RS Aggarwal Solutions for Class 10Maths Chapter 9 Constructions

**Exercise 9A**   **Page No: 518**

Question 1: Draw a line segment AB of length 7 cm. Using ruler and compasses, find a point P on AB such that AP/AB = 3/5.

Solution:

Steps of Construction:

1. Draw a line segment AB = 7cm.

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

3. Taking A as center draw an arc cutting at A_1 on the line.
And with the same radius consider A_1 as a center and draw another arc cutting line at A_2.
Repeat the same procedure and divide the line AX from A into 8 equal parts:
AA_1, A_1A_2, A_2A_3, A_3A_4, A_4A_5, A_5A_6, A_6A_7 and A_7A_8

4. Join A_8 and B by drawing a line.

5. Draw a parallel line to A_8B from A_3 which divides line segment AB at point P.

6. P is the required point such that AP/AB = 3/5.
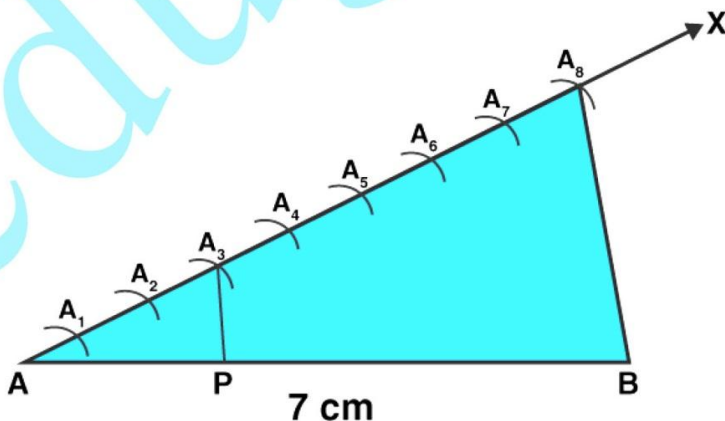
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Question 2:
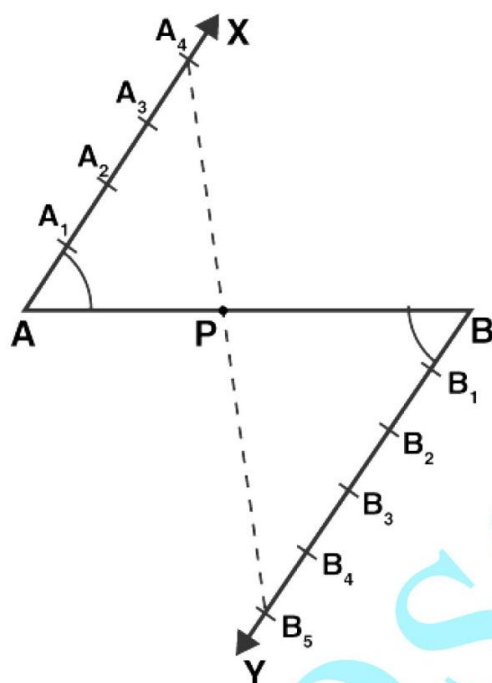**(i) Draw a line segment of length 8 cm and divide it internally in the ratio 4:5.**

Solution:

Steps of construction:

1. Draw a line segment AB = 8 cm.

2. Draw a ray AX making an acute angle at A with AB.

3. Draw another ray BY parallel to AX making an acute angle. Make sure angle must be same as considered in step 2.

4.Taking A as center draw an arc cutting at A_1 on the line.
Taking same radius consider A_1 as a center and draw another arc cutting line at A_2.
Repeat the same procedure and divide the line AX into 4 points A1, A2, A3, A4.
In such a way, AA1=A1A2=A2A3=A3A4

5. Similar to step 4,
Taking B as center draw an arc cutting at B1 on the line.
Taking same radius (set in step 4) consider B1 as a center and draw another arc cutting line at B2.
Repeat the same procedure and divide the line BYinto 5 points in such a way that BB1 = B1B2= B2B3= B3B4 = B4B5

6. Join A4B5

7.Line A4B5 intersect AB at a point P.

Therefore, P is the point dividing the line segment AB internally in the ratio of 4 : 5.

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

Solution:

Steps of construction:

1. Draw a line segment AB = 7.6 cm.

2. Draw a ray AX making an acute angle at A with AB.

3. Draw another ray BY parallel to AX making an acute angle. Make sure angle must be same as considered in step 2.

4. Taking A as center draw an arc cutting at A1 on the line.
Taking same radius consider A1 as a center and draw another arc cutting line at A2.
Repeat the same procedure and divide the line AX into 5 points A1, A2, A3, A4 and A5
In such a way, AA1 = A1A2 = A2A3 = A3A4 = A4A5

5. Similar to step 4,
Taking B as center draw an arc cutting at B1 on the line.
Taking same radius (set in step 4) consider B1 as a center and draw another arc cutting line at B2.

