CHAPTER

9

CONSTRUCTIONS

Syllabus

- Division of a line segment in a given ratio (Internally).
- Tangents to a circle from a point outside it.
- Construction of a triangle similar to a given triangle.

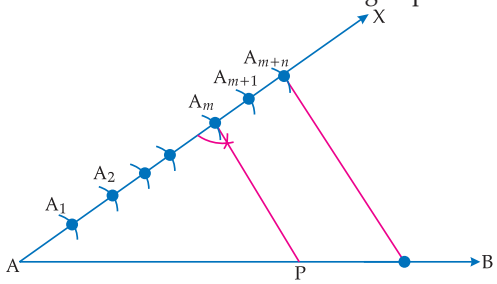
Trend Analysis

List of Concepts	2018		2019		2020	
	Delhi	Outside Delhi	Delhi	Outside Delhi	Delhi	Outside Delhi
Division of a line segment and Tangent to circle	1 Q (5 M)			1 Q (5 M)	1 Q (5 M)	3 Q (5 M)
Construction of Triangles			2 Q (5 M)	1 Q (5 M)	2 Q (5 M)	3 Q (5 M)

TOPIC - 1
Division of a Line Segment in a Given Ratio

Revision Notes

- The ratio of the sides of the triangle to be constructed with the corresponding sides of the given triangle is known as scale factor.
- To divide a line segment internally in a given ratio $m : n$, where both m and n are positive integers.
- **1st Method:** we follow the following steps:



Step 1. Draw a line segment AB of given length by using a ruler.

Step 2. Draw any ray AX making an acute angle with AB.

Step 3. Along AX mark off $(m + n)$ points A_1, A_2,……,A_m, A_{m+1},……, A_{m+n}, such that

$AA_1 = A_1A_2 = A_{m+n-1}\,A_{m+n}$.

Step 4. Join BA_{m+n}.

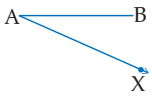
Step 5. Through the point A_m draw a line parallel to $A_{m+n}B$ by making an angle equal to $\angle AA_{m+n}B$ at A_m. *i.e.*, $\angle AA_mP$.

This line meets AB at point P.

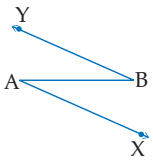
The point P is the required point which divides AB internally in the ratio $m : n$.

➢ **2nd Method:**

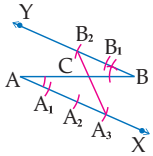
1. Draw an ray AX making an acute angle with line segment AB



2. Draw ray BY || AX



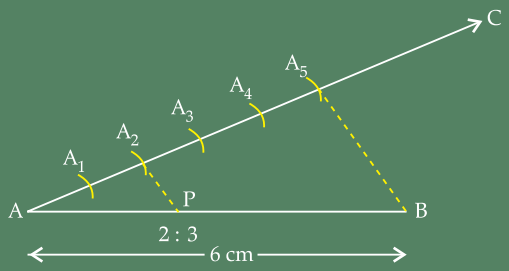
3. Locate A_1, A_2, A_3 $(m = 3)$ on AX and B_1, B_2 $(n = 2)$ on By join A_3B_2, intersecting AB at C, AC : BC = 3 : 2.



How is it done on the GREENBOARD?

Q.1. Draw a line segment AB = 6 cm and divide it in the ratio of 2 : 3.

Solution:



Steps of construction:

(i) Draw a line segment AB = 6 cm.

(ii) At A draw an acute angle BAC.

(iii) Mark A_1, A_2, A_3, A_4, A_5 at equal distance.

(iv) Join A_5 to B.

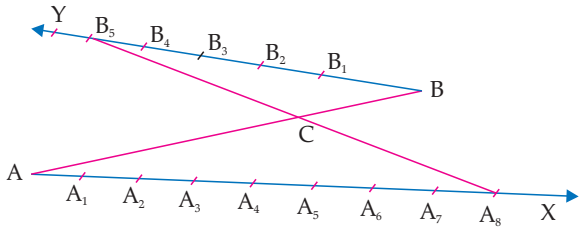
(v) Draw a line A_2P parallel to A_5B.

(vi) P is the required point on AB which divides it in the ratio 2 : 3.

