

Exercise - 13A

1. Draw a line segment AB of length 7 cm. Using ruler and compasses, find a point P on AB such that $\frac{AP}{AB} = \frac{3}{5}$.

Sol:

Steps of Construction:

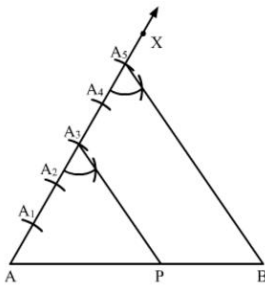
Step 1: Draw a line segment $AB = 7\text{ cm}$

Step 2: Draw a ray AX, making an acute angle $\angle BAX$.

Step 3: Along AX, mark 5 points (greater of 3 and 5) A_1, A_2, A_3, A_4 and A_5 such that $AA_1 = A_1A_2 = A_2A_3 = A_3A_4 = A_4A_5$

Step 4: Join A_5B .

Step 5: From A_3 , draw A_3P parallel to A_5B (draw an angle equal to $\angle AA_5B$), meeting AB in P.



Here, P is the point on AB such that $\frac{AP}{PB} = \frac{3}{2}$ or $\frac{AP}{AB} = \frac{3}{5}$.

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

Sol:

Steps of Construction:

Step 1: Draw a line segment $AB = 7.6\text{ cm}$

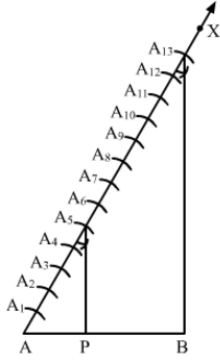
Step 2: Draw a ray AX, making an acute angle $\angle BAX$.

Step 3: Along AX, mark $(5+8=)13$ points $A_1, A_2, A_3, A_4, A_5, A_6, A_7, A_8, A_9, A_{10}, A_{11}, A_{12}$ and A_{13} such that

$AA_1 = A_1A_2 = A_2A_3 = A_3A_4 = A_4A_5 = A_5A_6 = A_6A_7 = A_7A_8 = A_8A_9 = A_9A_{10} = A_{10}A_{11} = A_{11}A_{12} = A_{12}A_{13}$.

Step 4: Join $A_{13}B$.

Step 5: From A_5 , draw A_5P parallel to $A_{13}B$ (draw an angle equal to $\angle AA_{13}B$), meeting AB in P.



Here, P is the point on AB which divides it in the ratio $5 : 8$.

\therefore Length of $AP = 2.9 \text{ cm}$ (Approx)

Length of $BP = 4.7 \text{ cm}$ (Approx)

3. Construct a ΔPQR , in which $PQ = 6 \text{ cm}$, $QR = 7 \text{ cm}$ and $PR = 8 \text{ cm}$. Then, construct another triangle whose sides are $\frac{4}{5}$ times the corresponding sides of ΔPQR

Sol:

Steps of Construction

Step 1: Draw a line segment $QR = 7 \text{ cm}$.

Step 2: With Q as center and radius 6 cm , draw an arc.

Step 3: With R as center and radius 8 cm , draw an arc cutting the previous arc at P

Step 4: Join PQ and PR . Thus, ΔPQR is the required triangle.

Step 5: Below QR , draw an acute angle $\angle RQX$.

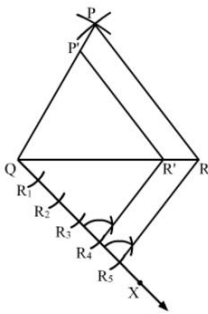
Step 6: Along OX , mark five points R_1, R_2, R_3, R_4 and R_5 such that

$$QR_1 = R_1R_2 = R_2R_3 = R_3R_4 = R_4R_5.$$

Step 7: Join RR_5 .

Step 8: From R_4 , draw $R_4R' \parallel RR_5$ meeting QR at R' .

Step 9: From R' , draw $P'R' \parallel PR$ meeting PQ in P' .



Here, $\Delta P'QR'$ is the required triangle, each of whose sides are $\frac{4}{5}$ times the corresponding sides of ΔPQR .