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Repeat the same procedure and divide the line BY into 8 points in such a way that BB1 = B1B2 = B2B3 = B3B4 = B4B5 = B5B6 = B6B7 = B7B8

6. Join A5B8

7. Line A5B8 intersect AB at a point P in the ratio 5:8

8. Measurement: PB = 4.7 cm and AP = 2.9 cm
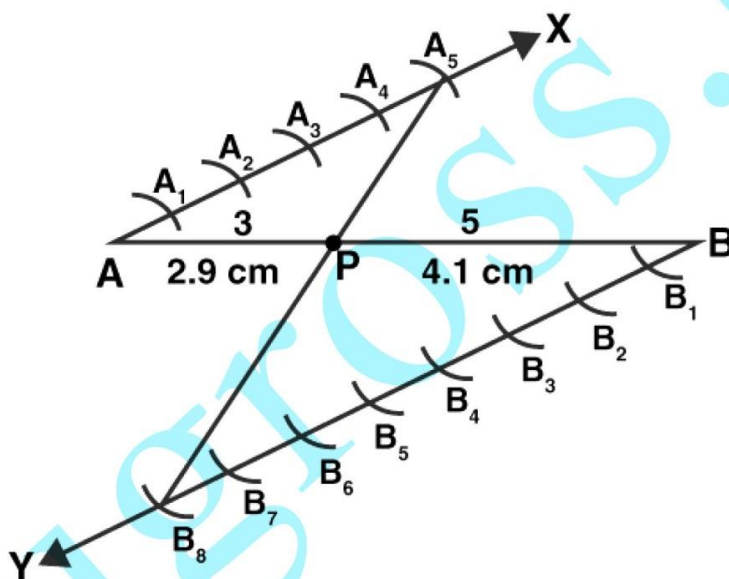
Question 3: Construct a ΔPQR, in which PQ = 6 cm, QR = 7 cm and PR = 8 cm. Then, construct another triangle whose sides are 4/5 times the corresponding sides of ΔPQR.
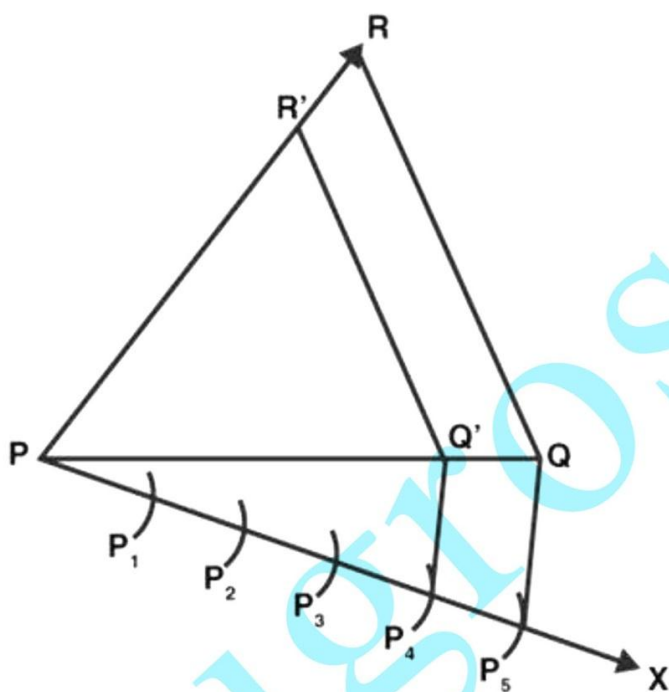
Solution:

Steps of construction:

1. Draw a line segment PQ = 6 cm.
2. Draw an arc, using P as a center and radius = 8 cm
3. Draw another arc, using Q as a center and radius = 7 cm
4. Now, join PR and QR to get △PQR
5. Draw a ray PX by making an acute angle, angle QPX
6. Divide PX into 4 equal parts

P_1, P_2, P_3, P_4, P_5 such that $PP_1 = P_1P_2 = P_2P_3 = P_3P_4 = P_4P_5$

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7. Join P5Q
8. Draw a line P4Q' which is parallel to P5Q
9. Similar to step 8, draw a line Q'R' which is parallel to QR

Therefore, △PQ'R' is the required triangle.

Question 4: Construct a triangle with sides 5 cm, 6 cm and 7 cm and then another triangle whose sides are 7/5 of the corresponding sides of first triangle.

Solution:
Steps of construction:

1. Draw a line segment BC = 5 cm.

2. Draw an arc, using B as a center and radius = 6 cm
3. Draw another arc, using C as a center and radius = 7 cm
4. Now, join AC and AB to get △ABC
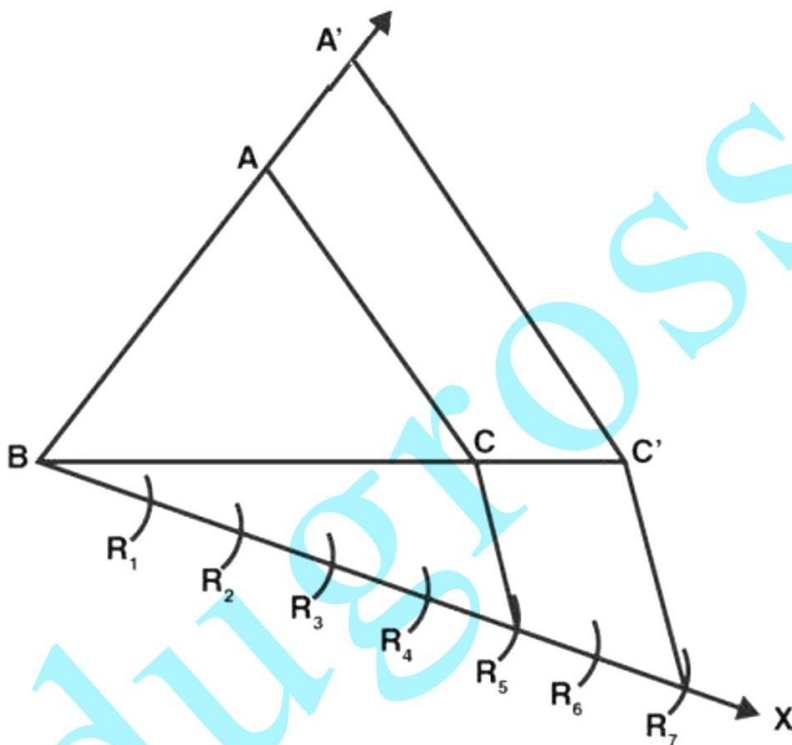5. Draw a ray BX by making an acute angle, angle CBX
6.

