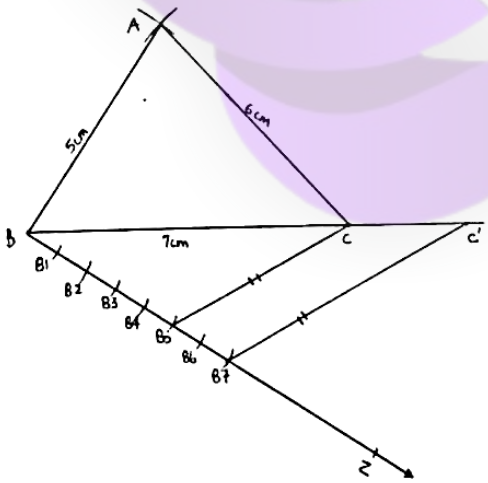
7. Draw a ray BZ making an acute angle with BC. Make 7 equal arcs along BZ starting from B then B1 and so on till B_7.



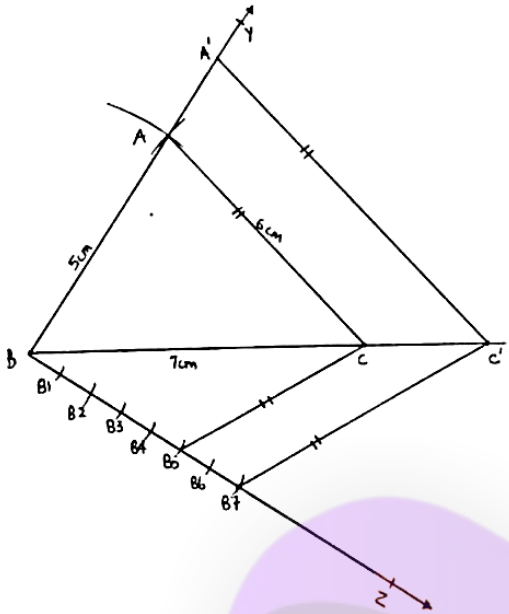
8. Join B_5C. Extend the line segment BC in the direction of C.



9. Draw a line from B_7 parallel to B_5C cutting the extended BC at C'.



10. Extend BA along A. Draw a line from C' parallel to CA cutting the extended line BA at A'.



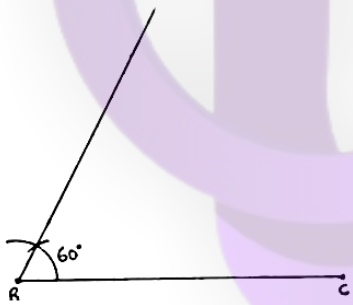
11. Then A'BC' is the required triangle.

Question: 5

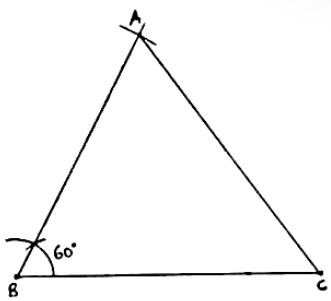
Solution:

Steps of Construction:

1. First, we draw a triangle ABC of given dimensions.
2. Draw a line segment BC of length 7cm.
3. From B, make an angle of 60° and draw a ray from B.

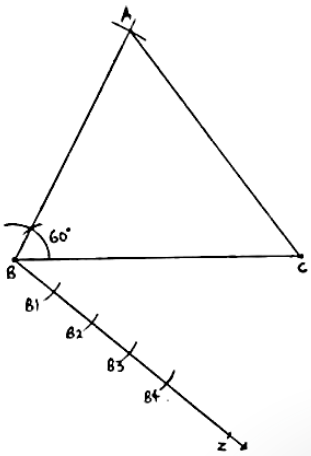


4. Now taking B as center and radius of 6cm(length of AB), draw an arc on the ray. The point is A.
5. Join AC.

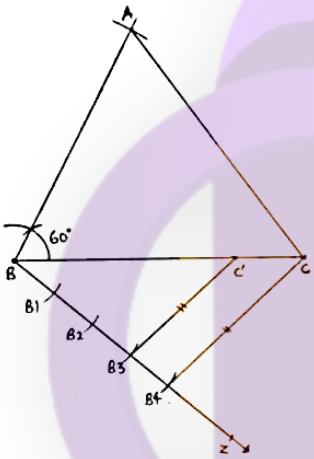


6. Now we have to make a triangle which is 3/4 times of this triangle.
7. Draw a ray BZ making an acute angle with the line BC. Make 4 equal arcs starting from B then

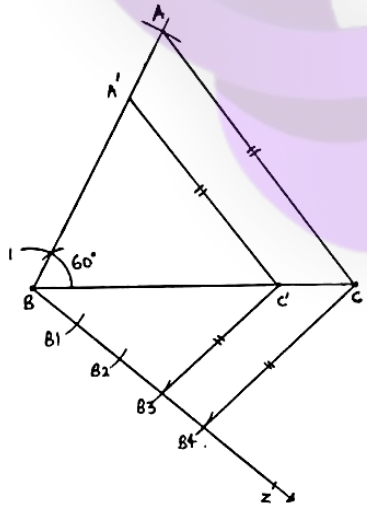
B_1 and so on till B_4.



8. Join B_4C. Draw a line from B3 parallel to B_4C cutting BC at C'.



9. Draw another line from C' parallel to CA cutting AB at A'.



10. A'BC' is our required triangle,

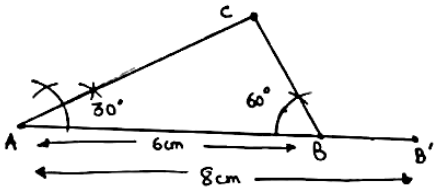
Question: 6

Solution:

Steps of Construction:

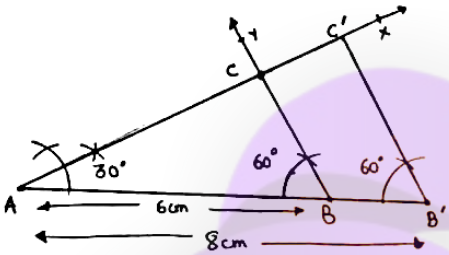
1. Draw a line AB of length 6cm and extend it to B' such that AB' is of length 8 c

2. Make an angle of 30° from A and angle of 60° from B. The point where these e meet is C.



3. As angles are equal in similar triangles, make an angle of 60° from B' as well.

4. Extend the line AC along C such that it cuts the ray from B' at C'.



5. AB'C' is the required triangle .

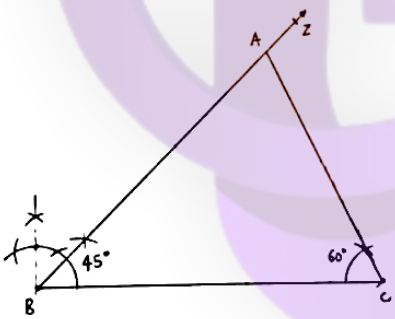
Question: 7

Solution:

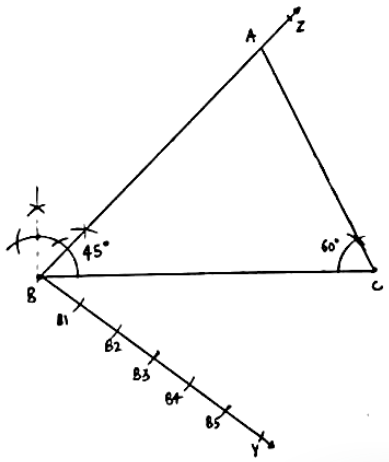
Steps of Construction:

1. Draw a line segment BC of length 8cm.

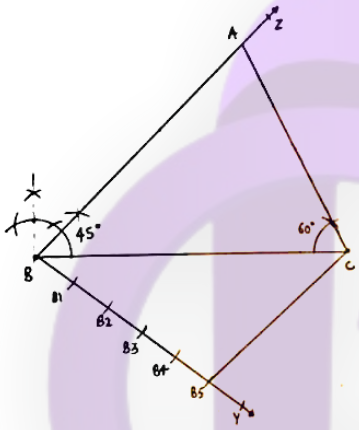
2. Make an angle of 45° from B and an angle of 60° from C. The point where the rays meet is point A.