4. Construct a triangle with sides 5 cm, 6 cm, and 7 cm and then another triangle whose sides are $\frac{7}{5}$ of the corresponding sides of the first triangle.

Sol:

Steps of Construction :

Step 1: Draw a line segment $BC = 4\text{ cm}$.

Step 2: With B as center, draw an angle of 90° .

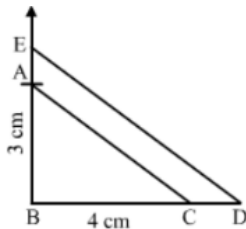
Step 3: With B as center and radius equal to 3 cm, cut an arc at the right angle and name it A.

Step 4: Join AB and AC.

Thus, ΔABC is obtained.

Step 5: Extend BC to D, such that $BD = \frac{7}{5}BC = \frac{7}{5}(4)\text{ cm} = 5.6\text{ cm}$.

Step 6: Draw $DE \parallel CA$, cutting AB produced to E.



Thus, ΔEBD is the required triangle, each of whose sides is $\frac{7}{5}$ the corresponding sides of ΔABC .

5. Construct a ΔABC with $BC = 7\text{ cm}$, $\angle B = 60^\circ$ and $AB = 6\text{ cm}$. Construct another triangle whose sides are $\frac{3}{4}$ times the corresponding sides of ΔABC

Sol:

Steps of Construction

Step 1: Draw a line segment $BC = 7\text{ cm}$.

Step 2: At B, draw $\angle XBC = 60^\circ$.

Step 3: With B as center and radius 6 cm, draw an arc cutting the ray BX at A.

Step 4: Join AC. Thus, ΔABC is the required triangle.

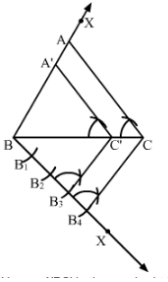
Step 5: Below BC, draw an acute angle $\angle YBC$.

Step 6: Along BY, mark four points B_1, B_2, B_3 and B_4 such that $BB_1 = B_1B_2 = B_2B_3 = B_3B_4$.

Step 7: Join CB_4 .

Step 8: From B_3 , draw $B_3C' \parallel CB_4$ meeting BC at C' .

Step 9: From C' , Draw $A'C' \parallel AC$ meeting AB in A' .



Here, $\Delta A'BC'$ is the required triangle whose sides are $\frac{3}{4}$ times the corresponding sides of ΔABC .

6. Construct a ΔABC in which $AB = 6$ cm, $\angle A = 30^\circ$ and $\angle B = 60^\circ$. Construct another $\Delta AB'C'$ similar to ΔABC with base $AB' = 8$ cm.

Sol:

Steps of Construction

Step 1: Draw a line segment $AB = 6$ cm.

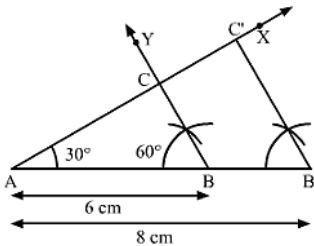
Step 2: At A, draw $\angle XAB = 30^\circ$.

Step 3: At B, draw $\angle YBA = 60^\circ$. Suppose AX and BY intersect at C.

Thus, ΔABC is the required triangle.

Step 4: Produce AB to B' such that $AB' = 8$ cm.

Step 5: From B' , draw $B'C' \parallel BC$ meeting AX at C' .



Here, $\Delta AB'C'$ is the required triangle similar to ΔABC .

7. Construct a ΔABC in which $BC = 8$ cm, $\angle B = 45^\circ$ and $\angle C = 60^\circ$. Construct another triangle similar to ΔABC such that its sides are $\frac{3}{5}$ of the corresponding sides of ΔABC .

Sol:

Steps of Construction

Step 1: Draw a line segment $BC = 8$ cm.

Step 2: At B, draw $\angle XBC = 45^\circ$.

Step 3: At C , draw $\angle YCB = 60^\circ$. Suppose BX and CY intersect at A .

Thus, $\triangle ABC$ is the required triangle

Step 4: Below BC , draw an acute angle $\angle ZBC$.

