10TH MATHS GEOMETRY

SIMILAR TRIANGLE

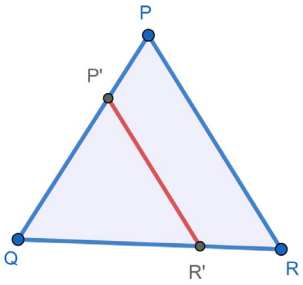
Note : Construction No Need Important

1. Construct a triangle similar to a given triangle **PQR** with its sides equal to $\frac{2}{3}$ of the corresponding sides of the triangle **PQR** (**Scale Factor** $\frac{2}{3} < 1$).

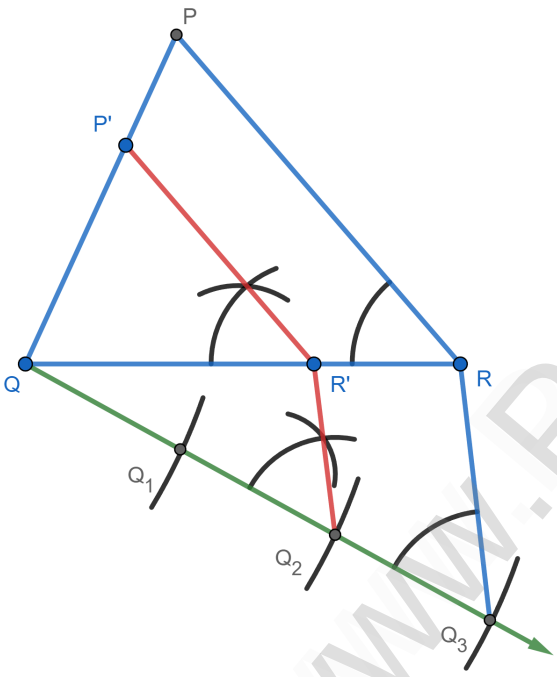
Solution:

Given
(Scale Factor $\frac{2}{3} < 1$**)**

Rough Diagram



Fair Diagram



Construction:

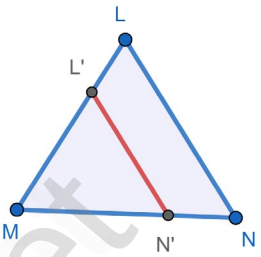
- Construct a $\Delta\, PQR$ with any measurement.
- Draw a ray QX making acute angle with QR on the side opposite to vertex P.
- Locate 3 (greater of 2 and 3 in $\frac{2}{3}$) points. Q_1, Q_2, Q_3, on QX . Q Q_1 = Q_1 Q_2 = Q_2 Q_3 .
- Join Q_3R and draw a line through Q_2 (2 being smaller and 3 in $\frac{2}{3}$) parallel to Q_3 R to intersect QR at R'.
- Draw line through R' parallel to the line RP to intersect QP at P'.
- $\Delta P'QR'$ is the required triangle of $\frac{2}{3}$ of the corresponding sides of ΔPQR.

2. Construct a triangle similar to a given triangle **LMN** with its sides equal to $\frac{4}{5}$ of the corresponding sides of the triangle **LMN** (**Scale Factor** $\frac{4}{5} < 1$).

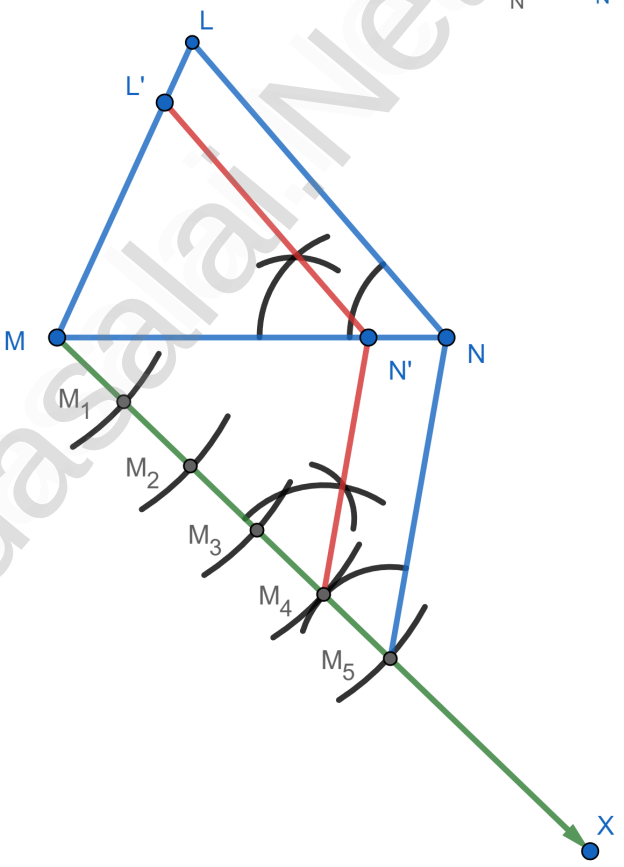
Solution:

Given
(Scale Factor $\frac{4}{5} < 1$**)**

Rough Diagram



Fair Diagram



Construction:

- Construct a $\Delta\, LMN$ with any measurement.
- Draw a ray QX making acute angle with MN on the side opposite to vertex L.
- Locate 5 (greater of 4 and 3 in $\frac{4}{5}$) points. M_1, M_2, M_3, on MX . M M_1 = M_1 M_2 = M_2 M_3 = M_3 M_4 = M_4 M_5.
- Join M_5 R and draw a line through M_4 (4 being smaller and 5 in $\frac{4}{5}$) parallel to M_4 N to intersect MN at N'.
- Draw line through N' parallel to the line NL to intersect ML at L'.
- $\Delta\, L'MN'$ is the required triangle of $\frac{4}{5}$ of the corresponding sides of ΔLMN.