3. Draw a ray BY making an acute angle with the line BC. Make 5 equal arcs starting from B, then B_1 and so on till B_5.

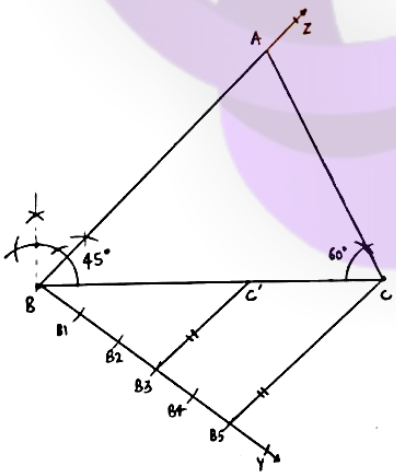


4. Join B_5C.

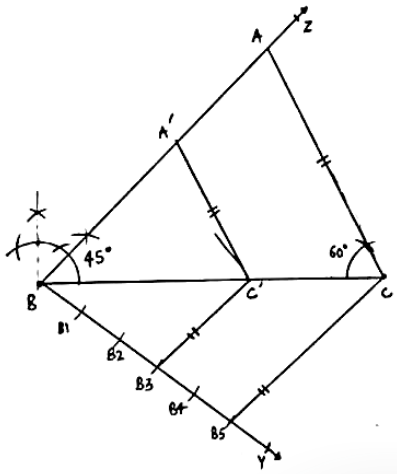


5. As we have to get the triangle 3/5 times of this triangle ABC.

6. From B_3, draw a line parallel to B_5C cutting BC at C'.



7. Draw another line from C' parallel to AC cutting AB at A'.



8. A'BC' is our required triangle.

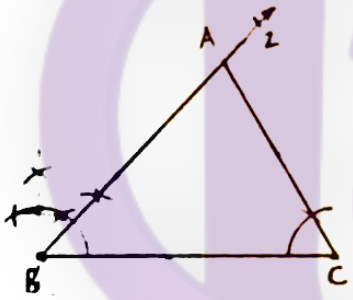
Question: 8

Solution:

Steps of Construction:

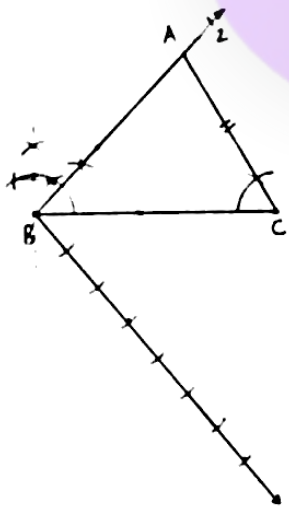
1. First we construct the triangle ABC with the given dimensions.

2. Draw a line segment BC of length 4. 5 cm. Make an angle of 45° from B and an angle 60° from C.

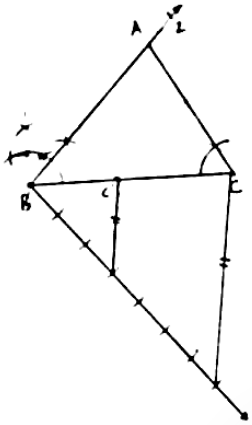


3. The point where the rays meet is A.

4. Now draw a ray making an acute angle with BC. Make 7 equal arcs.

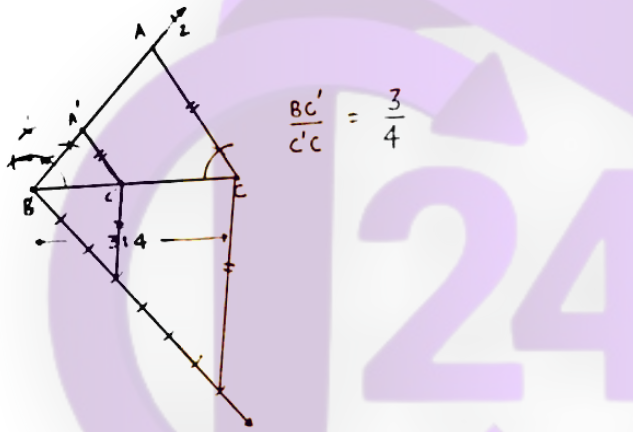


5. Join the last arc cut point with C and from 3rd arc, cut point draw a line paral BC at C'.



6. From C' draw a line parallel to AC cutting AB at A'.

A'BC' is or required triangle.



7. Now we see that our line BC gets divided into the ratio of 3:4.

So (a) 3:4 is the answer.

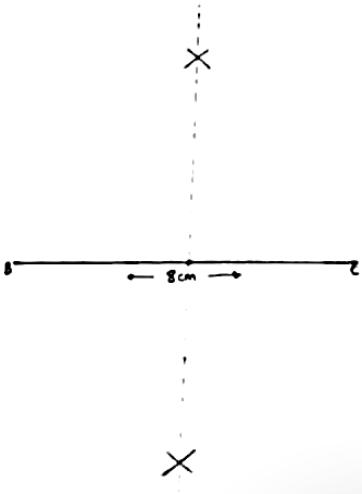
Question: 9

Solution:

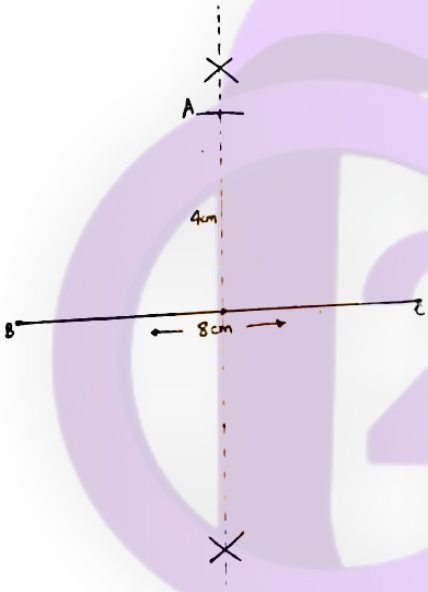
Steps of Construction:

1. Draw a line segment BC of length 8cm.

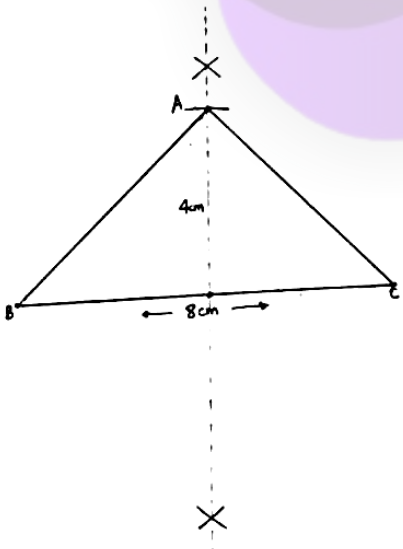
2. Now as we know that the altitude of the isosceles triangle is also the bisector of the baseline. So we draw a perpendicular bisector of line BC.



3. We cut an arc of length 4cm(length of altitude). The arc cut point is A.



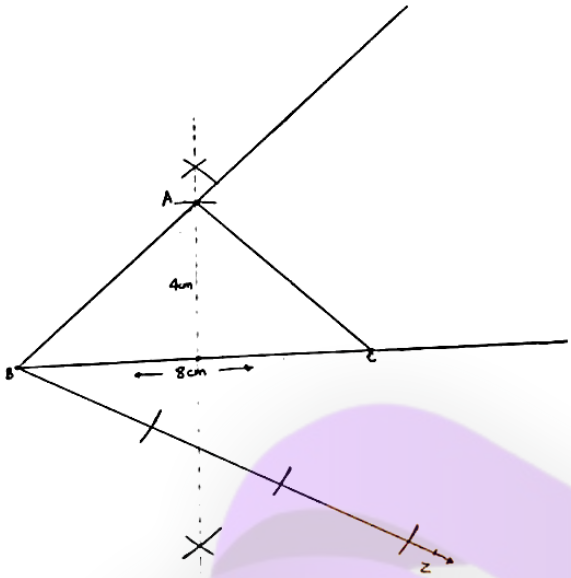
4. Join AB and AC.



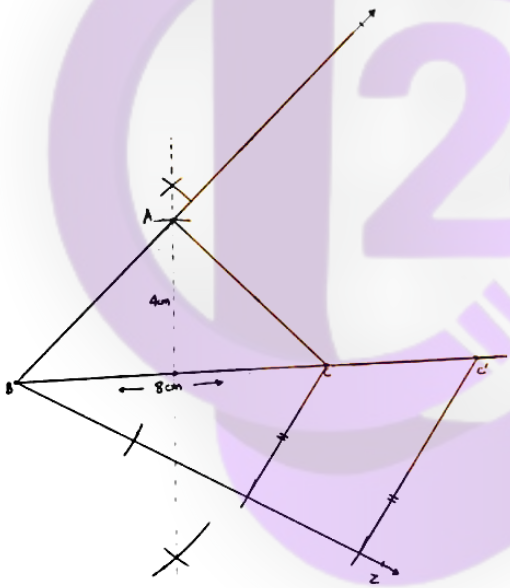
5. Now we have draw a triangle which is 3/2 times of this triangle that a triangle which is bigger than this.