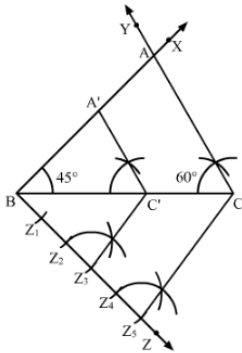
Step 5: Along BZ , mark five points Z_1, Z_2, Z_3, Z_4 and Z_5 such that

$$BZ_1 = Z_1Z_2 = Z_2Z_3 = Z_3Z_4 = Z_4Z_5.$$

Step 6: Join CZ_5 .

Step 7: From Z_3 , draw $Z_3C' \parallel CZ_5$ meeting BC at C' .

Step 8: From C' , draw $A'C' \parallel AC$ meeting AB in A' .



Here, $\triangle A'BC'$ is the required triangle whose sides are $\frac{3}{5}$ of the corresponding sides of $\triangle ABC$.

8. To construct a triangle similar to $\triangle ABC$ in which $BC = 4.5$ cm, $\angle B = 45^\circ$ and $\angle C = 60^\circ$, using a scale factor of $\frac{3}{7}$, BC will be divided in the ratio

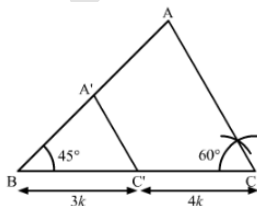
(a) 3 : 4 (b) 4 : 7 (c) 3 : 10 (d) 3 : 7

Answer: (a) 3 : 4

Sol:

To construct a triangle similar to $\triangle ABC$ in which $BC = 4.5$ cm, $\angle B = 45^\circ$ and $\angle C = 60^\circ$,

using a scale factor of $\frac{3}{7}$, BC will be divided in the ratio 3 : 4.



Here, $\triangle ABC \sim \triangle A'BC'$

$$BC' : C'C = 3 : 4$$

$$\text{or } BC' : BC = 3 : 7$$

Hence, the correct answer is option A.

9. Construct an isosceles triangles whose base is 8 cm and altitude 4 cm and then another triangle whose sides are $1\frac{1}{2}$ times the corresponding sides of the isosceles triangle.

Sol:

Steps of Construction

Step 1: Draw a line segment $BC = 8\text{cm}$.

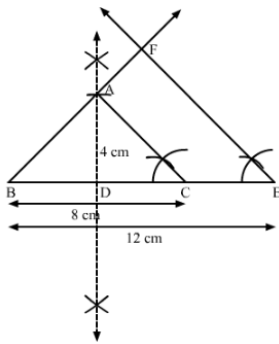
Step 2: Draw the perpendicular bisector XY of BC , cutting BC at D .

Step 3: With D as center and radius 4 cm, draw an arc cutting XY at A .

Step 4: Join AB and AC . Thus, an isosceles $\triangle ABC$ whose base is 8 cm and altitude 4 cm is obtained.

Step 5: Extend BC to E such that $BE = \frac{3}{2}BC = \frac{3}{2} \times 8\text{cm} = 12\text{cm}$.

Step 6: Draw $EF \parallel CA$, cutting BA produced in F .



Here, $\triangle BEF$ is the required triangle similar to $\triangle ABC$ such that each side of $\triangle BEF$ is $1\frac{1}{2}$ (or $\frac{3}{2}$) times the corresponding side of $\triangle ABC$.

10. Draw a right triangle in which the sides (other than hypotenuse) are of lengths 4 cm and 3 cm. Then, construct another triangle whose sides are $\frac{5}{3}$ times the corresponding sides of the given triangle.

Sol:

Steps of Construction

Step 1: Draw a line segment $BC = 3\text{cm}$.

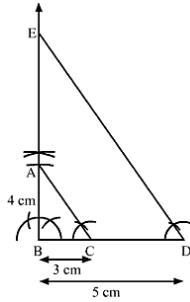
Step 2: At B , draw $\angle XBC = 90^\circ$.

Step 3: With B as center and radius 4 cm, draw an arc cutting BX at A .

Step 4: Join AC . Thus, a right $\triangle ABC$ is obtained.

Step 5: Extend BC to D such that $BD = \frac{5}{3}BC = \frac{5}{3} \times 3\text{cm} = 5\text{cm}$.