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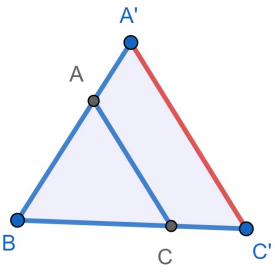
3. Construct a triangle similar to a given triangle **ABC** with its sides equal to $\frac{6}{5}$ of the corresponding sides of the triangle **ABC** (**Scale Factor** $\frac{6}{5} > 1$).

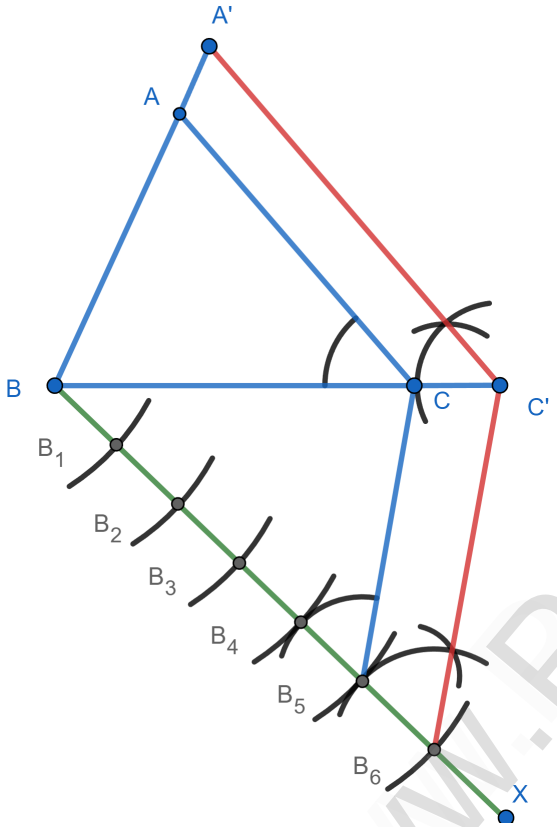
Solution:

Given
(Scale Factor $\frac{6}{5} > 1$**)**

Rough Diagram



Fair Diagram



Construction:

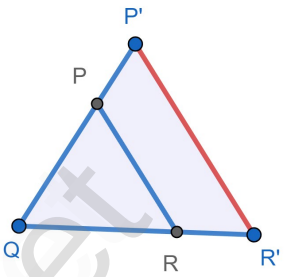
- Construct a $\Delta\, ABRC$ with any measurement.
- Draw a ray BX making acute angle with BC on the side opposite to vertex A.
- Locate 6 (greater of 6 and 5 in $\frac{6}{5}$) points. B_1, B_2, B_3, on BX . B B_1 = B_1 B_2 = B_2 B_3 = B_3 B_4 = B_4 B_5.= B_5 B_6.
- Join B_5C and draw a line through B_5 (5 being smaller and 6 in $\frac{6}{5}$) parallel to B_6 C to intersect BC at C'.
- Draw line through C' parallel to the line CA to intersect BA at A'.
- $\Delta\, A'BC'$ is the required triangle of $\frac{6}{5}$ of the corresponding sides of $\Delta\, ABC$.

4. Construct a triangle similar to a given triangle **PQR** with its sides equal to $\frac{7}{3}$ of the corresponding sides of the triangle **PQR** (**Scale Factor** $\frac{7}{3} > 1$).

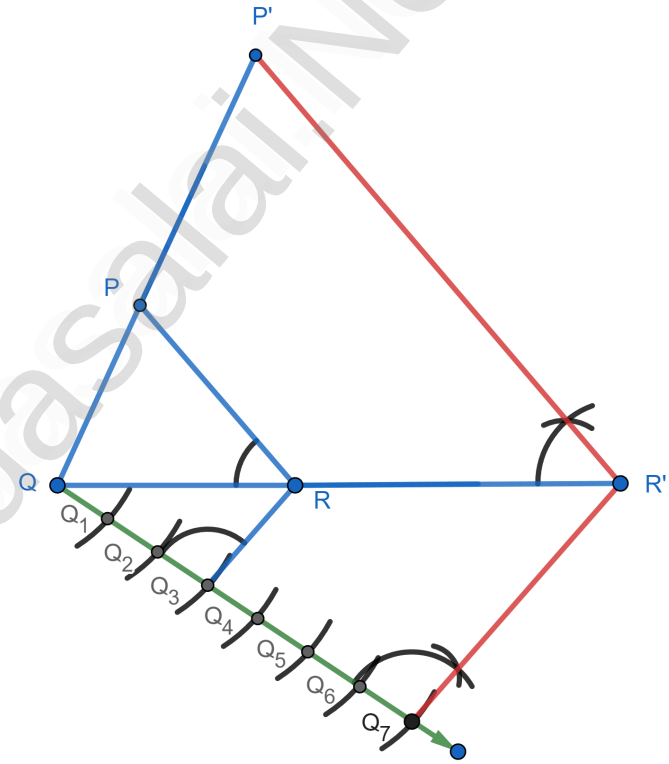
Solution:

Given
(Scale Factor $\frac{7}{3} > 1$**)**

Rough Diagram



Fair Diagram



Construction:

- Construct a $\Delta\, PQR$ with any measurement.
- Draw a ray QX making acute angle with QR on the side opposite to vertex P.
- Locate 7 (greater of 7 and 3 in $\frac{7}{3}$) points. Q_1, Q_2, Q_3, Q_4, Q_5, Q_6, Q_7, on QX . Q Q_1 = Q_1 Q_2 = Q_2 Q_3 = Q_3 Q_4.= Q_4 Q_5 = Q_5 Q_6 = Q_6 Q_7.
- Join Q_3R and draw a line through Q_3 (3 being smaller and 7 in $\frac{7}{3}$) parallel to Q_3 R to intersect QR at R'.
- Draw line through R' parallel to the line RP to intersect QP at P'.
- $\Delta P'QR'$ is the required triangle of $\frac{7}{3}$ of the corresponding sides of ΔPQR.

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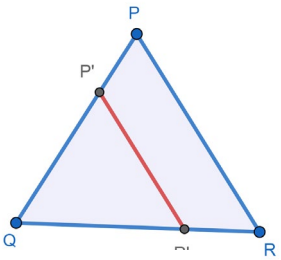
Example : 4.10.

Construct a triangle similar to a given triangle **PQR** with its sides equal to $\frac{3}{5}$ of the corresponding sides of the triangle **PQR** (**Scale Factor** $\frac{3}{5} < 1$).

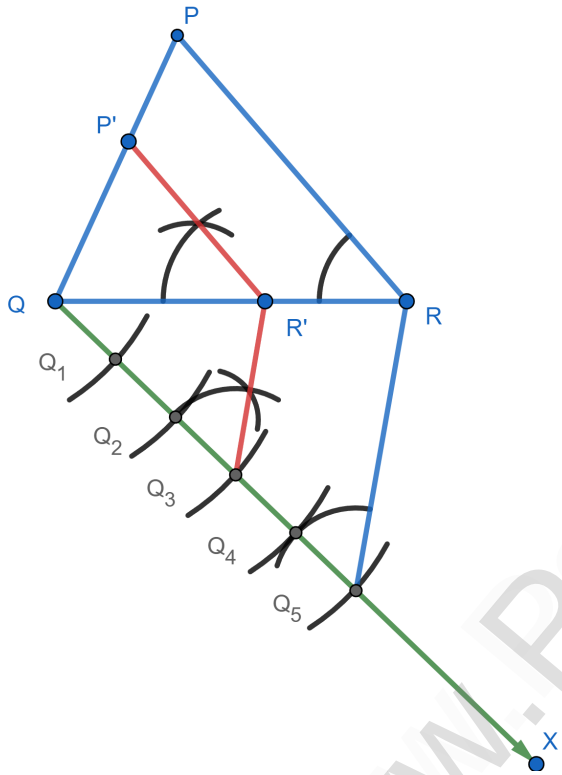
Solution:

Given
(Scale Factor $\frac{3}{5} < 1$)

Rough Diagram



Fair Diagram



Construction:

- Construct a $\Delta\, PQR$ with any measurement.
- Draw a ray QX making acute angle with QR on the side opposite to vertex P.
- Locate 5 (greater of 3 and 5 in $\frac{3}{5}$) points. Q_1, Q_2, Q_3, Q_4, Q_5, on QX . Q Q_1 = Q_1 Q_2 = Q_2 Q_3 = Q_3 Q_4 = Q_4 Q_5.
- Join Q_3R and draw a line through Q_3 (3 being smaller and 5 in $\frac{3}{5}$) parallel to Q_3 R to intersect QR at R'.
- Draw line through R' parallel to the line RP to intersect QP at P'.
- $\Delta P'QR'$ is the required triangle of $\frac{3}{5}$ of the corresponding sides of ΔPQR.

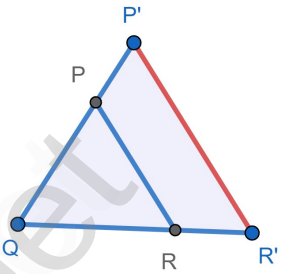
Example : 4.11.

Construct a triangle similar to a given triangle **PQR** with its sides equal to $\frac{7}{4}$ of the corresponding sides of the triangle **PQR** (**Scale Factor** $\frac{7}{4} > 1$).