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Along BX, mark off 7 points $R_1, R_2, R_3, R_4, R_5, R_6, R_7$ such that $BR_1 = R_1R_2 = R_2R_3 = R_3R_4 = ... = R_6R_7$

7. Join R5C
8. Draw a line R7C' which is parallel to R5C
9. Similar to step 8, draw a line C'A' which is parallel to CA
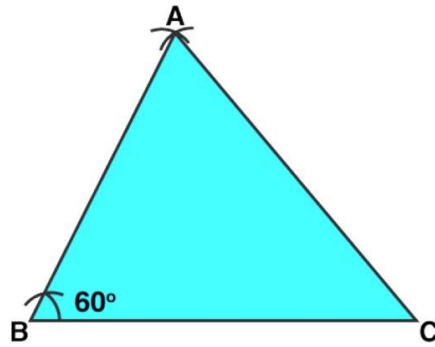

Therefore, △A'BC' is the required triangle.

Question 5: Construct a ΔABC, with BC = 7 cm, ∠B = 60° and AB = 6 cm. Construct another triangle whose sides are times the corresponding sides of ΔABC.
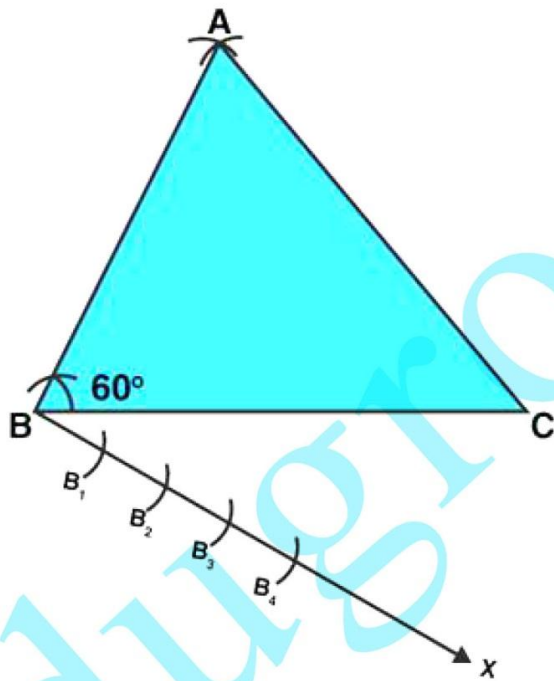
Solution:

Steps of Construction:

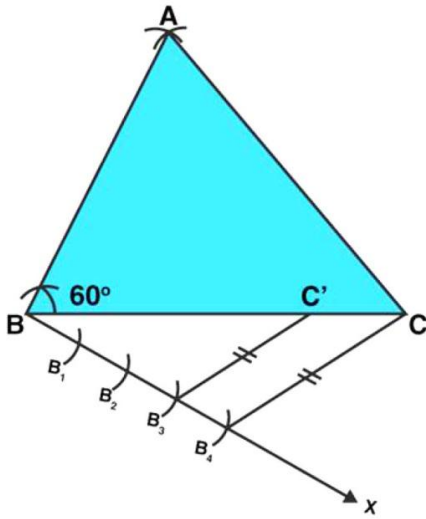1. Draw a triangle ABC with BC = 7 cm, ∠B = 60^0 and AB = 6 cm.

2. Draw a ray BX making an acute angle with the line BC.

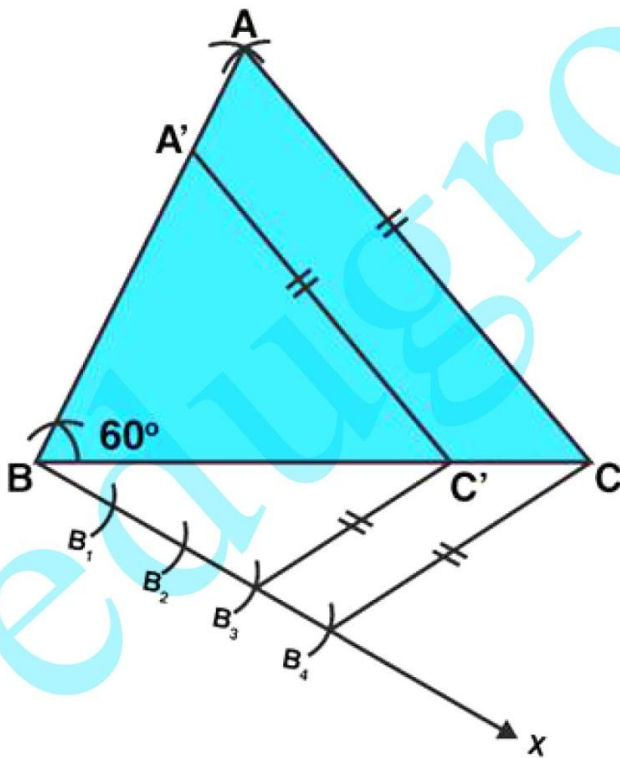3. Divide BX into 4 equal arcs starting from B till B4. As shown in the below image.