Step 6: Draw $DE \parallel CA$, cutting BX in E .



Here, $\triangle BDE$ is the required triangle similar to $\triangle ABC$ such that each side of $\triangle BDE$ is $\frac{5}{3}$ times the corresponding side of $\triangle ABC$.

Exercise – 13B

1. Draw a circle of radius 3 cm. Form 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.

Sol:

Steps of Construction

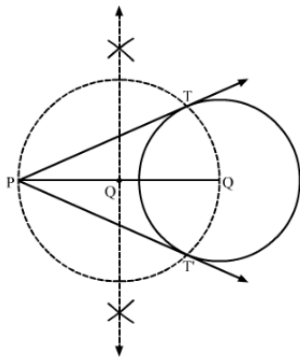
Step 1: Draw a circle with O as center and radius 3 cm.

Step 2: Mark a point P outside the circle such that $OP = 7\text{ cm}$.

Step 3: Join OP. Draw the perpendicular bisector XY of OP, cutting OP at Q.

Step 4: Draw a circle with Q as center and radius PQ (or OQ), to intersect the given circle at the points T and T'.

Step 5: Join PT and PT'.



Here, PT and PT' are the required tangents.

$$PT = PT' = 6.3\text{ cm (Approx)}$$

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.

Sol:

Steps of Construction

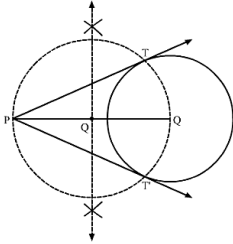
Step 1: Draw a circle with O as center and radius 3.5 cm.

Step 2: Mark a point P outside the circle such that $OP = 6.2\text{ cm}$.

Step 3: Join OP . Draw the perpendicular bisector XY of OP , cutting OP at Q .

Step 4: Draw a circle with Q as center and radius PQ (or OQ), to intersect the given circle at the points T and T' .

Step 5: Join PT and PT' .



Here, PT and PT' are the required tangents.

3. Draw a circle of radius 3.5 cm. Take two points A and B on one of its extended diameter, each at a distance of 5 cm from its center. Draw tangents to the circle from each of these points A and B .

Sol:

Steps of Construction

Step 1: Draw a circle with center O and radius 3.5 cm.

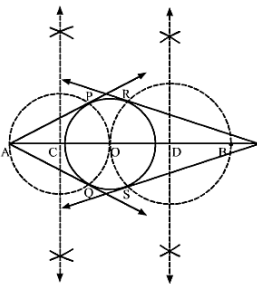
Step 2: Extends its diameter on both sides and mark two points A and B on it such that $OA = OB = 5\text{ cm}$.

Step 3: Draw the perpendicular bisectors of OA and OB . Let C and D be the mid-points of OA and OB , respectively.

Step 4: Draw a circle with C as center and radius OC (or AC), to intersect the circle with center O , at the points P and Q .

Step 5: Draw another circle with D as center and radius OD (or BD), to intersect the circle with center O at the points R and S .

Step 6: Join AP and AQ , Also, join BR and BS .



Here, AP and AQ are the tangents to the circle from A , Also, BR and BS are the tangents to the circle from B .

4. Draw a circle with center 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 .

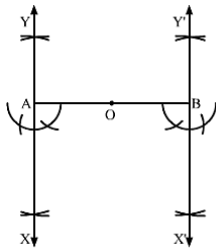
Sol:

Step 1: Draw a circle with center O and radius 4 cm.

Step 2: Draw any diameter AOB of the circle.

Step 3: At A , draw $\angle OAX = 90^\circ$. Produce $XA = Y$.

Step 4: At B , draw $\angle OBX' = 90^\circ$. Produce $X'B$ to Y' .



Here, XAY and $X'BY'$ are the tangents to the circle at the end points of the diameter AB .

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.

Sol:

Steps of Construction

Step 1: Draw a circle with the help of a bangle.

Step 2: Mark a point P outside the circle.

Step 3: Through P , draw a secant PAB to intersect the circle at A and B .