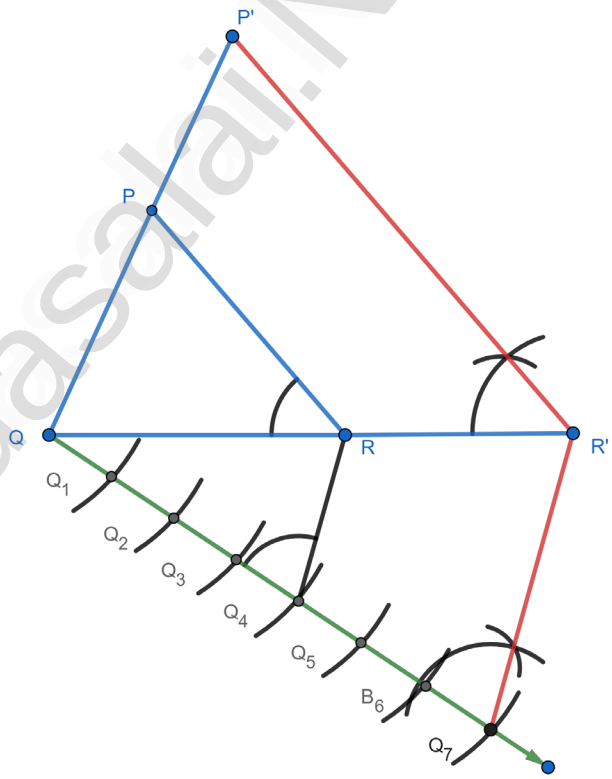
Solution:

Given
(Scale Factor $\frac{7}{4} > 1$)

Rough Diagram



Fair Diagram



Construction:

- Construct a $\Delta\, PQR$ with any measurement.
- Draw a ray QX making acute angle with QR on the side opposite to vertex P.
- Locate 7 (greater of 4 and 7 in $\frac{7}{4}$) points. Q_1, Q_2, Q_3, Q_4, Q_5, Q_6, Q_7, on QX . Q Q_1 = Q_1 Q_2 = Q_2 Q_3 = Q_3 Q_4 = Q_4 Q_5 = Q_5 Q_6 = Q_6 Q_7 .
- Join Q_4R and draw a line through Q_4 (4 being smaller and 7 in $\frac{7}{4}$) parallel to Q_4 R to intersect QR at R'.
- Draw line through R' parallel to the line RP to intersect QP at P'.
- $\Delta P'QR'$ is the required triangle of $\frac{7}{4}$ of the corresponding sides of ΔPQR.

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10TH MATHS GEOMETRY

TWO TANGENT AND TANGENT

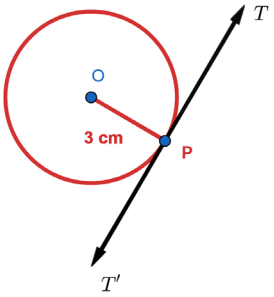
Example 4.29

Draw a circle of **radius 3 cm**. Take a point P on this circle and draw **a tangent at P**.

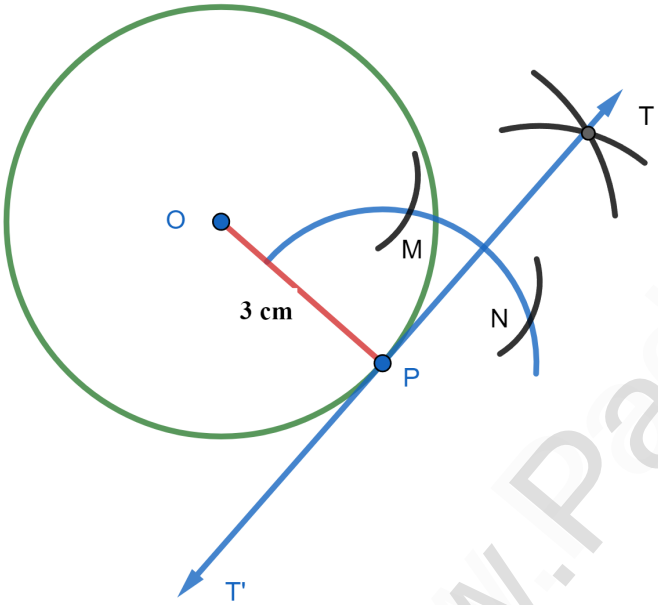
Solution:

Given
Radius $r = 3\ cm$

Rough Diagram



Fair Diagram



Construction:

- Draw a circle with centre at O of radius 3 cm.
- Take a point P on the circle. Join OP.
- Draw perpendicular line to OP which passes through P.
- TT' is the required tangent.

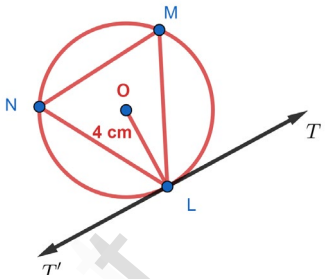
Example 4.30

Draw a circle of **radius 4 cm**. At a point L on it draw a **tangent** to the circle using the **alternate segment**.