4. Join B4C. Also draw a line from B3 parallel to B4C passing BC at C'.

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5.Draw another line from C' parallel to CA passing AB at A'.
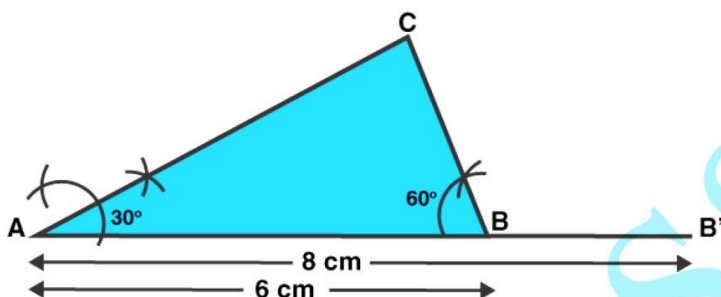

Thus, △A'BC' is required triangle.

Question 6: Construct a ΔABC in which AB = 6 cm, ∠A = 30° and ∠B = 60°. Construct another ΔAB'C' similar to ΔABC with base AB' = 8 cm.

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Solution:
Construct a ΔABC in which AB = 6 cm, ∠A = 30° and ∠B = 60°. Construct another ΔAB'C' similar to ΔABC with base AB' = 8 cm.

1. Draw a line segment AB = 6cm and extend it to B' such that AB' = 8 cm.
2. Make an angle of 30° from A and angle of 60° from B. The point where these extended rays meet is C.

3. Draw an angle of 60° from B' (Similar triangles)

4. Extend line AC along C such that ray passing through point B' Cut AX at C'.
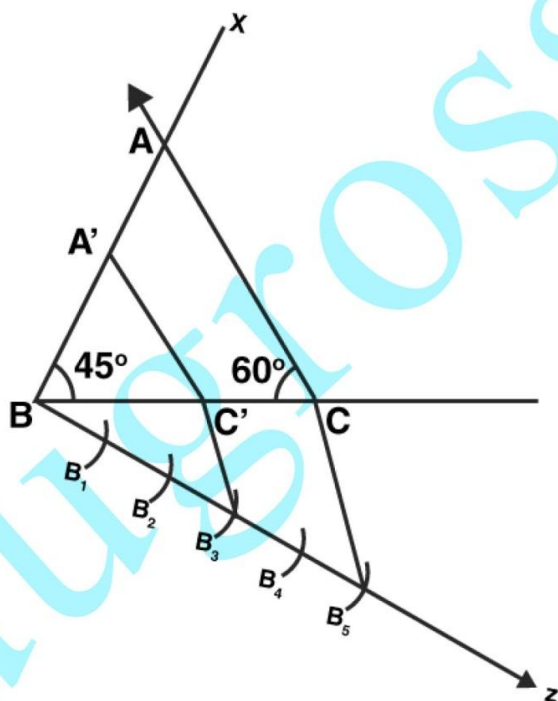5. AB'C' is the required triangle.
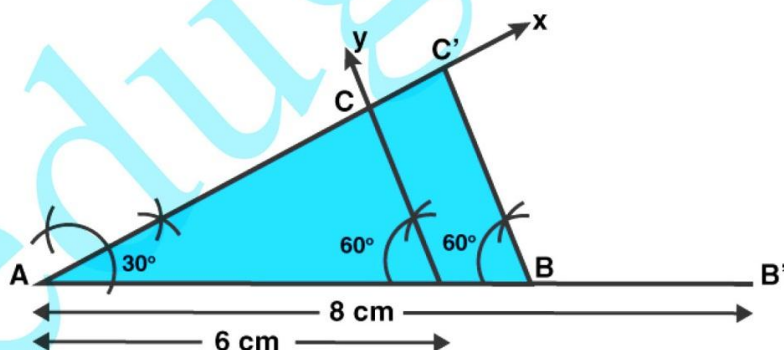
Question 7: Construct a ΔABC in which BC = 8 cm, ∠B = 45^0 and ∠C = 60°. Construct another triangle similar to ΔABC such that its sides are 3/5 of the corresponding sides of ΔABC.

Solution:

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Steps of Construction:
1. Draw a line segment BC = 8 cm.
2. Construct a triangle ABC based on given instructions.
3. Draw an arc below BC, by making an acute angle, angle CBZ
4. Divide BZ into 5 equal parts.
such that $BB_1 = B_1B_2 = B_2B_3 = B_3B_4 = B_4B_5$
5. Join B5C
6. Draw a line B3C' which is parallel to B5C and join C'A' which is parallel to CA.

Therefore, △A'BC' is the required triangle.

Question 8: To construct a triangle similar to ΔABC in which BC = 4.5 cm, ∠B = 45° and ∠C = 60°, using a scale factor of 3/7, BC will be divided in the ratio.
(a) 3 : 4   (b) 4 : 7   (c) 3 : 10   (d) 3 : 7

Solution:
BC will be divided in the ratio 3 : 4. Option (a) is correct.