6. So we extend BC along C and BA along A as in figure.

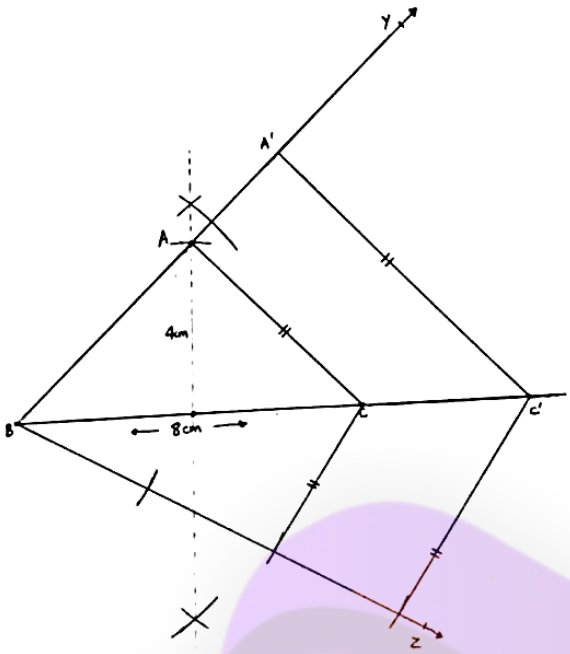
7. Draw a ray BZ making an acute angle with BC. Make 3 equal arcs along BZ.



7. Join the second arc with C. Now draw a line from last arc cut point parallel to the previous line cutting the extended BC at C'.



8. From C' draw another line parallel to CA cutting the extended BY at A'.



9. A'BC' is our required triangle.

Question: 10

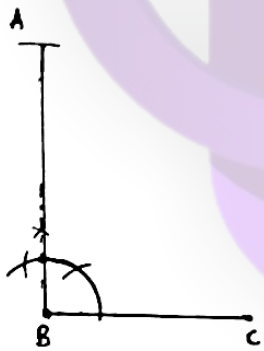
Solution:

Steps of Construction:

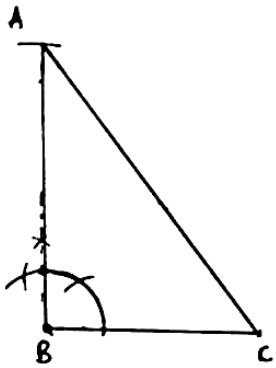
1. First we have to draw a triangle of given dimensions lets say ABC.

2. Draw a line segment of length BC of length 3cm.

3. Make an angle of 90° at B and cut an arc of radius 4cm taking B as center. The Arc cut point is A.



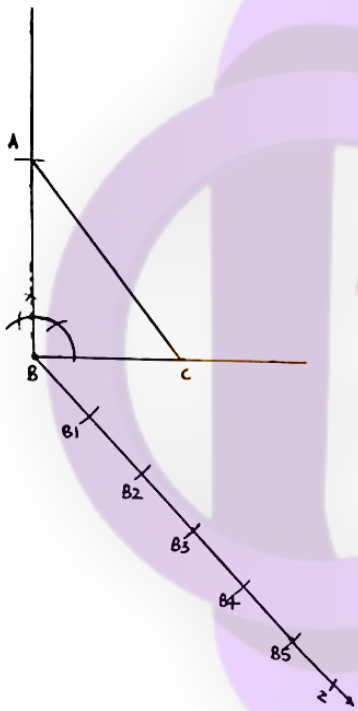
4. Join AC. ABC is the right angled triangle with the given dimensions.



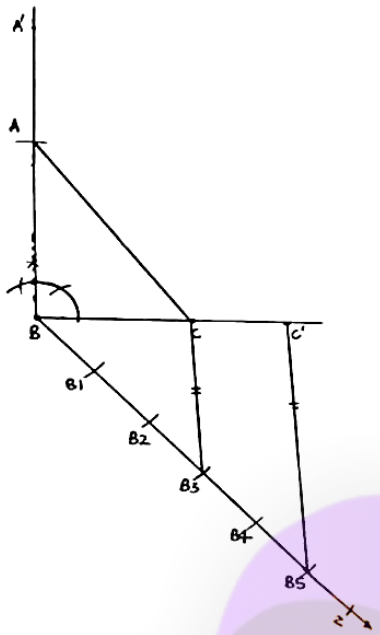
5. Now we have to make a triangle which 5/3 times of this triangle, that is bigger than this triangle.

6. So we extend the line BC along C and BA along A.

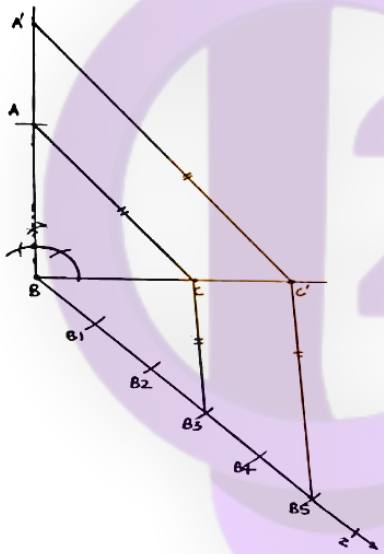
7. Draw a ray BZ making an acute angle with BC. Make 5 equal arcs along BZ starting from B then B1 and so on till B5.



8. Join B3C. From B5 draw a ray parallel to B3C cutting the extended BC at C'.



9. From C', draw another ray parallel to CA cutting the extended BA at A'.



10. Then A'BC' is our required triangle.

Exercise : 13B

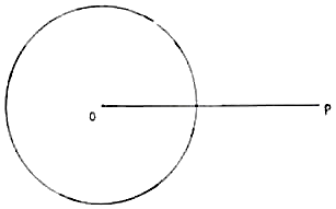
Question: 1

Solution:

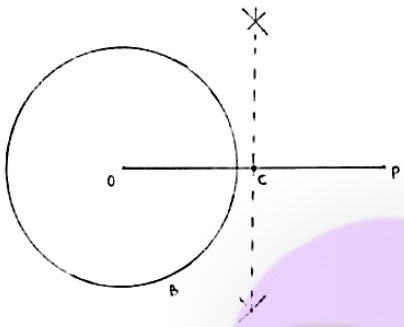
Steps of Construction:

1. Draw a circle of radius 3 cm taking O as center.

2. Mark a point P, 7 cm far from point O. Draw OP.

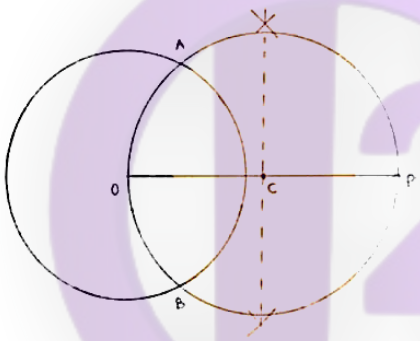


3. Draw a perpendicular bisector of OP. The bisector cuts OP at C.

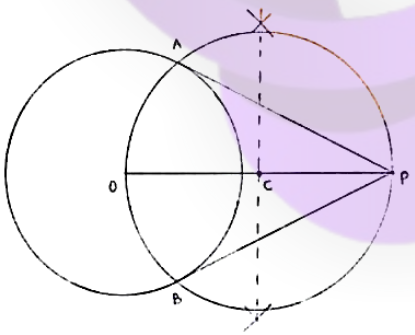


4. Taking C as center and radius equal to length OC or CP, draw a circle.

5. Both circles intersect at points A and B.



6. Join AP and BP. Then AP and BP are the required tangents.



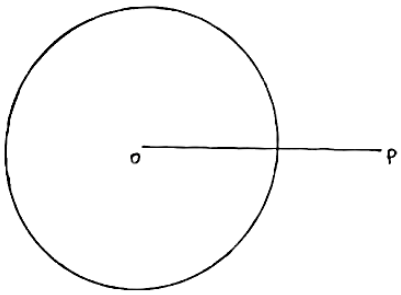
Question: 2

Solution:

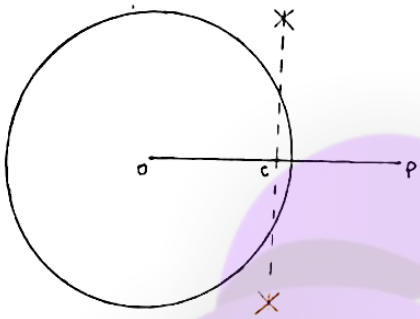
Steps of Construction:

1. Draw a circle of radius 3. 5 cm taking O as center.

2. Mark a point P, 6. 2 cm far from point O. Draw OP.

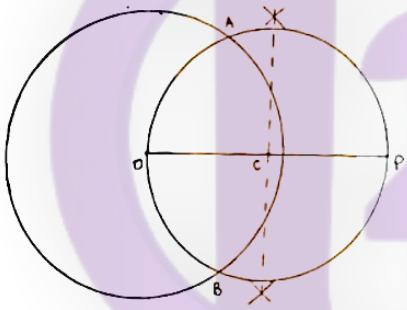


3. Draw a perpendicular bisector of OP. The bisector cuts OP at C.

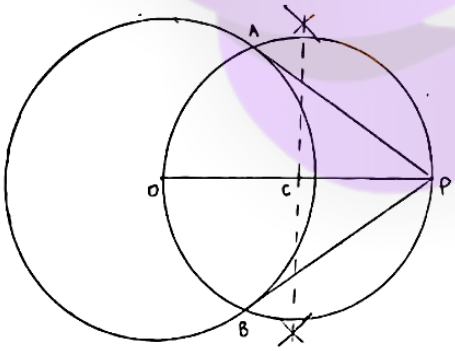


4. Taking C as center and radius equal to length OC or CP, draw a circle.

5. Both circles intersect at points A and B.



6. Join AP and BP. Then AP and BP are the required tangents.



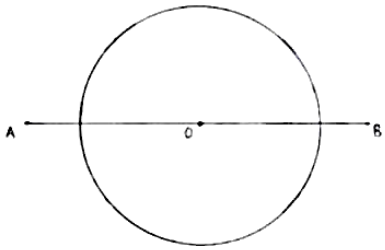
Question: 3

Solution:

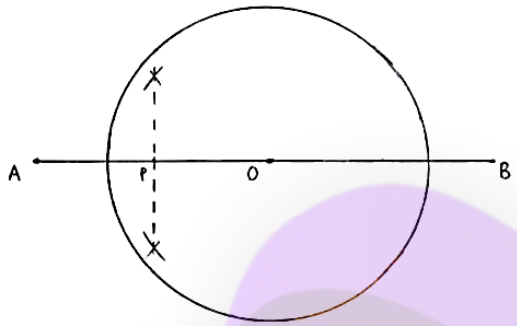
Steps of Construction:

1. Draw a circle of radius 3.5 cm taking O as the center.

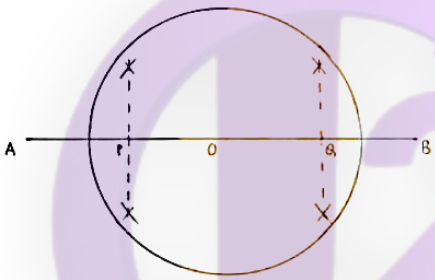
2. Extend any diameter of the circle. On the extended diameter, mark two points in two directions, A and B such that OA = OB = 5 cm.



3. Draw perpendicular bisector of OA. The bisector cuts OA at P.

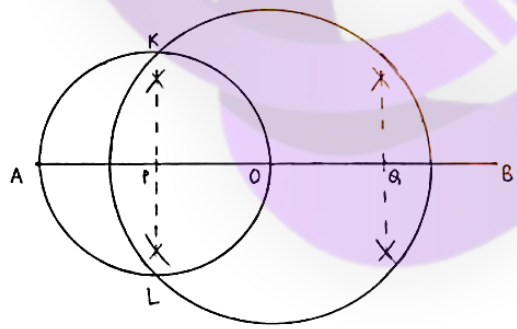


4. Draw perpendicular bisector of OB. The bisector cuts OB at Q.

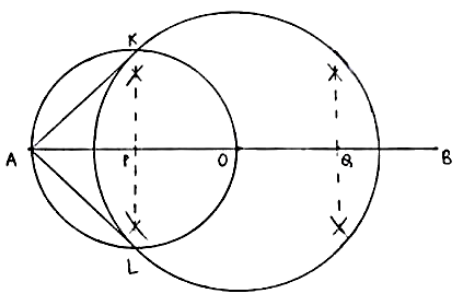


5. Taking P as center and radius equal to length OP or PA, draw a circle.

6. The two circles intersect each other at K and L.

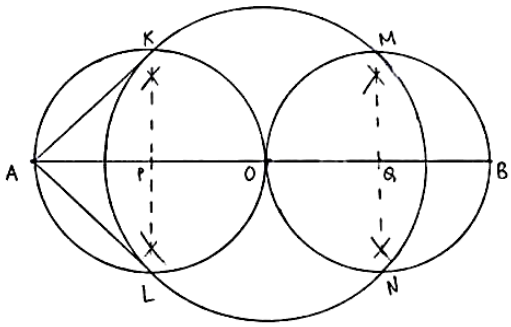


7. Join AK and AL. AK and AL are the required tangents from point A.

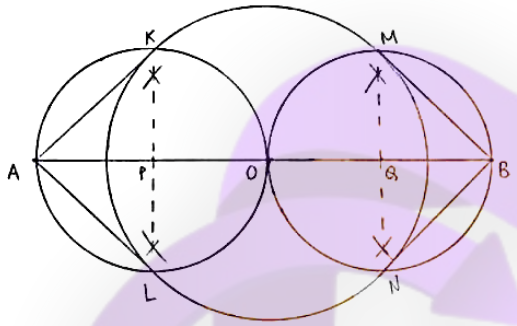


8. Now, Taking Q as center and radius equal to length OQ or QB, draw a circle.

9. The circle with center O and center Q intersect each other at M and N.



10. Join BM and BN. BM and BN are the required tangents from point B.



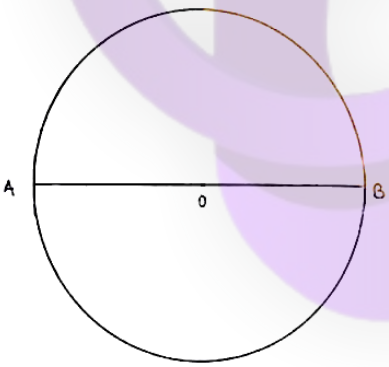
Question: 4

Solution:

Steps of construction:

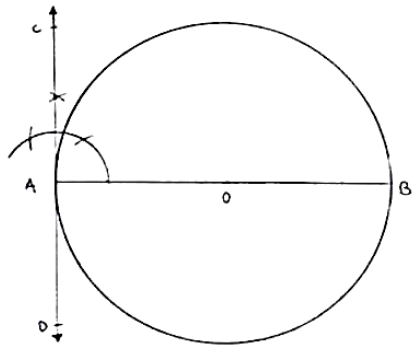
1. Draw a circle of radius 4 cm taking O as center.

2. Draw a diameter AB of this circle.

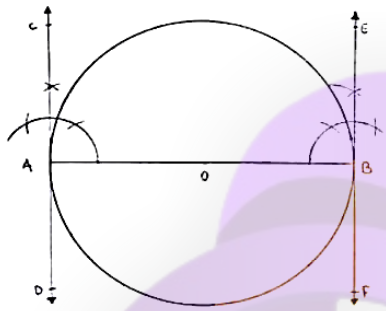


3. As we know that the tangents make an angle of 90° with the radius of the circle.

4. We draw ∠OAC = 90° at A. Produce CA to D. CD is the required tangent.



5. We draw ∠OBE = 90° at B. Produce EB to F. EF is the required tangent.

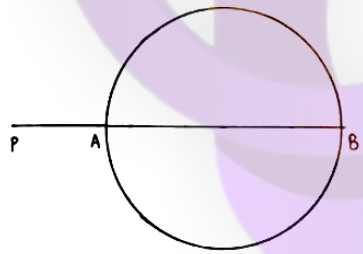


Question: 5

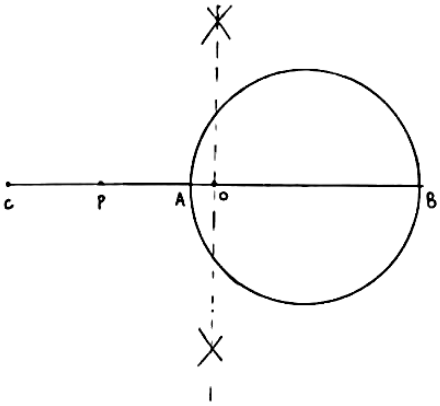
Solution:

Steps of Construction:

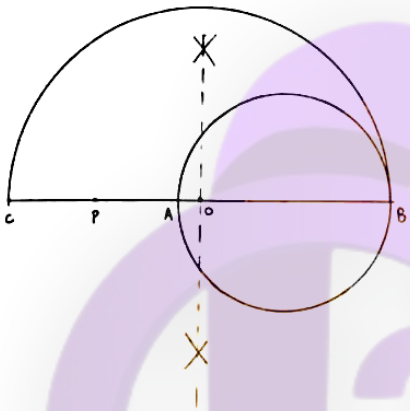
1. Draw a circle with the help of a bangle. (implies center and radius of the circle is unknown)
2. Mark a point P outside the circle.
3. Draw a secant to this circle , PAB that intersect the circle at A and B.