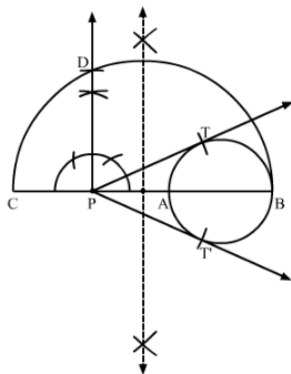
Step 4: Produce AP to C such that $PA = PC$.

Step 5: Draw a semicircle with CB as diameter.

Step 6: Draw $PD \perp BC$, intersecting the semicircle at D .

Step 7: With P as center and PD as radius, draw arcs to intersect the circle at T and T' .

Step 8: Join PT and PT' .



Here, PT and PT' are the required pair of tangents.

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.

Sol:

Steps of Construction

Step 1: Draw a line segment $AB = 8$ cm.

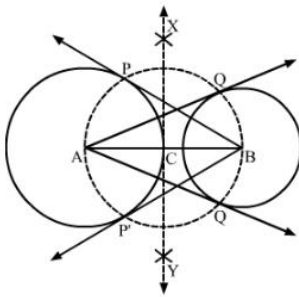
Step 2: With A as center and radius 4 cm, draw a circle.

Step 3: With B as center and radius 3 cm, draw another circle.

Step 4: Draw the perpendicular bisector XY of AB , cutting AB at C .

Step 5: With C as center and radius AC (or BC), draw a circle intersecting the circle with center A at P and P' : and the circle with center B at Q and Q' .

Step 6: Join BP and BP' . Also, join AQ and AQ' .



Here, AQ and AQ' are the tangents from A to the circle with center B . Also, BP and BP' are the tangents from B to the circle with center A .

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

Sol:

Steps of Construction:

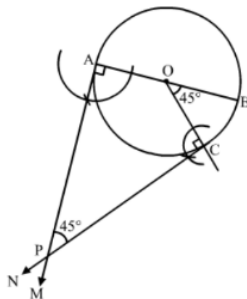
Step 1: Draw a circle with center O and radius = 4.2 cm.

Step 2: Draw any diameter AOB of this circle.

Step 3: Construct $\angle BOC = 45^\circ$, such that the radius OC meets the circle at C .

Step 4: Draw $AM \perp AB$ and $CN \perp OC$.

AM and CN intersect at P .



Thus, PA and PC are the required tangents to the given circle inclined at an angle of 45° .

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° .

Sol:

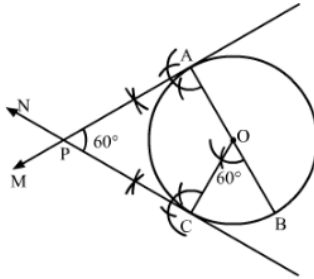
Steps of Construction

Step 1: Draw a circle with center O and radius 3 cm.

Step 2: Draw any diameter AOB of the circle.

Step 3: Construct $\angle BOC = 60^\circ$ such that radius OC cuts the circle at C .

Step 4: Draw $AM \perp AB$ and $CN \perp OC$. Suppose AM and CN intersect each other at P .



Here, AP and CP are the pair of tangents to the circle inclined to each other at an angle of 60° .

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

Sol:

Steps Of construction:

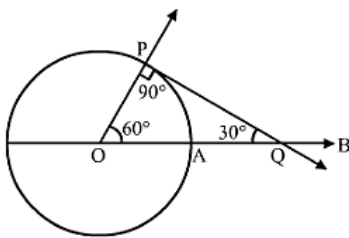
Step 1: Draw a circle with center O and radius 3 cm.

Step 2: Draw radius OA and produce it to B .

Step 3: Make $\angle AOP = 60^\circ$

Step 4: Draw $PQ \perp OP$, meeting OB at Q .

Step 5: Then, PQ is the desired tangent, such that $\angle OQP = 30^\circ$



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.

Sol:

Steps of Construction

Step 1: Mark a point O on the paper

Step 2: With O as center and radii 4 cm and 6 cm, draw two concentric circles.