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Question 9: Construct an isosceles triangle whose base is 8 cm and altitude 4 cm and then another triangle whose sides are 1_1/2 (or 3/2) times the corresponding sides of the isosceles triangle.

Solution:
Steps of Construction:
1. Draw a line segment BC = 8 cm.
2. Draw a perpendicular bisector PQ of BC dividing BC at point M.
3. From QP cut off a distance MA = 4cm
4. Join AC and AB
5. Draw an arc below BC, by making an acute angle, angle CBX
6.
   Along BX, mark off 3 points
   B_1, B_2, B_3 such that $BB_1 = B_1B_2 = B_2B_3$.

7. Join B2C
8. Join B3C'which is parallel to B2C and Join A'C' which is parallel to AC
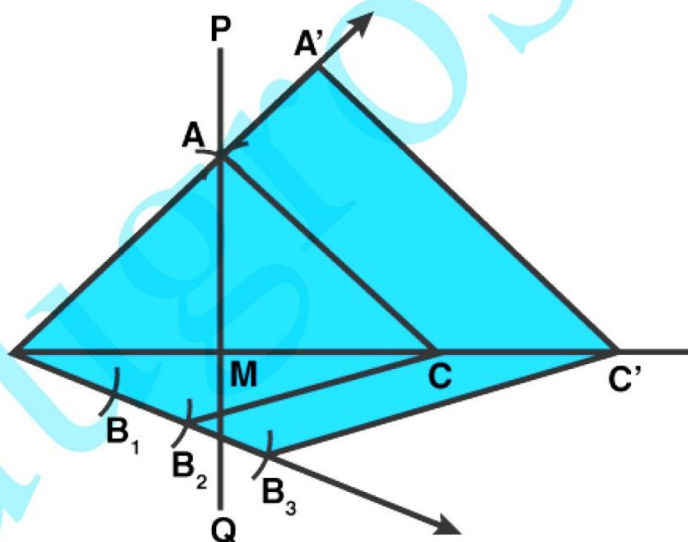
Thus, △A'BC' is required triangle.

Question 10: Draw a right triangle in which sides (other than hypotenuse) are of lengths 4 cm and 3 cm. Then, construct another triangle whose sides are 5/3 times the corresponding sides of the given triangle.
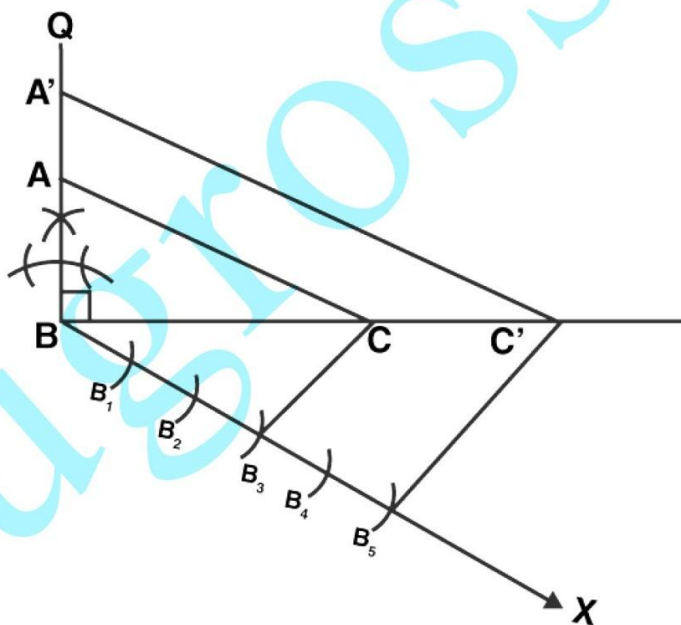
Solution:
Steps to construction:
1. Draw a line segment BC = 4 cm.

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2. Construct, angle B = 90 degrees

3. Cut BA at the radius of 3 cm from BQ
4. Join AC (we have right triangle ABC)

5. Draw a ray BX and make an acute below BC, i.e. angle CBX

6.
Along BX, mark off 5 points B_1, B_2, B_3, B_4, B_5
such that $BB_1 = B_1B_2 = \ldots\ldots = R_4R_5$

7. Join B3C
8. Join B5C' which is parallel to B3C and C'A' which is parallel to AC.

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Exercise 9B   **Page No: 525**

Question 1: Draw a circle of radius 3 cm. From a point P, 7 cm away from the centre of the circle, draw two tangents to the circle. Also, measure the lengths of the tangents.
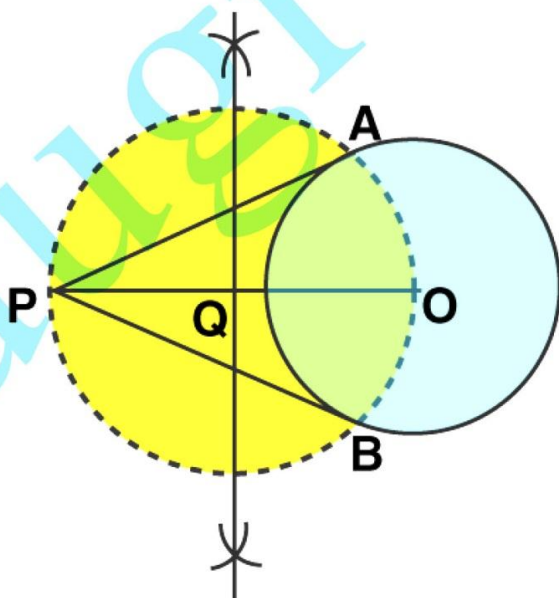
Solution:

Steps of Construction:
1. Draw a circle of radius 3 cm from center O.
2. Set a point P which is 7 cm far from point O. Join OP.
3. Draw a perpendicular bisector of OP which cuts OP at point Q.
4. Now, considering Q as a center and equal radius (OQ = PQ). Draw a circle.
5. Both circles intersect at points A and B.
6. Join PA and PB.
Therefore, AP and BP are the required tangents.
Measurements: AP = BP = 6.1 cm

Question 2: Draw two tangents to a circle of radius 3.5 cm from a point P at a distance of 6.2 cm from its centre.
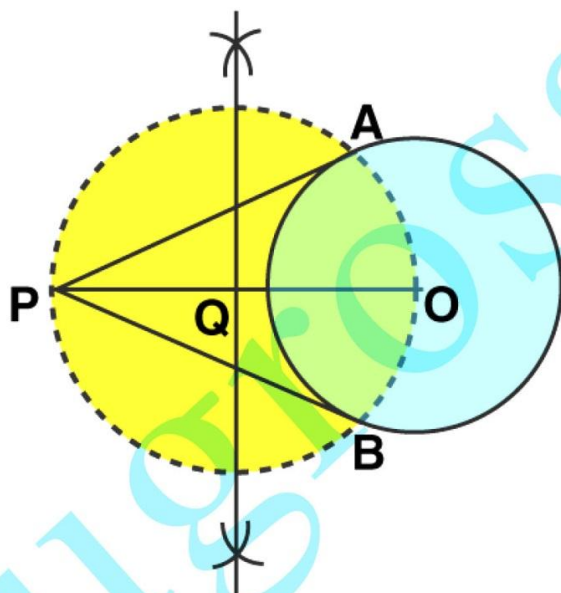
Solution:

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Steps of Construction:
1. Draw a circle of radius 3.5 cm from center point O.
2. Set a point P which is located at distance 6.2 cm from point O. Join OP.
3. Draw a perpendicular bisector of OP which cuts OP at point Q.
4. Now, considering Q as a center and equal radius (OQ = PQ). Draw a circle.
5. Both circles intersect at points A and B.
6. Join PA and PB.
Therefore, AP and BP are the required tangents.

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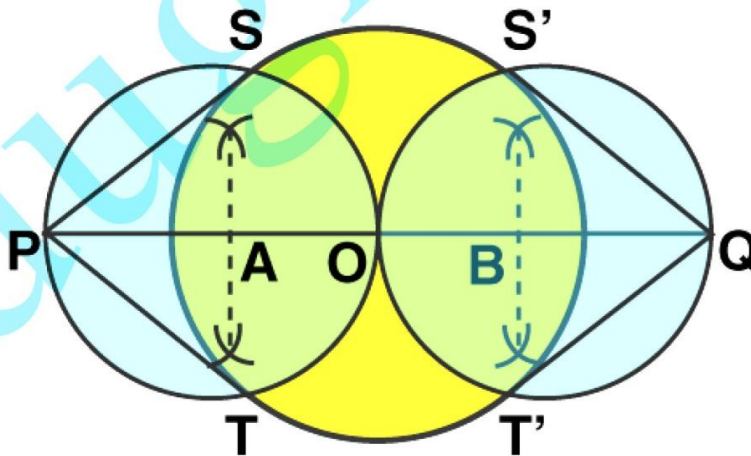
Solution:

Steps of Construction:
1. Draw a circle of radius 3 cm from a center point O.
2. Extend diameter of the circle from both the sides. Mark point P and Q such that OP = OQ = 7cm.
3. Draw a perpendicular bisector of OP which divide OP at point A.
4. Draw perpendicular bisector of OQ which divide OQ at B.
5. Draw a circle taking point A as a center and radius (OA or AP).
6. Both the circles intersect each other at S and T.

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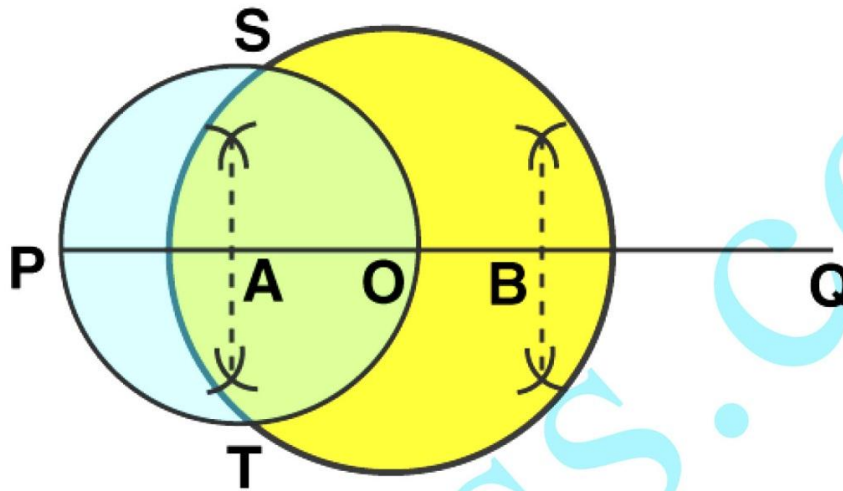
7. Join PS and PT. Both are tangents from point P.
8. Draw a circle by taking B as center and radius (OB or QB).
9. Both the circles intersect each other at S' and T'.
10. Join QS' and ST'. Both are tangents from point Q.