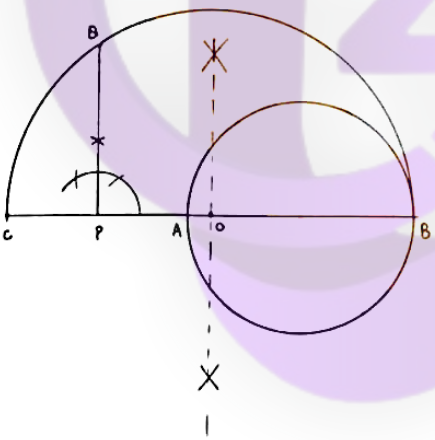
4. Extend AP to C, such that PA = PC.
5. Draw perpendicular bisector of CB, which intersects CB at O.



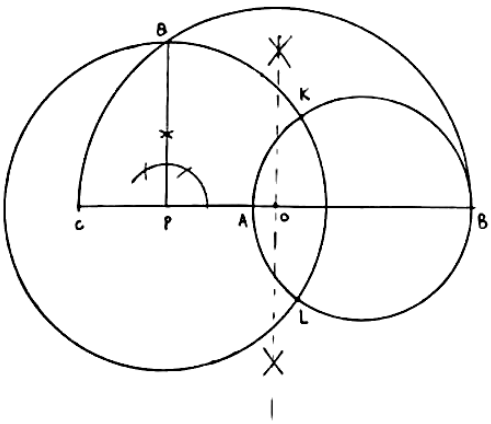
6. With O as center, draw a semicircle passing through C and B.



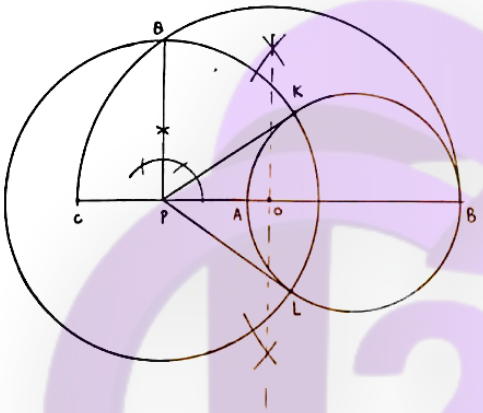
7. From P, make an angle of 90° such that it cuts the semicircle at Q.



8. With P as center and PQ as the radius of the circle. Draw a circle that cuts the previous circle at K and L.



9. Join PK and PL. Then PK and PL are the required tangents.

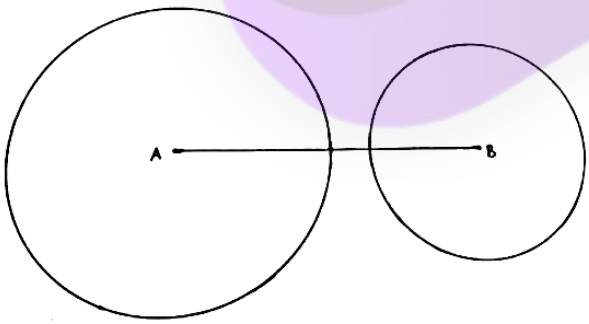


Question: 6

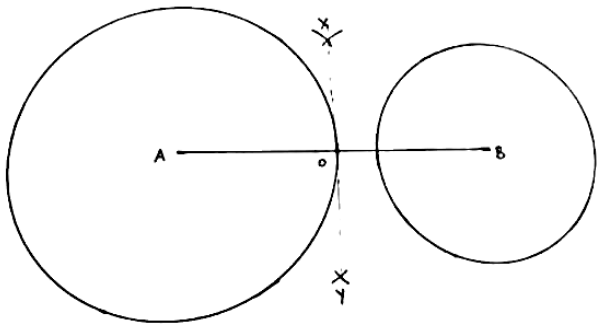
Solution:

Steps of Construction:

1. Draw a line segment AB of length 8cm.
2. With A as center, draw a circle with radius of length equal to 4cm.
3. With B as center , draw a circle with radius of length equal to 3cm.

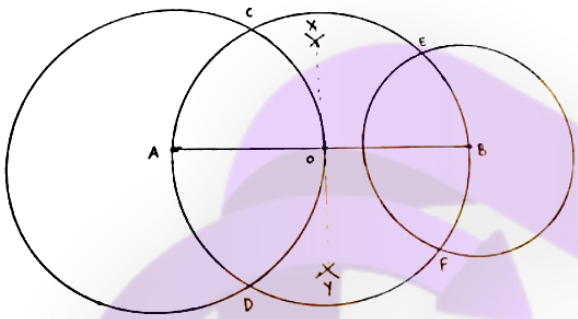


4. Draw perpendicular bisector of AB, which cuts AB at O.



5. With O as center and radius equal to OA(or OB), draw a circle.

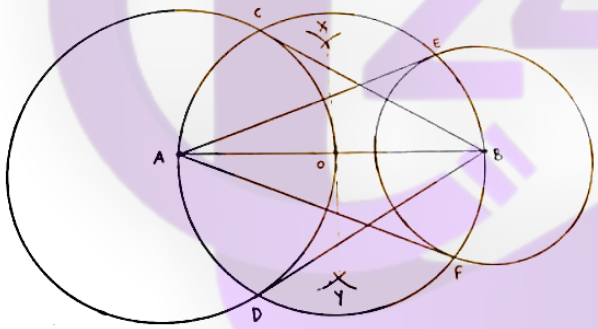
6. The Circle of center O cuts the center of center A at C and D.



7. Join BC and BD. Then BC and BD are the required tangents.

8. The circle of center O cuts a circle of center B at E and F.

9. Join AE and AF. Then AE and AF are the required tangents.



Question: 7

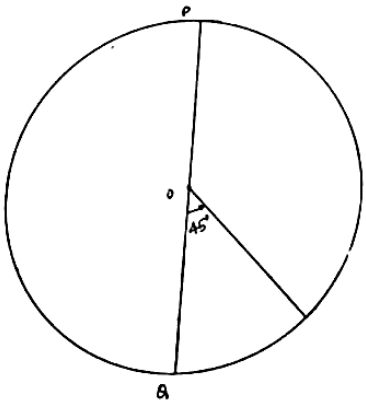
Solution:

Steps of Construction:

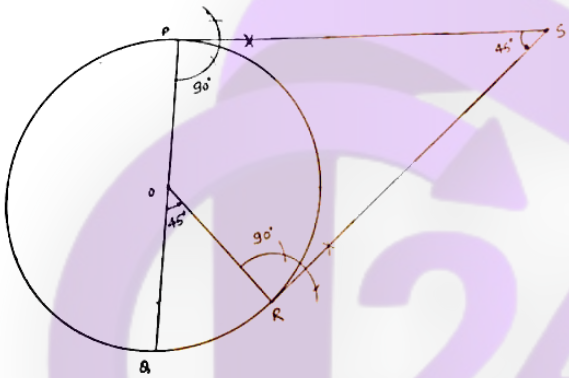
1. Draw a circle with center O and radius of length 4. 2cm.

2. We then draw any diameter POQ of this circle.

3. We then draw an angle ROQ = 45°.



4. Draw angle of 90° from P and R.
5. Extend both the rays. The point where both the points intersect is S.
6. Then PS and RS are the required tangents.

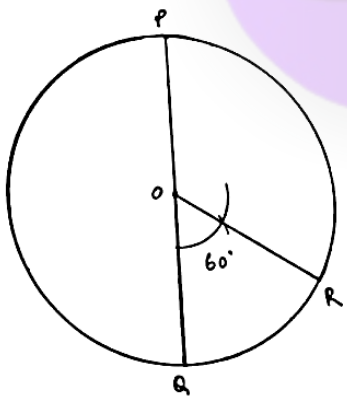


Question: 8

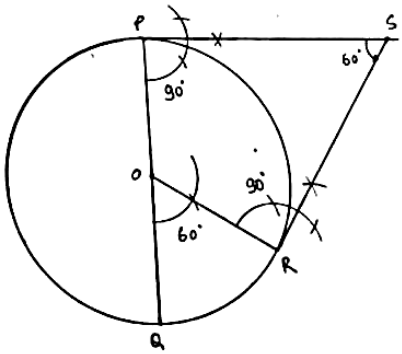
Solution:

Steps of Construction:

1. Draw a circle with center O and radius of length 3cm.
2. We then draw any diameter POQ of this circle.
3. We then draw an angle ROQ = 60°.



4. Draw angle of 90° from P and R.
5. Extend both the rays. The point where both the points intersect is S.
6. Then PS and RS are the required tangents.