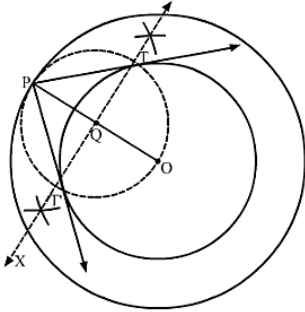
Step 3: Mark a point P on the outer circle.

Step 4: Join OP.

Step 5: Draw the perpendicular bisector XY of OP, cutting OP at Q.

Step 6: Draw a circle with Q as center and radius OQ (or PQ), to intersect the inner circle in points T and T'.

Step 7: Join PT and PT'.



Here, PT and PT' are the required tangents.

$PT = PT' \approx 4.5 \text{ cm}$ (Approx)

Verification by actual calculation

Join OT to form a right $\triangle OTP$ (Radius is perpendicular to the tangent at the point of contact)

In right $\triangle OTP$,

$$OP^2 = OT^2 + PT^2 \quad (\text{Pythagoras Theorem})$$

$$\Rightarrow PT = \sqrt{OP^2 - OT^2}$$

$$\Rightarrow PT = \sqrt{6^2 - 4^2} = \sqrt{36 - 16} = \sqrt{20} \approx 4.5 \text{ cm}$$

$$(OP = 6 \text{ cm and } OT = 4 \text{ cm})$$

Exercise - Formative Assessment

11. Draw a line segment AB of length 5.4 cm. Divide it into six equal parts. Write the steps of construction.

Sol:

Steps of Construction:

Step 1: Draw a line segment $AB = 5.4 \text{ cm}$.

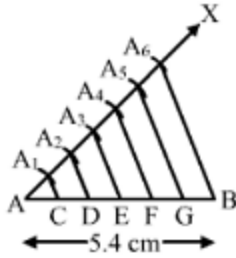
Step 2: Draw a ray AX, making an acute angle, $\angle BAX$.

Step 3: Along AX, mark 6 points A_1, A_2, A_3, A_4, A_5 such that,

$$AA_1 = A_1A_2 = A_2A_3 = A_3A_4 = A_4A_5 = A_5A_6.$$

Step 4: Join A_6B .

Step 5: Draw A_1C, A_2D, A_3D, A_4F and A_5A_6 .



Thus, AB is divided into six equal parts.

12. Draw a line segment AB of length 6.5 cm and divided it in the ratio 4 : 7. Measure each of the two parts.

Sol:

Steps of Construction:

Step 1: Draw a line segment $AB = 6.5\text{ cm}$.

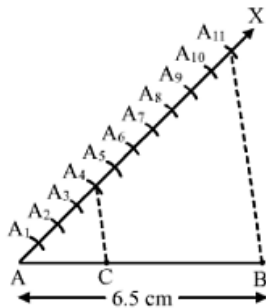
Step 2: Draw a ray AX, making an acute angle $\angle BAX$.

Step 3: Along AX, mark $(4 + 7) = 11$ points $A_1, A_2, A_3, A_4, A_5, A_6, A_7, A_8, A_9, A_{10}, A_{11}$ such that $AA_1 = A_1A_2 = A_2A_3 = A_3A_4 = A_4A_5 = A_5A_6 = A_6A_7 = A_7A_8 = A_8A_9 = A_9A_{10} = A_{10}A_{11}$

Step 4: Join $A_{11}B$.

Step 5: From A_4 , draw $A_4C \parallel A_{11}B$, meeting AB at C.

Thus, C is the point on AB, which divides it in the ratio 4 : 7.



Thus, $AC : CB = 4 : 7$

From the figure,

$$AC = 2.36\text{ cm}$$

$$CB = 4.14\text{ cm}$$

13. Construct a $\triangle ABC$ in which $BC = 6.5\text{ cm}$, $AB = 4.5\text{ cm}$ and $\angle ABC = 60^\circ$

Sol:

Steps of Construction:

Step 1: Draw a line segment $BC = 6.5\text{ cm}$.

Step 2: With B as center, draw an angle of 60° .

Step 3: With B as center and radius equal to 4.5 cm, draw an arc, cutting the angle at A

Step 4: Join AB and AC.

Thus, $\triangle ABC$ is obtained.