Question 4: Draw a circle with centre O and radius 4 cm. Draw any diameter AB of this circle. Construct tangents to the circle at each of the two end points of the diameter AB.
Solution:

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Steps of construction:
1) Draw a circle with centre O and radius 4 cm.
2) Draw any diameter AB.
3) Draw line L ⊥ OA such that ∠OAL = 90°
4) Draw line M ⊥ OB such that ∠OBM = 90°
Thus, LA and LB are the required tangents.
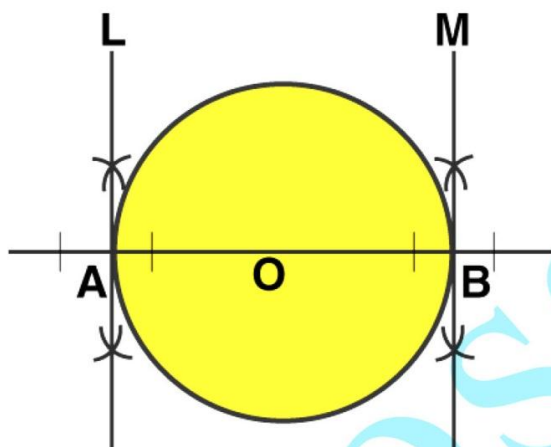
Question 5: Draw a circle with the help of a bangle. Take any point P outside the circle. Construct the pair of tangents from the point P to the circle.

Solution:

Steps of Construction:
1. Draw a circle with the help of a bangle.
2. Draw a point P outside the circle and draw two chords ST and QR.
3. Draw a perpendicular bisector form ST and QR.
4. Join PO.
5. Draw a circle taking U as a center and radius OU (let's say U is the midpoint of OP)
6. Both the circles are intersecting at W and V. Join PW and PV.

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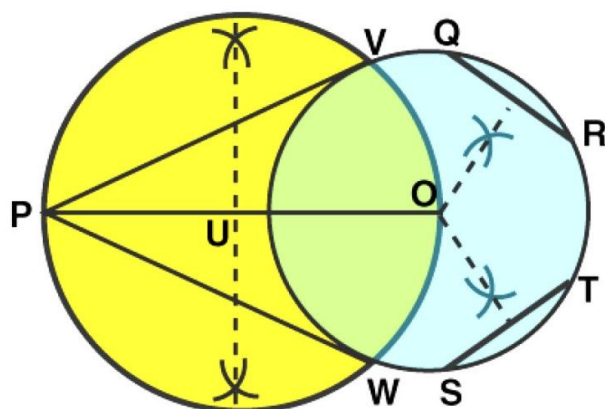
Therefore, PW and PV are required tangents.

Question 6: 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.
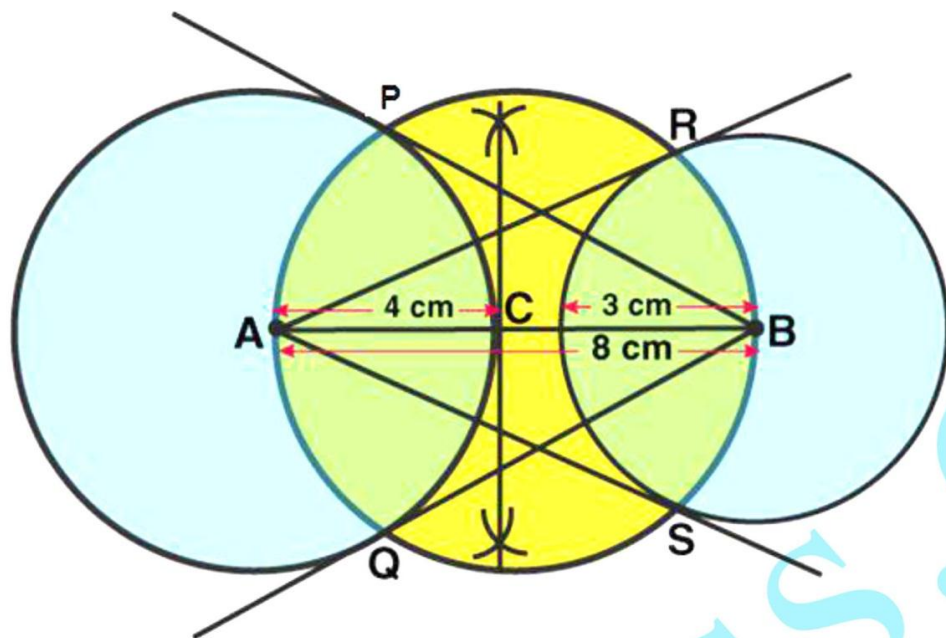
Solution:

Steps of Construction:

1. Draw a line segment AB = 8 cm
2. Draw a perpendicular bisector of AB which intersect at point C.
3. Draw a circle, with centre C and radius CA.
4. Draw two circles: with center A having radius 4 cm and with center B having radius 3 cm.
   Both circles intersect previous circle at the points P, Q, R and S.
5. Join AR, BP, AS and BQ

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

Question 7: Draw a circle of radius 4.2 cm. Draw a pair of tangents to this circle inclined to each other at an angle of 45°.