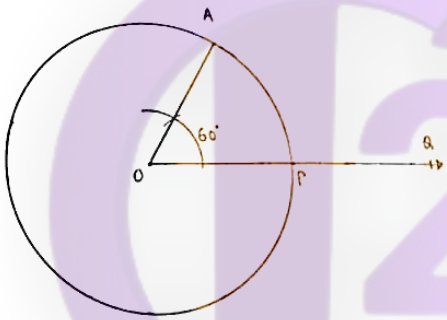


Question: 9

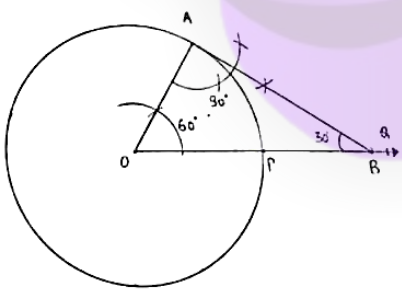
Solution:

Steps of Construction:

1. Draw a circle with center O and radius of length 3cm.
2. Draw any radius OP of this circle.
3. Extend OP to Q.
4. Draw angle AOP = 60°.



5. From A, draw angle of 90°.
6. The two lines intersect each other at B.
7. Then BA is the required tangent.

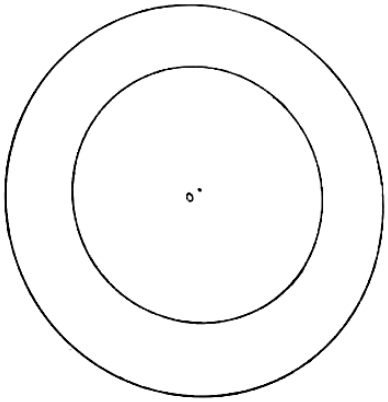


Question: 10

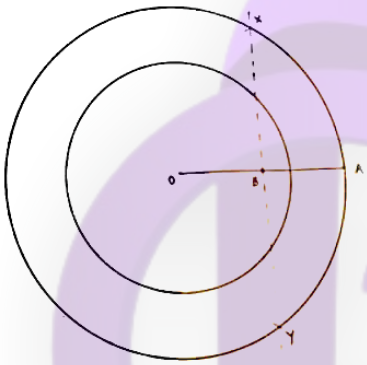
Solution:

Steps of Construction:

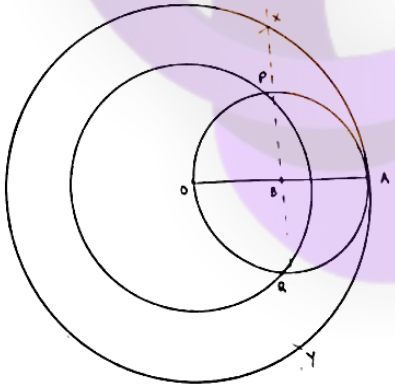
1. With O as center, draw a circle of radius of 4cm and another circle of radius 6cm.



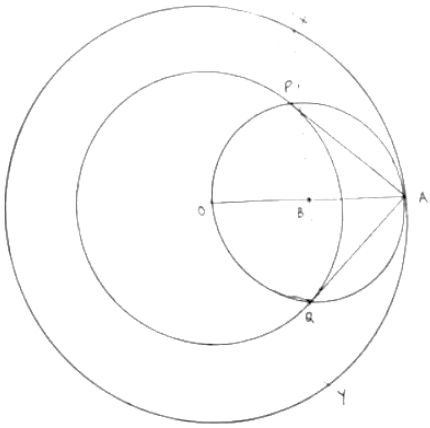
2. Mark any point A on the bigger circle.
3. Join OA. Draw perpendicular bisector of OA.
4. The perpendicular bisector XY of OA intersects OA at B.



5. With B as center and radius of length OB (or BA), draw a circle.
6. This circle intersects the smaller circle(of radius 4cm) at P and Q.



7. Join AP and AQ.
8. Then AP and AQ are the required tangents.



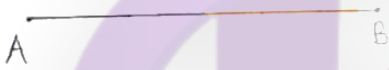
Exercise : FORMATIVE ASSESSMENT (UNIT TEST)

Question: 1

Solution:

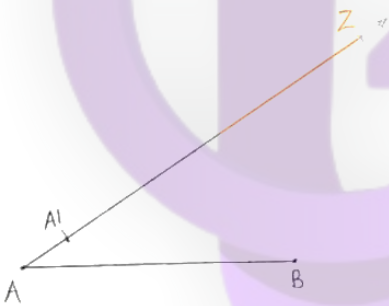
Steps of Construction:

1. Draw a line segment AB of given length 5. 4cm.



2. Draw a ray, AZ, originating from A and making an acute angle with line segment AB.

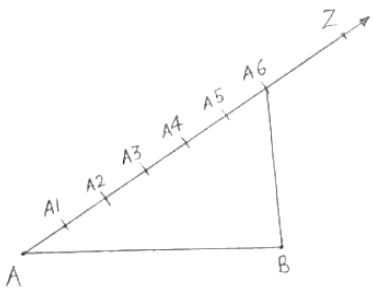
3. Taking A as center draw an arc cutting at A1 on the ray.



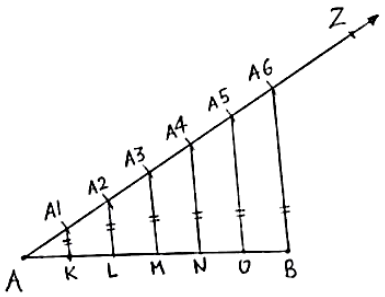
4. As we have to divide the line into 6 equal parts, With the same radius and taking A1 as center draw another arc on the ray.

5. Repeat till we get A6.

6. Join A6 with B.



7. Now draw lines parallel to A6B from A1,A2,A3,A4 and A5 as well, which cut the line segment AB at K,L,M,N and O respectively.



8. Then AK,KL,LM,MN,NO,OB are the required 6 equal parts of line AB.

Question: 2

Solution:

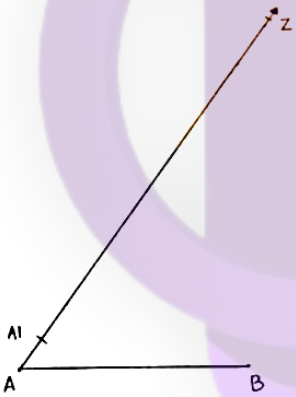
Steps of Construction:

1. Draw a line segment AB of length 6. 5cm.

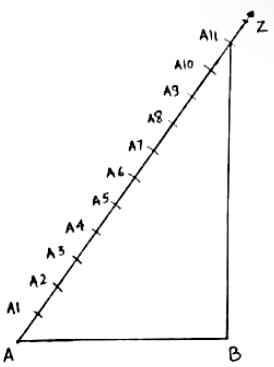
2. Draw a ray AZ making an acute angle with the line AB.

3. As we have to divide the line in the ratio of 4 : 7. So we will make 4 + 7 = 11 points along AZ.

4. Along AZ we mark 11 arcs taking A as starting point for the first, A1 as starting point for second and so on till A11.

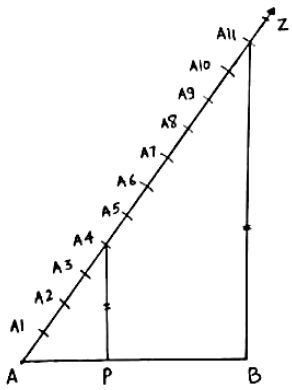


5. Join the A11B.



6. With the help of these arcs this line can be divided into 11 equal points.

7. In our case of 4 : 7, we join the 4^{th} point i. e. A4 with the line AB such that the line A4P is parallel to line A11B.



8. P is the required point, the point that divides the line in ratio of 4 : 7.

Length of AP = 2. 4cm (approximately)

Length of PB = 4. 1cm (approximately)

AP+PB = 2. 4+4. 1 = 6. 5 = AB.

Question: 3

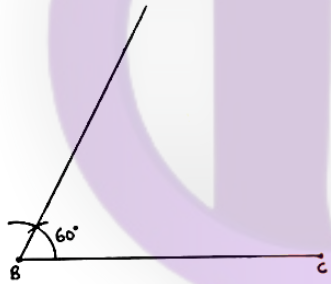
Solution:

Steps of Construction:

1. First we draw a triangle ABC of given dimensions.

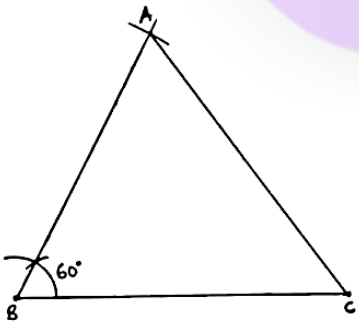
2. Draw a line segment BC of length 6. 5 cm.

3. From B, make an angle of 60° and draw a ray from B.



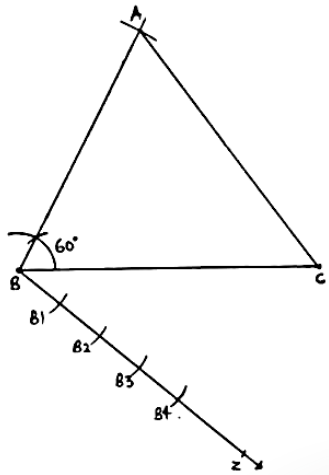
4. Now taking B as center and radius of 4. 5 cm (length of AB), draw an arc on the ray. The point is A.