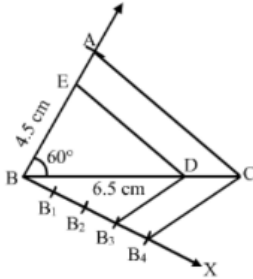
Step 5: Below BC , draw an acute $\angle CBX$.

Step 6: Along BX , mark off four points B_1, B_2, B_3, B_4 such that $BB_1 = B_1B_2 = B_2B_3 = B_3B_4$.

Step 7: Join B_4C .

Step 8: From B_3 , draw $B_3D \parallel B_4C$, meeting BC at D .

Step 9: From D , draw $DE \parallel CA$, meeting AB at E .



Thus, $\triangle EBD$ is the required triangle, each of whose sides is $\frac{3}{4}$ the corresponding sides of $\triangle ABC$.

14. Construct a $\triangle ABC$ in which $BC = 5\text{cm}$, $\angle C = 60^\circ$ and altitude from A equal to 3cm . Construct a $\triangle ADE$ similar to $\triangle ABC$ such that each side of $\triangle ADE$ is $\frac{3}{2}$ times the corresponding side of $\triangle ABC$. Write the steps of construction.

Sol:

Steps of Construction:

Step 1: Draw a line l .

Step 2: Draw an angle of 90° at M on l

Step 3: Cut an arc of radius 3cm on the perpendicular. Mark the point as A

Step 4: With A as center, make an angle of 30° and let it cut l at C . We get $\angle ACB = 60^\circ$.

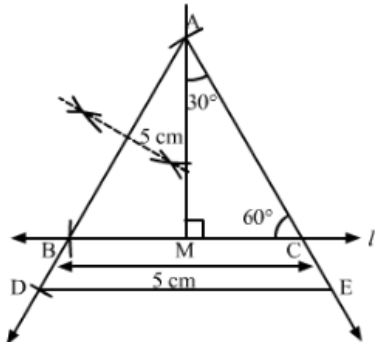
Step 5: Cut an arc of 5cm from C on l and mark the point as B .

Step 6: Join AB .

Thus, $\triangle ABC$ is obtained

Step 7: Extend AB to D , such that $BD = BC$.

Step 8: Draw $DE \parallel BC$, cutting AC produced to E .



Then, $\triangle ADE$ is the required triangle, each of whose sides is of the corresponding sides of $\triangle ABC$.

15. Construct an isosceles triangle whose base is 9 cm and altitude 5 cm. Construct another triangle whose sides are $\frac{3}{4}$ of the corresponding sides of the first isosceles triangle.

Sol:

Steps of Construction:

Step 1: Draw a line segment $BC = 9\text{ cm}$

Step 2: With B as center, draw an arc each above and below BC.

Step 3: With C as center, draw an arc each above and below BC.

Step 4: Join their points of intersection to obtain the perpendicular bisector of BC. Let it intersect BC at D

Step 5: From D, cut an arc of radius 5 cm and mark the point as A

Step 6: Join AB and AC

Thus $\triangle ABC$ is obtained

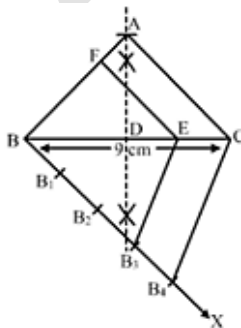
Step 5: Below BC, make an acute $\angle CBX$.

Step 6: Along BX, mark off four points B_1, B_2, B_3, B_4 such that $BB_1 = B_1B_2 = B_2B_3 = B_3B_4$

Step 7: Join B_4C .

Step 8: From B_3 , draw $B_2E \parallel B_4C$ meeting BC at E.

Step 9: From E, draw $EF \parallel CA$ meeting AB at F.



Thus, $\triangle FBE$ is the required triangle, each of whose sides is $\frac{3}{4}$ the corresponding sides of the first triangle.

16. Draw a $\triangle ABC$, right-angled at B such that $AB = 3$ cm and $BC = 4$ cm. Now, Construct a triangle similar to $\triangle ABC$, each whose sides is $\frac{7}{5}$ times the corresponding side of $\triangle ABC$.