Solution:

Given
Radius $r = 4\ cm$

Rough Diagram



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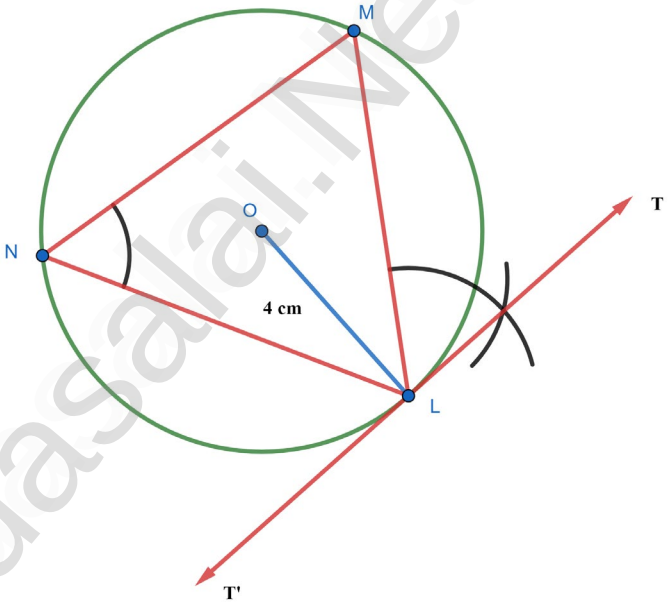

Construction:

- With O as the centre, draw a circle of radius 4 cm.
- Take a point L on the circle. Through L draw any chord LM.
- Take a point N distinct from L and M on the circle, so that L, M and N are in anti-clockwise direction. Join LN and NM.
- Through L draw a tangent TT' such that $\angle TLM = \angle MNL$.
- TT' is the required tangent.

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Example 4.31

Draw a circle of **diameter 6 cm** from a point P, which is **8 cm** away from its centre. Draw the **two tangents PA** and **PB** to the circle and measure their lengths.

Solution:

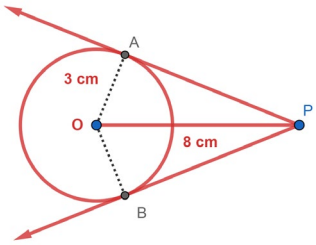
Given, **d = 6 cm**

Radius, $R = \frac{d}{2}$

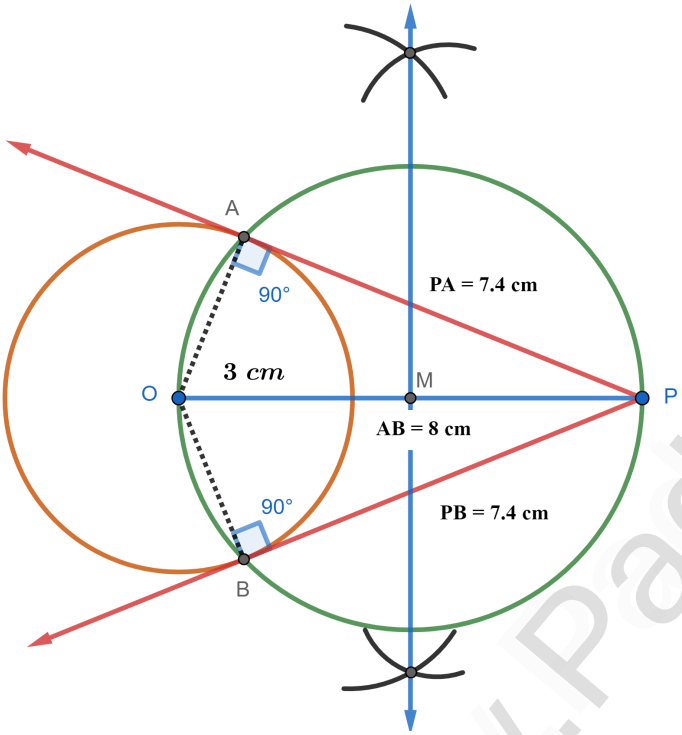
$= \frac{6}{2}$

Radius $r = 3\ cm$

Rough Diagram



Fair Diagram



Construction:

- With centre at O, draw a circle of radius 3 cm.
- Draw a line OP of length 8 cm.
- Draw a perpendicular bisector of OP, which cuts OP at M.
- With M as centre and MO as radius, draw a circle which cuts previous circle at A and B.
- Join AP and BP. AP and BP are the required tangents. Thus length of the tangents are PA = PB = 7.4 cm.

Verification:

In the Right Angle triangle OAP,

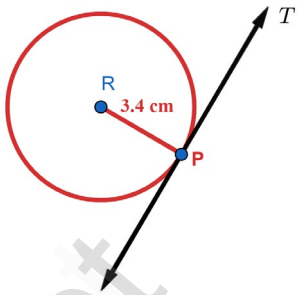
$$PA^2 = OP^2 - OA^2$$
$$= 8^2 - 3^2$$
$$= 64 - 9$$
$$= 55$$
$$PA = \sqrt{55} = 7.4\ cm\ (approximately)$$