5. Join AC.

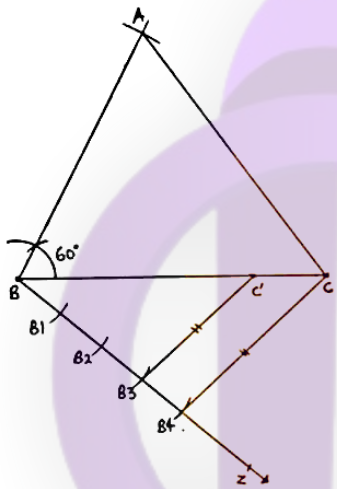


6. Now we have to make a triangle which is 3/4 times of this triangle.

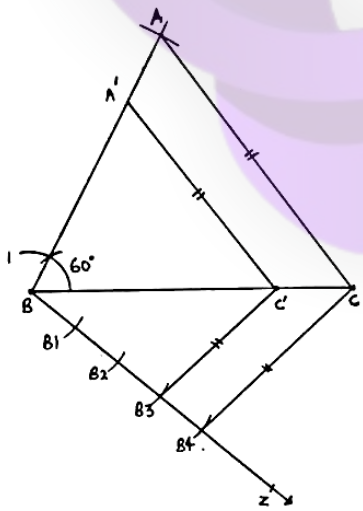
7. Draw a ray BZ making an acute angle with the line BC. Make 4 equal arcs starting from B then B1 and so on till B4.



8. Join B4C. Draw a line from B3 parallel to B4C cutting BC at C'.



9. Draw another line from C' parallel to CA cutting AB at A'.



11. A'BC' is our required triangle.

Question: 4

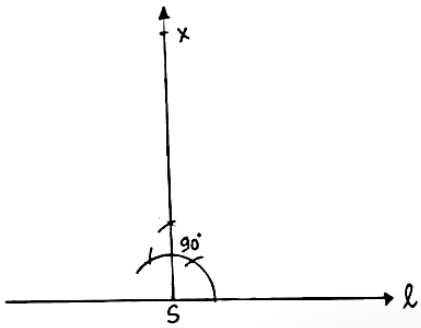
Solution:

Steps of Construction:

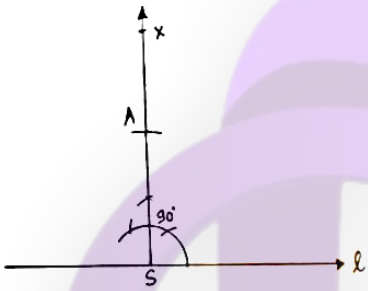
1. First we have to draw triangle of the given dimensions.

2. Draw a line l.

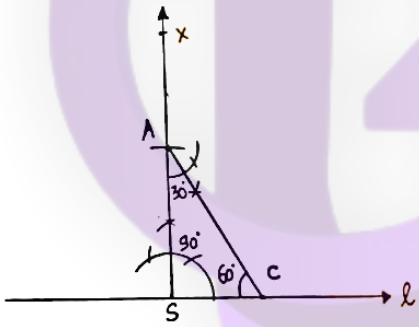
3. Take any point S on this line, and draw an angle of 90° from this point.



4. From S, draw an arc of length 3cm(length of altitude) cutting the perpendicular at A.

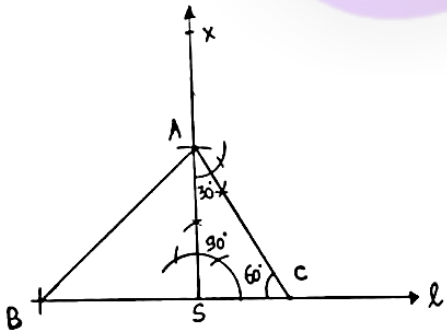


5. From A draw an angle of 30°, which cuts line l at C.



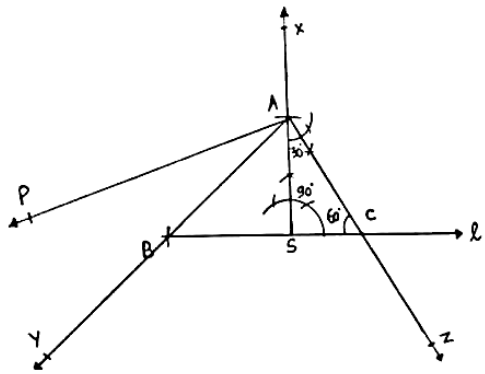
6. From C, draw an arc of length 5cm(length of BC) cutting line l at B.

7. Join AB. Then ABC is the triangle of given dimensions.



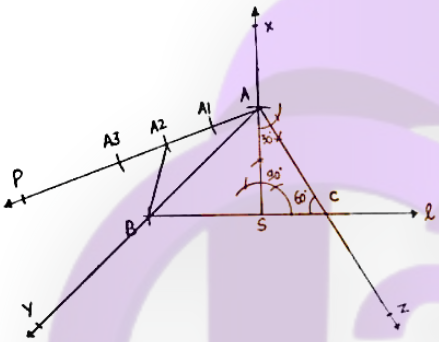
8. Draw a ray AP making an acute angle with the line AB.

9. As we have to make a triangle ADE which is 3/2 times of this triangle, i. e. a bigger triangle. We extend AB to Y and AC to Z.



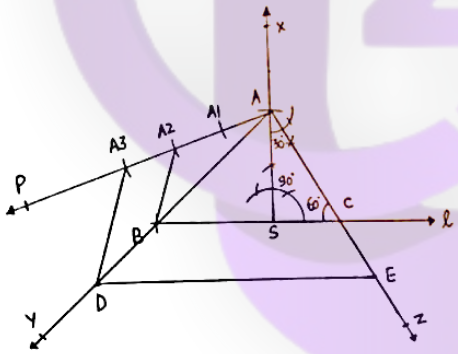
10. With A as center draw an arc on the ray AP. Then A1 as center and same radius draw another arc till we get A3.

11. Join A2B.



12. From A3 draw a line parallel to A2B cutting the AY at D.

13. From D, draw a line parallel to BC, cutting AZ at E.



14. Then ADE is the required triangle.

Question: 5

Solution:

Steps of Construction:

1. Draw a line segment AB of length 9 cm.

2. Now as we know that the altitude of the isosceles triangle is also the bisector of the base line. So we draw a perpendicular bisector of line BC.

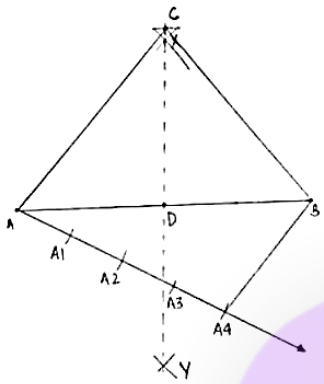
3. We cut an arc of length 5 cm(length of altitude). The arc cut point is C.

4. Join AB and AC. ABC is the triangle of the given dimensions.

5. Now we have draw a triangle which is 3/4 times of this triangle.

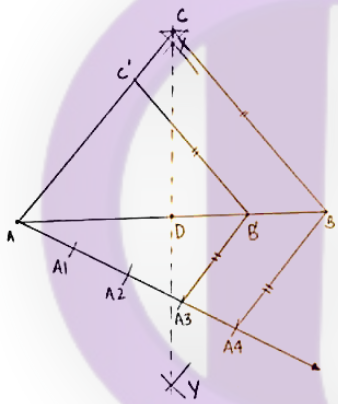
6. Draw a ray from A making an acute angle with AB. Make 4 equal arcs along the ray, i. e. A1, A2, A3, and A4.

7. Join A4B.



8. From A3, draw a line parallel to A4B cutting AB at B'.

9. From B', draw another line parallel to BC cutting AC at C'.



10. AB'C' is our required triangle.

Question: 6

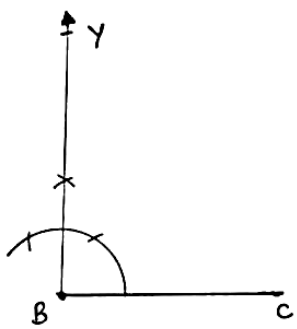
Solution:

Steps of Construction:

1. First we have to draw a triangle of given dimensions.

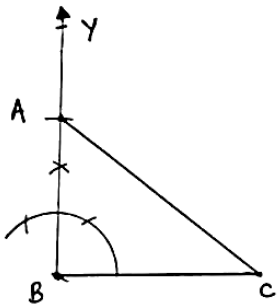
2. Draw a line segment of length BC of length 4cm.