Sol:

Steps of Construction

Sept 1: Draw a line segment $BC = 4$ cm

Sept 2: With B as center draw an angle of 90°

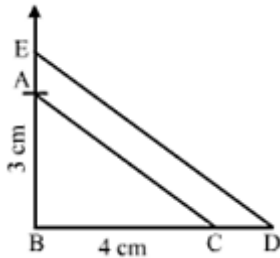
Step 3: With B as center and radius equal to 3cm cat an arc at the night angle and name it A

Step 4: Join AB and AC

Thus, $\triangle ABC$ is obtained

Step 5: Extend BC to D, such that $BD = \frac{7}{5} BC = \frac{7}{5}(4) \text{ cm} = 5.6 \text{ cm}$

Step 6: Draw $DE \parallel CA$ cutting AB produced to E



Thus, $\triangle EBD$ is the required triangle, each of whose sides is $\frac{7}{5}$ the corresponding sides of $\triangle ABC$.

17. Draw a circle of radius 4.8 cm. Take a point P on it. Without using the centre of the circle, construct a tangent at the point P. Write the steps of construction.

Sol:

Steps of Construction:

Step 1: Draw a circle of radius 4.8 cm.

Step 2: Mark a point P on it.

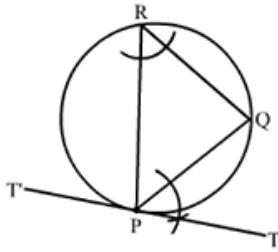
Step 3: Draw any chord PQ.

Step 4: Take a point R on the major arc QP

Step 5: Join PR and RQ.

Step6: Draw $\angle QPT = \angle PRQ$

Step 7: Produce TP to T' , as shown in the figure.



TPT is the required tangent.

18. Draw a circle of radius 3.5 cm. Draw a pair of tangents to this circle which are inclined to each other at an angle of 60° . Write the steps of construction.

Sol:

Steps of Construction:

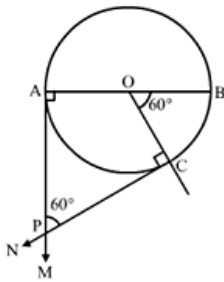
Step 1: Draw a circle with center O and radius = 3.5cm

Step 2: Draw any diameter AOB of this circle

Step 3: Construct $\angle BOC = 60^\circ$, such that the radius OC meets the circle at C .

Step 4: Draw $MA \perp AB$ and $NC \perp OC$.

Let AM and CN intersect at P .



Then, PA and PC are the required tangents to the given circle that are inclined at an angle of 60°

19. Draw a circle of radius 4 cm. Draw tangent to the circle making an angle of 60° with a line passing through the centre.

Sol:

Steps of construction

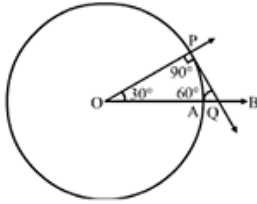
Step 1: Draw a circle with center O and radius 4cm

Step 2: Draw radius OA and produce it to B .

Step 3: Make $\angle AOP = 30^\circ$

Step 4: Draw $PQ \perp OP$, meeting OB at Q .

Step 5: Then, PQ is the desired tangent, such that $\angle OQP = 60^\circ$



20. Draw two concentric circles of radii 4 cm and 6 cm. Construct a tangent to the smaller circle from a point on the larger circle. Measure the length of this tangent.

Sol:

Step of Construction:

Step 1: Draw a circle with O as center and radius 6 cm

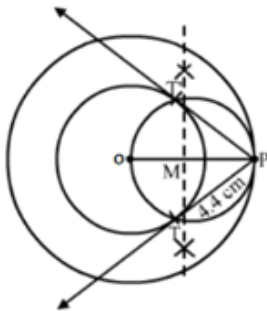
Step 2: Draw another circle with O as center and radius 4 cm

Step 2: Mark a point P on the circle with radius 6 cm

Step 3: Join OP and bisect it at M .

Step 4: Draw a circle with M as center and radius equal to MP to intersect the given circle with radius 4 cm at points T and T' .

Step 5: Join PT and PT' .



Thus, PT or PT' the required tangents and measure 4.4 cm each.