1. Draw a tangent at any point R on the circle of **radius 3.4 cm** and centre at **P**?.

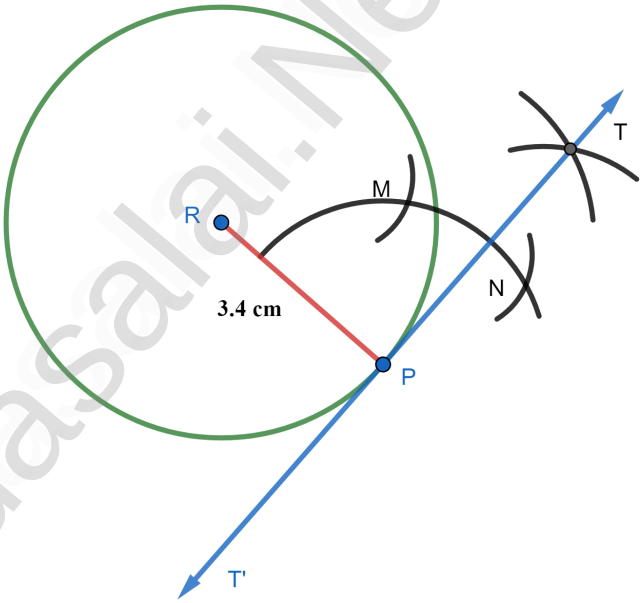
Solution:

Given
Radius $r = 3.4\ cm$

Rough Diagram



Fair Diagram



Construction:

- Draw a circle with centre at O of radius 3.4 cm.
- Take a point P on the circle. Join OP.
- Draw perpendicular line to OP which passes through P.
- TT' is the required tangent.

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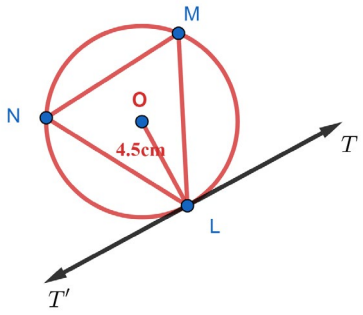
2. Draw a circle of **radius 4.5 cm** . Take a point on the circle. Draw the tangent at that point using the **Alternate Segment Theorem.**

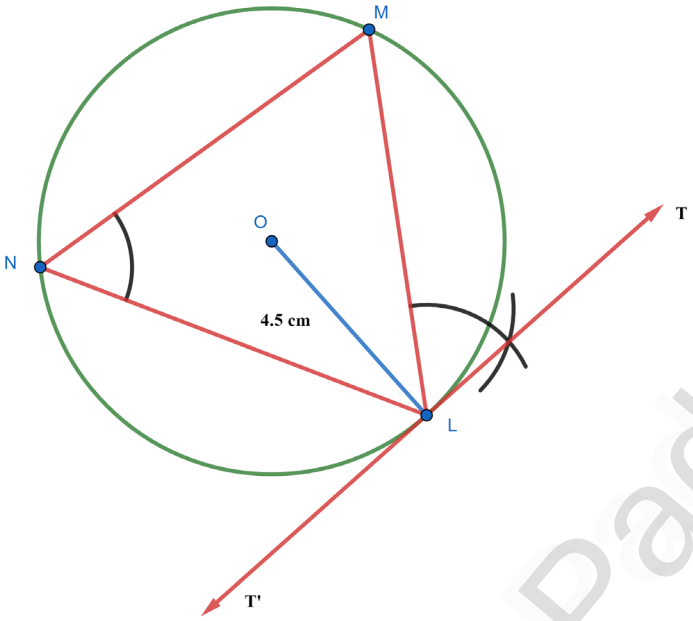
Solution:

Given
Radius $r = 4.5\ cm$

Rough Diagram



Fair Diagram



Construction:

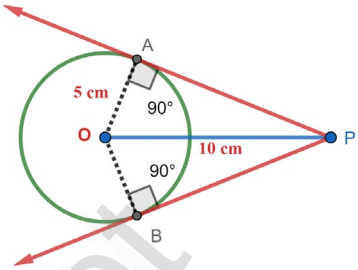
- With O as the centre, draw a circle of radius 4.5 cm.
- Take a point L on the circle. Through L draw any chord LM.
- Take a point N distinct from L and M on the circle, so that L, M and N are in anti-clockwise direction. Join LN and NM.
- Through L draw a tangent TT' such that ∠TLM = ∠MNL.
- TT' is the required tangent.

3. Draw the two tangents from a point which is **10 cm** away from the centre of a circle of **radius 5 cm**. Also, measure the lengths of the tangents.