Solution:

Steps of construction :
1) Draw a circle with radius 4.2 cm and centre O
2) Draw diameter AB
3) With OB as base, draw ∠BOC = 45°
4) At C, draw a line perpendicular to OC.
5) At A, draw a line perpendicular to OA.

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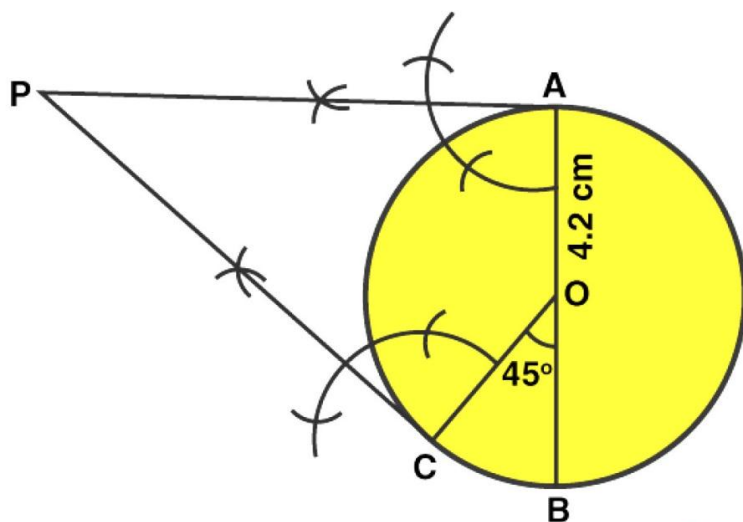
Both the lines intersect each other at point P. So PC and PA are tangents.

Question 8: Write the steps of construction for drawing a pair of tangents to a circle of radius 3 cm, which are inclined to each other at an angle of 60°.

Solution:

Steps of construction:
1) Draw a circle by taking O as a centre and OA = 3 cm (radius)
2) Extend OA to B s.t. OA = AB = 3 cm
3) Taking A as the centre draw a circle of radius AO = AB = 3 cm
   Supose it cuts the circle drawn in step 1 at P and Q.
4) Join BP and BQ to get the desired tangents.

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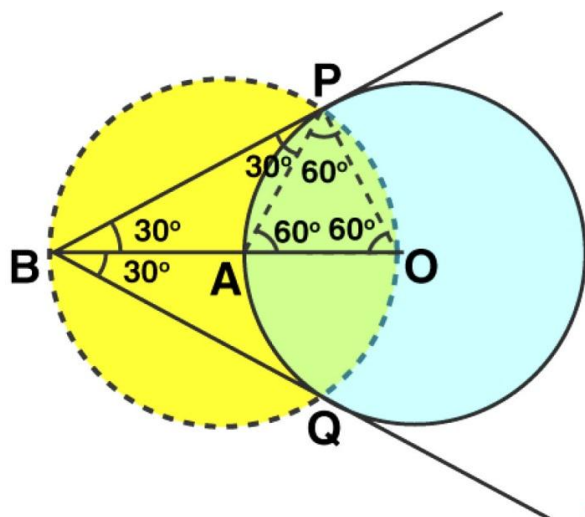
Question 9: Draw a circle of radius 3 cm. Draw a tangent to the circle making an angle of 30° with a line passing through the centre.
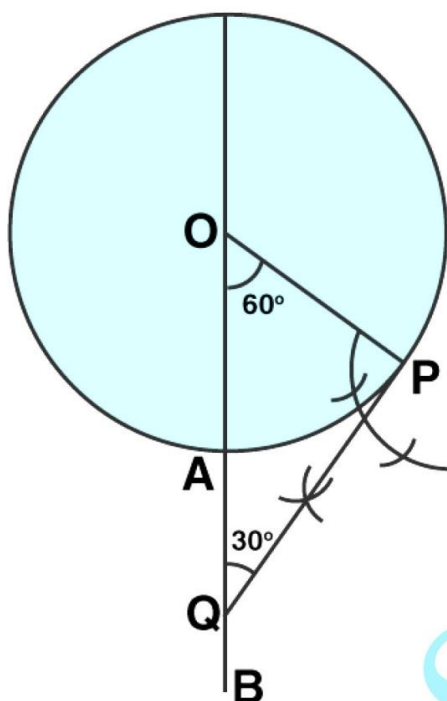
Solution:

Steps of construction:

1) Draw a circle with radius 3 cm and centre O
2) Draw a radius OA of this circle and produce it to B.
3) Construct an ∠AOP = 60° (complement of 30°)
4) Draw perpendicular to OP at P which intersects OA produced at Q.

Thus, PQ is the desired tangent such that ∠OQP = 30°

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Question 10: Construct a tangent to a circle of radius 4 cm from a point on the concentric circle of radius 6 cm and measure its length. Also, verify the measurement by actual calculation.

Solution:
Steps of Construction:
1. Draw two circles with radius OA = 4 cm and radius OB = 6 cm. Centre point is O.
2. Draw a circle of radius BC = OC. Say, C be the midpoint of OB.
3. Both the circles intersect at P and Q.
4. Join BQ and BP which are the required tangents.

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Measurement:
BP = BQ = 4.5 cm
Verification:
In triangle BOP, OP = 4 cm and OB = 6 cm
Using Pythagoras theorem, we have
$OB^2 = BP^2 + OP^2$
$BP = \sqrt{20} = 4.5$ cm
Similarly BQ = 4.5 cm (approx.)
Verified lengths of both the tangents.

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