Very Short Answer Type Questions — 1 mark each

AI **Q. 1. In the figure, if B_1, B_2, B_3,….. and A_1, A_2, A_3,….. points have been marked at equal distances. On lines X and Y in what ratio does C divides AB?**

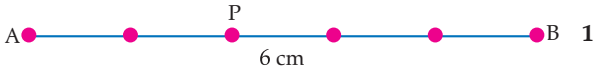
U [CBSE SQP, 2020-21]



Sol. C divides AB internally in the ratio 8 : 5. **1**

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

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



1

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

Sol. Here, $AB = 7$, $PB = 3$

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

$\therefore \quad AP : PB = 4 : 3$ **1**

Short Answer Type Questions-I — 2 marks each

Q. 1. Draw a line segment of length 8 cm and divide it internally in the ratio 4 : 5. U **[CBSE Board, Delhi Region, 2017]**

Sol. Steps of Construction:

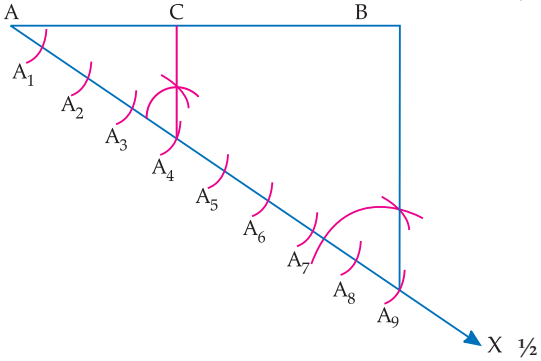
(i) Draw a line segment $AB = 8$ cm and draw a ray AX making an acute angle with AB at A.

(ii) Locate $(4 + 5) = 9$ points $A_1, A_2, A_3, \ldots\ldots A_9$ on AX such that $AA_1 = A_1A_2 = A_2A_3 \ldots\ldots\ldots = A_8A_9$.

(iii) Join BA_9

(iv) Through the point A_4 draw a line parallel to BA_9 intersecting AB at C.

(v) Therefore, C is the point which divides the AB in the ratio 4 : 5. ½

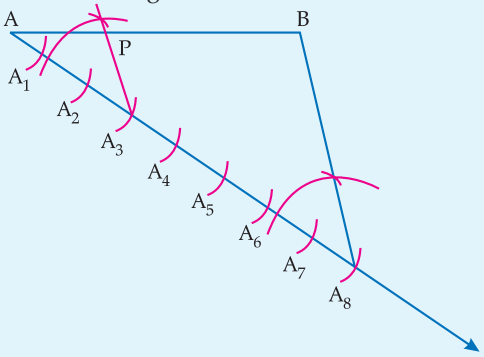


½

Q. 2. Draw a line segment of length 7 cm. Find a point P on it which divides it in the ratio 3 : 5. U **[Board Term-2, 2015]**

Sol. Steps of construction:

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



1

2. Draw any ray AX making an acute angle down ward with AB.

3. Mark the points $A_1, A_2, A_3, \ldots\ldots, A_8$ on AX such that $AA_1 = A_1A_2 = A_2A_3 = \ldots\ldots, A_7A_8$.

4. Join BA_8.

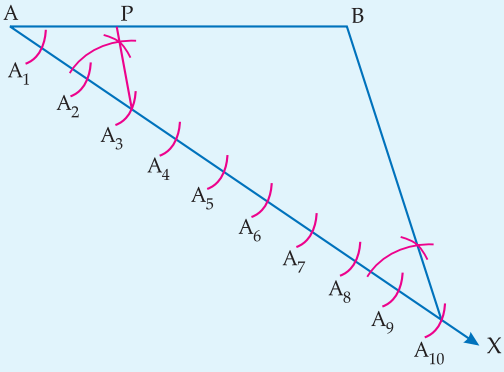
5. Through the point A_3, draw a line parallel to BA_8. To meet AB on P.

Hence $AP : PB = 3 : 5$ **1**

[CBSE Marking Scheme, 2015]

Q. 3. Draw a line segment of length 5 cm and divide it in the ratio 3 : 7. U **[Board Term-2, 2015]**

Sol.