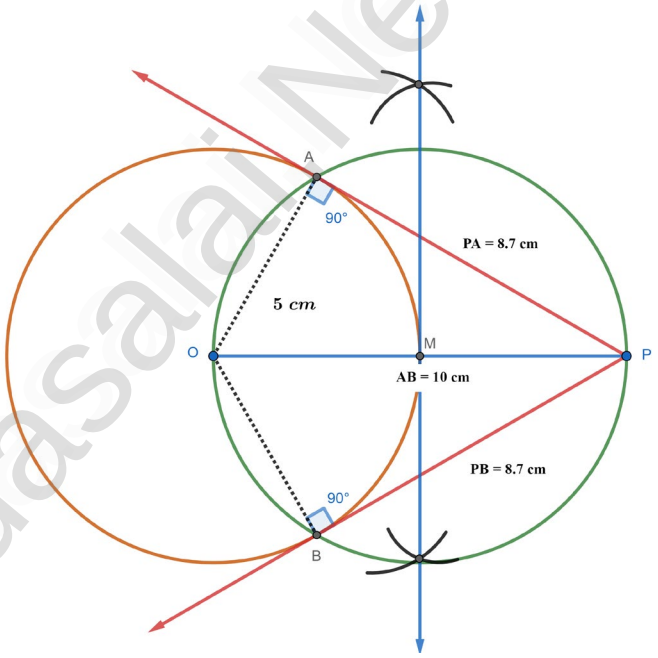
Solution:

Given,
Radius $r = 5\ cm$

Rough Diagram



Fair Diagram



Construction:

- With centre at O, draw a circle of radius 5 cm.
- Draw a line OP of length 10 cm.
- Draw a perpendicular bisector of OP, which cuts OP at M.
- With M as centre and MO as radius, draw a circle which cuts previous circle at A and B.
- Join AP and BP. AP and BP are the required tangents. Thus length of the tangents are PA = PB = 8.7 cm.

Verification:

In the Right Angle triangle OAP,

$$PA^2 = OP^2 - OA^2$$
$$= 10^2 - 5^2$$
$$= 100 - 25$$
$$= 75$$
$$PA = \sqrt{75} = 8.7\ cm\ (approximately)$$

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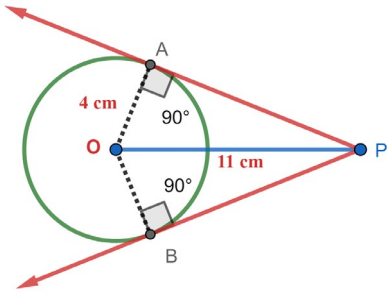
4. Take a point which is **11 cm** away from the centre of a circle of **radius 4 cm** and draw the **two tangents** to the circle from that point.

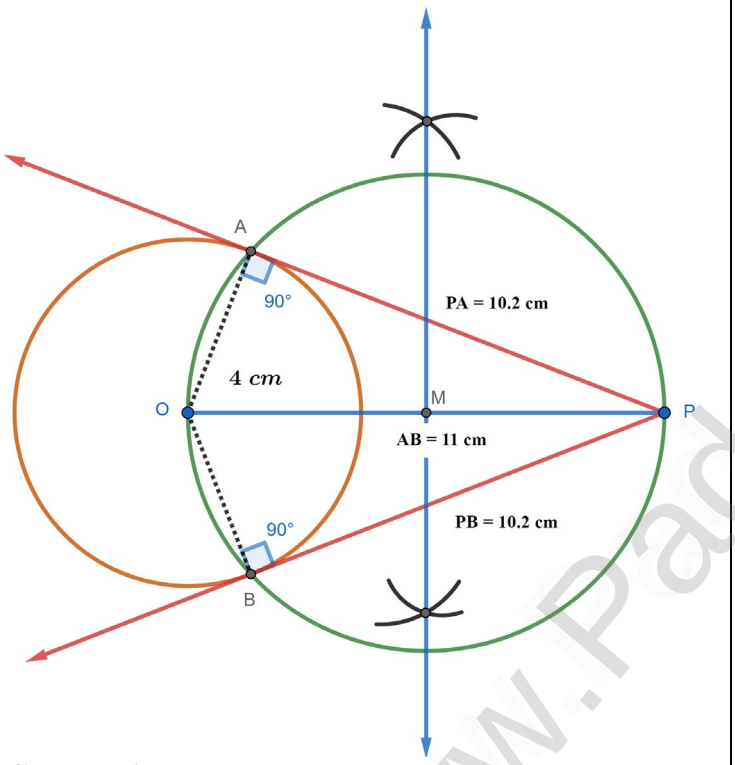
Solution:

Given,
Radius $r = 4\ cm$

Rough Diagram



Fair Diagram



Construction:

- With centre at O, draw a circle of radius 4 cm.
- Draw a line OP of length 11 cm.
- Draw a perpendicular bisector of OP, which cuts OP at M.
- With M as centre and MO as radius, draw a circle which cuts previous circle at A and B.
- Join AP and BP. AP and BP are the required tangents. Thus length of the tangents are PA = PB = **10.2 cm**.

Verification:

In the Right Angle triangle **OAP**,

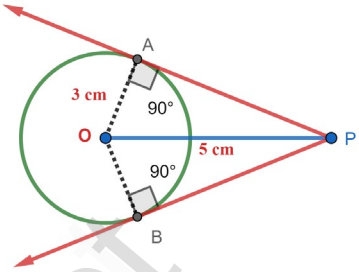
$$PA^2 = OP^2 - OA^2$$
$$= 11^2 - 4^2$$
$$= 121 - 16$$
$$= 105$$
$$PA = \sqrt{105} = 10.2\ cm\ (approximately)$$

5. Draw the two tangents from a point which is **5 cm** away from the centre of a circle of **diameter 6 cm**. Also , measure the lengths of the tangents.