3. Make an angle of 90° at B.



4. cut an arc of radius 3 cm taking B as center on the ray BY. The arc cut point is

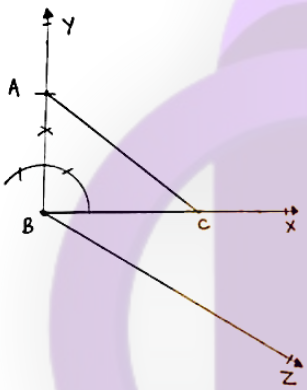
5. Join AC. ABC is the right angled triangle with the given dimensions.



6. Now we have to make a triangle which 7/5 times of this triangle, that is bigger than this triangle.

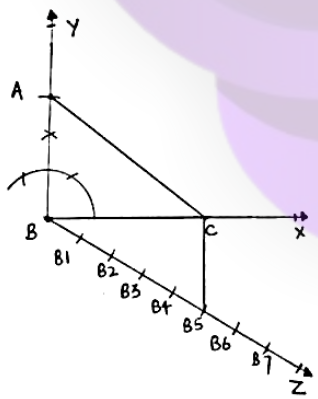
7. So we extend the line BC along C to X and BA along A to Y.

8. Draw a ray BZ making an acute angle with BC.



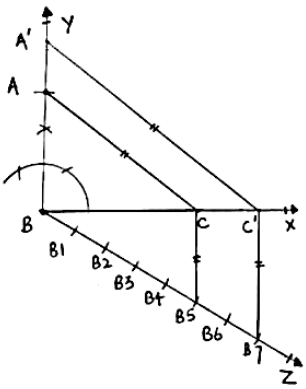
9. Make 7 equal arcs along BZ starting from B then B1 and so on till B7.

10. Join B5C.



11. From B7 draw a ray parallel to B5C cutting the BX at C'.

12. From C', draw another ray parallel to CA cutting BY at A'.



13. Then A'BC' is our required triangle.

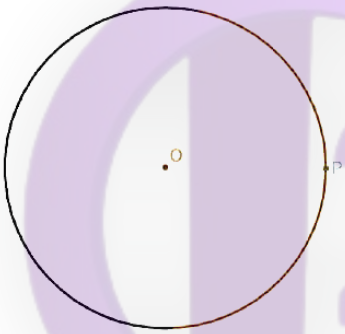
Question: 7

Solution:

Steps of Construction:

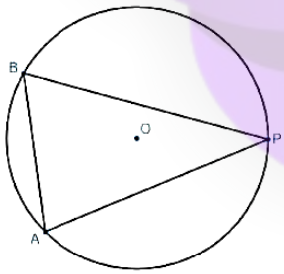
1. Draw a circle of radius 4. 8 cm.

2. Take any point P on this circle. We have to draw tangent to this circle passing through P.



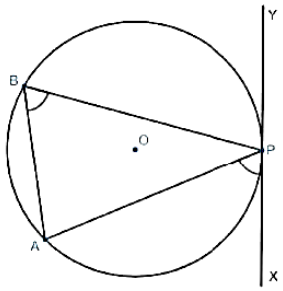
3. Draw any chord PA.

4. Take a point B in the major arc. Join BA and BP.



5. Draw angle ABP = angle APX.

6. Extend XP along P to Y.



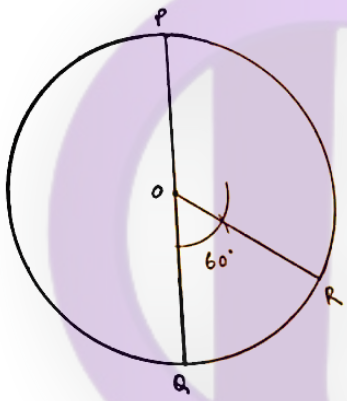
7. then XY is the required tangent.

Question: 8

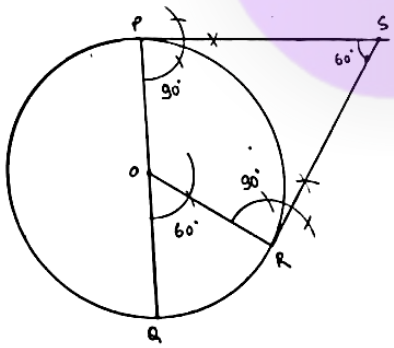
Solution:

Steps of Construction:

1. Draw a circle with center O and radius of length 3. 5cm.
2. We then draw any diameter POQ of this circle.
3. We then draw an angle ROQ = 60°.



4. Draw angle of 90° from P and R.
5. Extend both the rays. The point where both the points intersect is S.
6. Then PS and RS are the required tangents.



Question: 9

Solution:

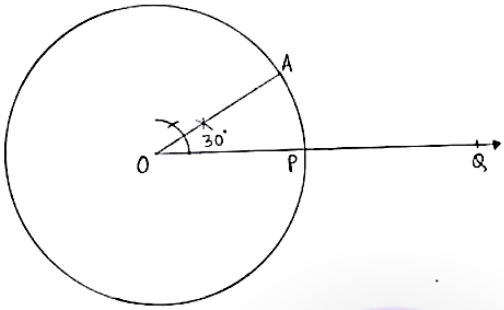
Steps of Construction:

1. Draw a circle with center O and radius of length 4cm.

2. Draw any radius OP of this circle.

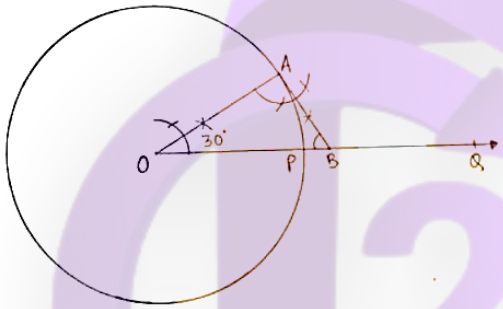
3. Extend OP to Q.

4. Draw angle AOP = 30°.



5. From A, draw angle of 90°.

6. The two lines intersect each other at B.



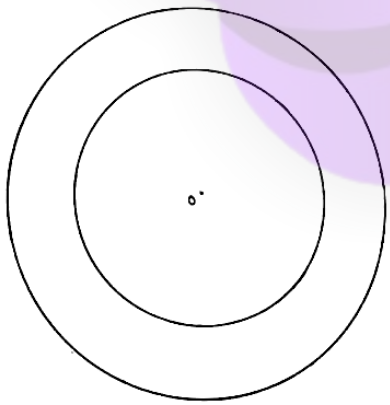
7. Then BA is the required tangent as angle ABP = 60°

Question: 10

Solution:

Steps of Construction:

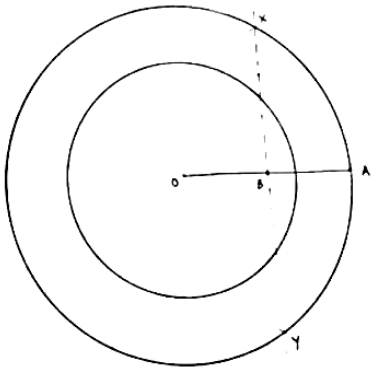
1. With O as a center, draw a circle of radius of 4cm and another circle of radius 6cm.



2. Mark any point A on the bigger circle.

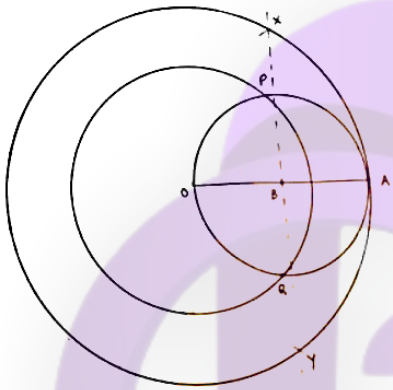
3. Join OA. Draw perpendicular bisector of OA.

4. The perpendicular bisector XY of OA intersects OA at B.



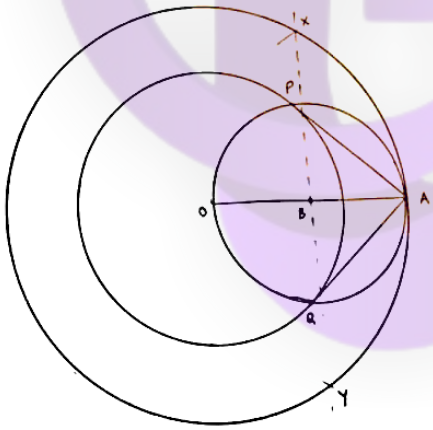
5. With B as center and radius of length OB (or BA), draw a circle.

6. This circle intersects the smaller circle(of radius 4cm) at P and Q.



7. Join AP and AQ.

8. Then AP and AQ are the required tangents.



9. The measured length of AP and AQ is 4. 4cm (approximately).