1

Steps of Construction :

1. Draw a line segment $AB = 5$ cm.

2. Draw any ray AX making an acute angle down ward with AB.

3. Mark the points $A_1, A_2, A_3, \ldots\ldots A_{10}$ on AX such that $AA_1 = A_1A_2 = \ldots\ldots = A_9A_{10}$.

4. Join BA_{10}.

5. Through the point A_3 draw a line parallel to BA_{10}. To meet AB at P.

Hence $AP : PB = 3 : 7$. **1**

[CBSE Marking Scheme, 2015]

Short Answer Type Questions-II — 3 marks each

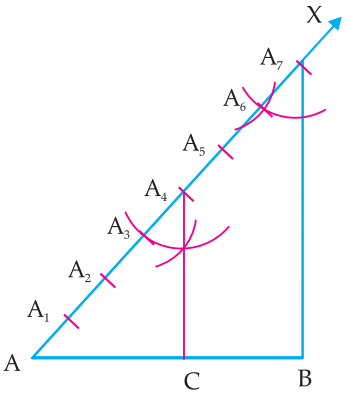
Q. 1. Draw a line segment of length 6 cm and divide it internally in the ratio 4 : 3. Prove your assertion. C + AE

Sol. Steps of Construction:

(i) Draw a line segment $AB = 6$ cm.

(ii) Draw a ray AX, making an acute $\angle BAX$.

(iii) Along AX, mark $(4 + 3) = 7$ points $A_1, A_2, A_3, ..., A_7$ such that $AA_1 = A_1A_2 = ... = A_6A_7$.



1

(iv) Join BA_7.

(v) Through the point A_4 draw a line parallel to BA_7. To meet AB at C. Hence, $AC : CB = 4 : 3$.

Proof : Suppose $AA_1 = A_1A_2 = ... = A_6A_7 = x$

In ΔBAA_7, we have $CA_4 \parallel BA_7$

$$\therefore \quad \frac{AC}{CB} = \frac{AA_4}{A_4A_7} = \frac{4x}{3x} = \frac{4}{3}$$

[By using Thale's theorem]

Hence, $AC : CB = 4 : 3$. **1**

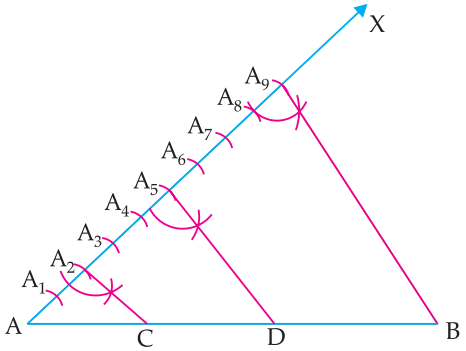
Q. 2. Draw a line segment of length 13.5 cm and divide it internally in the ratio 2 : 3 : 4. Measure each part and verify it. C + AE

Sol. Steps of Construction: **1**

(i) Draw a line segment $AB = 13.5$ cm.

(ii) Draw a ray AX, making an acute $\angle BAX$.

(iii) Along AX, make $(2 + 3 + 4) = 9$ points $A_1, A_2, A_3, ..., A_9$ such that $AA_1 = A_1A_2 = A_2A_3 = ... = A_8A_9$.



1

(iv) Join BA_9.

(v) Through the points A_2 and A_5, draw $BA_9 \parallel CA_2$ and $BA_9 \parallel DA_5$. To meet AB at C and D respectively.

(vi) On measuring the three parts, we get $AC = 3$ cm, $CD = 4.5$ cm and $DB = 6$ cm.

Verification: $AC = 2x$, $CD = 3x$ and $DB = 5x$

$$\therefore \quad 2x + 3x + 5x = 13.5$$

$$\Rightarrow \quad 9x = 13.5$$

$$\Rightarrow \quad x = 1.5$$

$$\text{Sum of ratio} = 2 + 3 + 4 = 9$$

$$\therefore \quad AC = \frac{2x}{9x} \times 13.5 = 3 \text{ cm}$$

$$CD = \frac{3x}{9x} \times 13.5 = 4.5 \text{ cm}$$

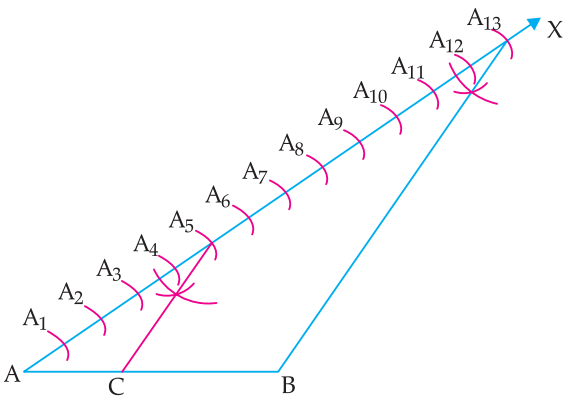
$$\text{and} \quad DB = \frac{4x}{9x} \times 13.5 = 6 \text{ cm}$$

Hence, $AC + CD + DB = (3 + 4.5 + 6)$ cm

$= 13.5$ cm. **1**

Q. 3. Draw a line segment of length 7.6 cm and divide it in the ratio 5 : 8 and verify it.

Sol.