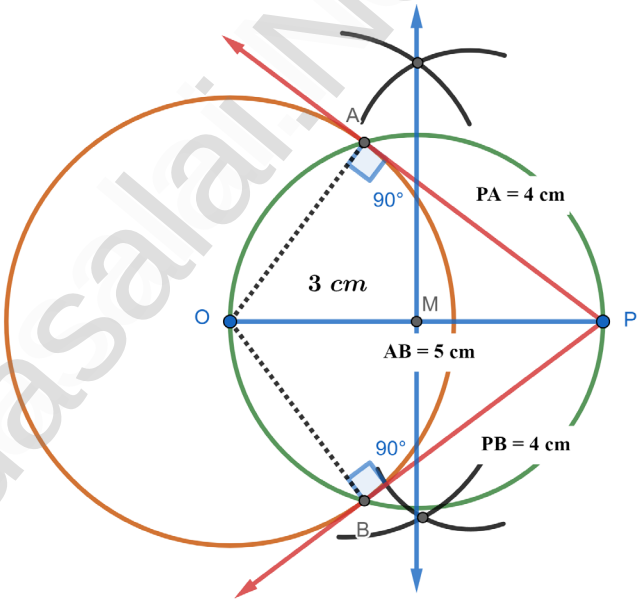
Solution:

Given, **d = 6 cm**
Radius, $R = \frac{d}{2}$
$= \frac{6}{2}$
Radius $r = 3\ cm$

Rough Diagram



Fair Diagram



Construction:

- With centre at O, draw a circle of radius 3 cm.
- Draw a line OP of length 5 cm.
- Draw a perpendicular bisector of OP, which cuts OP at M.
- With M as centre and MO as radius, draw a circle which cuts previous circle at A and B.
- Join AP and BP. AP and BP are the required tangents. Thus length of the tangents are **PA = PB = 4 cm**.

Verification:

In the Right Angle triangle **OAP**,

$$PA^2 = OP^2 - OA^2$$
$$= 5^2 - 3^2$$
$$= 25 - 9$$
$$= 16$$
$$PA = \sqrt{16} = 4\ cm\ (approximately)$$

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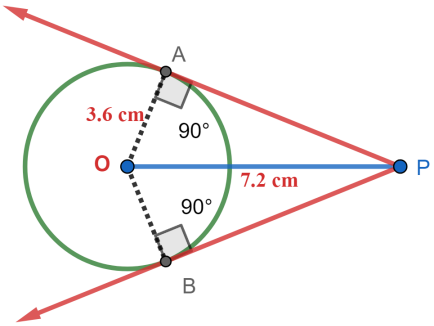
6. Draw a tangent to the circle from the point P having **radius 3.6 cm.** and centre O point P is at a **distance 7.2 cm** from the centre.

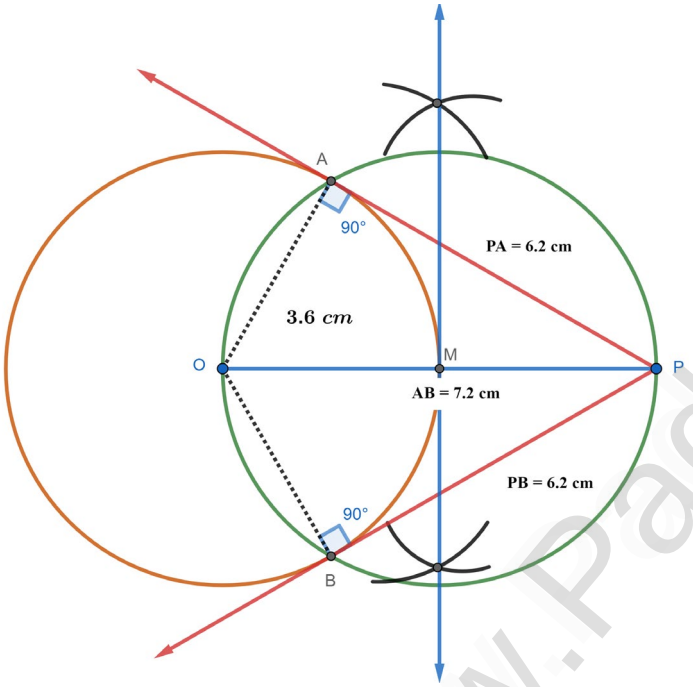
Solution:

Given,
Radius $r = 3.6\ cm$

Rough Diagram



Fair Diagram



Construction:

- With centre at O, draw a circle of radius 3.6 cm.
- Draw a line OP of length 7.2 cm.
- Draw a perpendicular bisector of OP, which cuts OP at M.
- With M as centre and MO as radius, draw a circle which cuts previous circle at A and B.
- Join AP and BP. AP and BP are the required tangents. Thus length of the tangents are **PA = PB = 6.2 cm**.

Verification:

In the Right Angle triangle **OAP**,

$$PA^2 = OP^2 - OA^2$$
$$= 7.2^2 - 3.6^2$$
$$= 51.84 - 12.96$$
$$= 38.88$$
$$PA = \sqrt{38.88} = 6.2\ cm\ (approximately)$$

***

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PG – TEACHER (MATHS)

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