1

Steps of Construction: **1**

(i) Draw a line segment $AB = 7.6$ cm.

(ii) Draw a ray AX, making an acute $\angle BAX$.

(iii) Along AX, make $(5 + 8) = 13$ points $A_1, A_2, A_3, ..., A_{13}$ such that $AA_1 = A_1A_2 = A_2A_3 = ... = A_{12}A_{13}$.

(iv) Join BA_{13}.

(v) Through the point A_5 draw a line parallel to BA_{13}. To meet AB at C.

Hence, $AC : CB = 5 : 8$.

(vi) On measuring the two parts, we get $AC = 4.7$ cm and $BC = 2.9$ cm.

Justification:

In ΔACX_5 and ΔABX_{13}, we have.

$BA_{13} \parallel CA_5$.

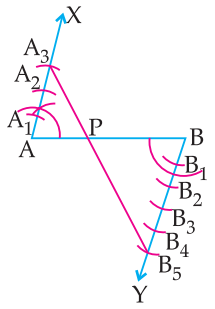
$$\therefore \quad \frac{AC}{CB} = \frac{AA_5}{A_5A_{13}} = \frac{5}{8}$$

$$\Rightarrow \quad AC : CB = 5 : 8.$$ **1**

Long Answer Type Questions — 5 marks each

AI **Q. 1. Draw a line segment of length 8 cm. Find a point P on it which divides it in the ratio 3 : 5. Write the measurement of each part and give Justification.** C

Sol.



1½

Steps of Construction:

(i) Draw a line segment $AB = 8$ cm.

(ii) Draw $AX \parallel BY$ such that $\angle A$ and $\angle B$ are acute.

(iii) Divide AX and BY in 3 and 5 parts equally by compass and mark $A_1, A_2, A_3, B_1, B_2, B_3, B_4$ and B_5 respectively.

(iv) Join A_3B_5 which intersect AB at P and divides $AP : PB = 3 : 5$. **1½**

Measurement of each part:

$AP = 3$ cm and $PB = 5$ cm. **1**

Justification: In ΔAA_3P and ΔBB_5P,

$AX \parallel BY$ (By construction)

$\angle A = \angle B$ (Alternate angles)

$\angle A_3PA = \angle B_5PB$ (Vertically opposite angles)

$\therefore \quad \Delta AA_3P \sim \Delta BB_5P$ (By AA criterion of similarity)

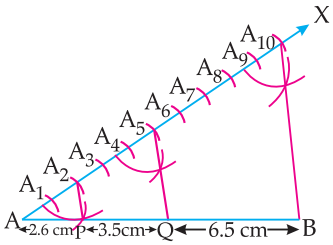
$\Rightarrow \quad \frac{AA_3}{BB_5} = \frac{AP}{BP}$

(Let each equal part be x cm)

$\Rightarrow \quad AP : BP = 3 : 5.$ **1**

Q. 2. Draw a line segment 12.6 cm long with ruler and compass divide it into three line segments in the ratio 2 : 3 : 5. Measure each of the three parts. C

Sol.



2

Steps of Construction: **2**

(i) Draw a line segment $AB = 12.6$ cm.

(ii) At A, draw an acute angle BAX.

(iii) On AX mark 10 (2 + 3 + 5) points $A_1, A_2, A_3, \ldots, A_{10}$ such that $AA_1 = A_1A_2 = A_2A_3 = \ldots = A_9A_{10}$.

(iv) Join $A_{10}B$.

(v) Through A_2 and A_5 draw two line parallel to $A_{10}B$ intersecting AB at points P and Q respectively, which divide AB in the ratio 2 : 3 : 5. *i.e.*, $AP : PQ : QB = 2 : 3 : 5$.

Measurement of each part:

$AP = 2.6$ cm, $PQ = 3.5$ cm and $QB = 6.5$ cm. **1**

Q. 3. Draw a line segment of length 11 cm. Find a point R on it which divides it in the ratio 4 : 5. Write the measurements of each part and give Justification. R + C

Sol. Try yourself similar to Q.No. 1 of LATQ.

TOPIC - 2
Tangents to a Circle from a Point Outside It

Revision Notes

➢ **To draw the tangent to a circle at a given point on it, when the centre of the circle is known.**

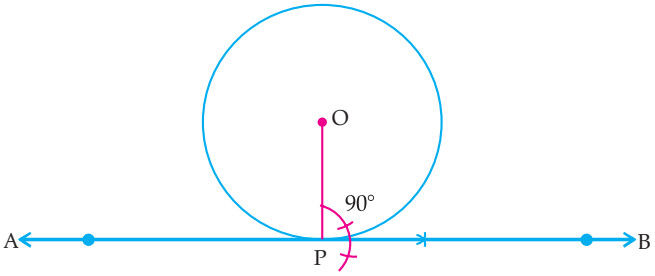
Given: A circle with centre O and a point P on it.

To construct: The tangent to the circle at the point P.

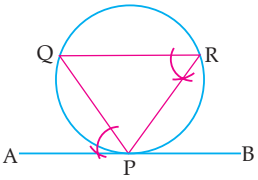
Steps of construction:

(i) Join OP.

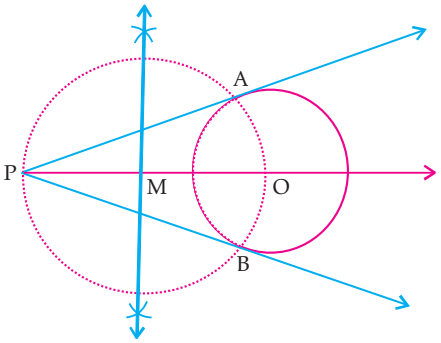
(ii) Draw a line segment $AB \perp OP$ at the point P. APB is the required tangent at P.



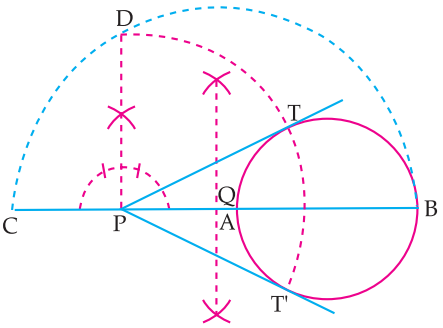
- **To draw the tangent to a circle at a given point on it, when the centre is not known.**
  Given: P is a point on the circle.
  To construct: Draw a tangent from the point P.
  Steps of construction:
  (i) Draw any chord PQ and join P and Q to a point R.
  (ii) Draw $\angle QPA$ equal to $\angle PRQ$ on opposite side of chord PQ.
  The line segment BPA is the tangent to the circle at P.



- **To draw the tangent to a circle from an external point when its centre is known.**
  Given: A circle with centre O and a point P outside it.
  To construct : The tangents to the circle from P.
  Steps of construction:
  (i) Join OP and bisect it. Let M be the mid-point of OP.
  (ii) Taking M as centre and MO as radius, draw a circle to intersect $C(O, r)$ in two points, say A and B.
  (iii) Join PA and PB. These are the required tangents from P to the circle.



- **To draw tangents to a circle from a point outside it when its centre is not known.**
  Given: P is a point outside the circle.
  To construct: To draw tangents from the point P.
  Steps of construction:
  (i) Draw a circle of given radius.
  (ii) Through P draw a secant PAB to meet the circle at A and B.
  (iii) Produce AP to C such that $PC = PA$. Bisect CB at Q.
  (iv) With CB as diameter and centre as Q, draw a semi-circle.
  (v) Draw $PD \perp CB$, to meet semi-circle at the point D.
  (vi) Taking P as centre and PD as radius draw an arc to interest the circle at T and T'.
  (vii) Join P to T and T'.
  Hence, PT and PT' are the required tangents.



How is it done on the GREENBOARD?

Q.1. Draw a pair of tangents to a circle of any convenient radius, which are inclined to the line joining the centre of the circle and the point at which they intersect at an angle of 45°. A

OR

Draw a circle of radius 3.5 cm. Draw two tangents to the circle which are perpendicular to each other.

Solution: Steps of construction:

Step I: Draw a circle of any convenient radius with O as centre.

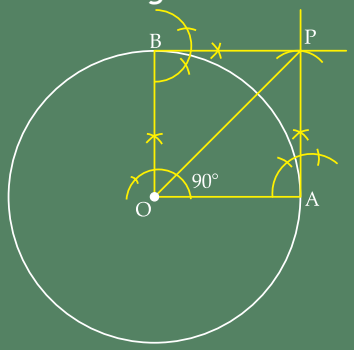
Step II: Take a point *A* on the circumference of the circle and join *OA*. Draw a perpendicular to *OA* at point *A*.

Step III: Draw a radius *OB*, making an angle of 90° with *OA*.

Step IV: Draw a perpendicular to *OB* at point *B*. Let both the perpendiculars intersect at point *P*.

Step V: Join *OP*.

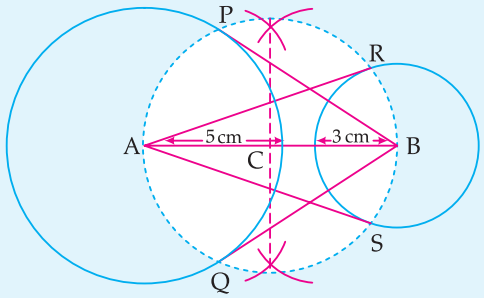
PA and *PB* are the required tangents, which make an angle of 45° with *OP*.



Short Answer Type Questions-I — 2 marks each

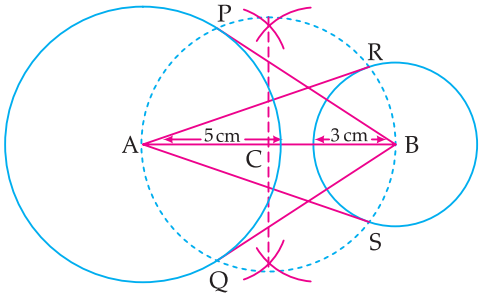
Q. 1. Draw a line segment AB of length 9 cm. With A and B as centres, draw circles of radius 5 cm and 3 cm respectively. Construct tangents to each circle from the centre of the other circle.

Sol.



[CBSE Marking Scheme, 2020-21] **2**

Detailed Solution:



Steps of Construction :

(i) Draw a line segment AB of 9 cm.

(ii) Taking A and B as centres draw two circles of radii 5 cm and 3 cm respectively.

(iii) Bisect the line AB. Let mid-point of AB be C.

(iv) Taking C as centre draw a circle of radius AC which intersects the two circles at point P, Q, R and S.

(v) Join BP, BQ, AS and AR.

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

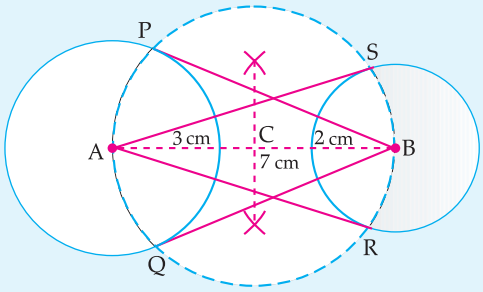
Q. 2. Draw a line segment *AB* of length 7 cm. Taking *A* as centre, draw a circle of radius 3 cm and taking *B* as centre, draw another circle of radius 2 cm. Construct tangents to each circle from the centre of the other circle. A [Delhi CBSE Term-2, 2015]

Sol. Steps of Construction:

(i) Draw a line segment *AB* of 7 cm.

(ii) Taking *A* and *B* as centres draw two circles of radii 3 cm and 2 cm respectively.

(iii) Bisect the line *AB*. Let mid-point of *AB* be *C*.



(iv) Taking *C* as centre draw a circle of radius *AC* which intersects the two circles at point *P*, *Q*, *R* and *S*.

(v) Join *BP*, *BQ*, *AS* and *AR*.

BP, *BQ* and *AR*, *AS* are the required tangents. **2**

[CBSE Marking Scheme, 2015]

AI **Q. 3. Draw a circle of radius 1·5 cm. Take a point *P* outside it. Without using the centre draw two tangents to the circle from the point *P*.** A

Sol. Steps of construction :

(i) Draw a circle of radius 1·5 cm. Take a point *P* outside it.

(ii) Through *P* draw a secant *PAB* to meet the circle at *A* and *B*.

(iii) Produce *AP* to *C* such that $PC = PA$. Bisect *CB* at *Q*.

(iv) With *CB* as diameter and centre as *Q*, draw a semi-circle.

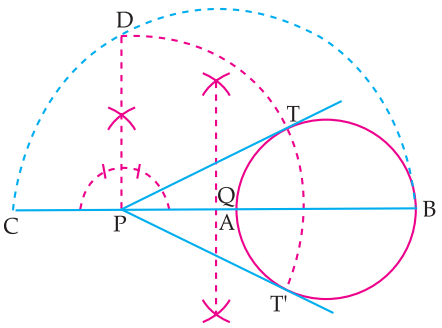
(v) Draw $PD \perp CB$, to meet semi-circle at the point *D*.

(vi) Intersect *P* as centre and *PD* as radius draw an arc to intersect the circle at *T* and *T'*. **1**

PT and *PT'* are the required tangents.

(vii) Join *P* to *T* and *T'*

Hence, *PT* and *PT'* are the required tangents.



1

Short Answer Type Questions-II — 3 marks each

Q. 1. Draw a circle of radius of 3 cm. Take two points *P* and *Q* one of its diameter extended on both sides, each at a distance of 7 cm on opposite sides of its centre. Draw tangents to the circle from these two points.

A [Foreign Set-III, 2017]

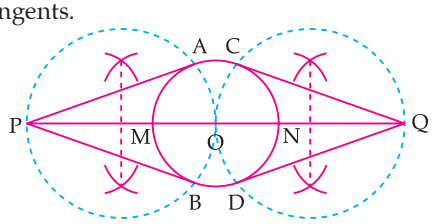
Sol. Steps of Construction :

(i) Draw a circle with centre O and radius 3 cm.

(ii) Draw its diameter *MON* and extend it to both the sides to *P* and *Q*. Such that $OP = OQ = 7$ cm.

(iii) Taking diameters as *OP* and *OQ* draw two circles each of which intersects the first circle at the points *A, B* and *C, D* respectively.

(iv) Join *PA, PB, QC* and QO to get the required tangents. **1**



2

Q. 2. Construct a pair of tangents *PQ* and *PR* to a circle of radius 4 cm from a point *P* outside the circle 8 cm away from the centre. Measure *PQ* and *PR*. A **[Board Term-2, 2015]**

Sol. Steps of construction :

(i) Draw a line segment $OP = 8$ cm

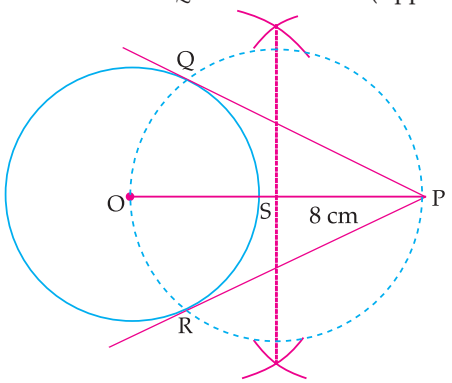
(ii) Taking *O* as centre and radius 4 cm, draw a circle.

(iii) Taking *OP* as diameter draw another circle which intersects the first circle at *Q* and *R*.

(iv) Join *P* to *Q* and *P* to *R*.

On measuring, we get

$PQ = PR = 6.92$ cm (Approx.) **1**



2

Q. 3. Construct a tangent to a circle of radius 4 cm from a point on the concentric circle of radius 6 cm. A **[Board Term-2, 2013]**

Sol. Steps of construction :

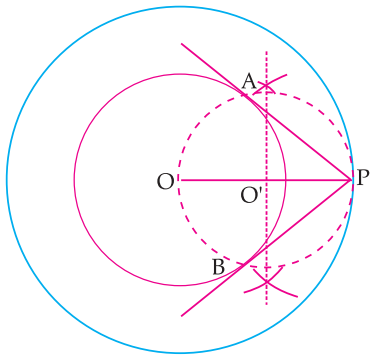
(i) Draw a circle of radius 4 cm with centre *O*.

(ii) Draw another circle of radius 6 cm with same centre *O*.

(iii) Take a point *P* on second circle and join *OP*.

(iv) Draw perpendicular bisector of *OP* which intersect *OP* at *O'*.

(v) Draw a circle with centre *O'* which intersects the inner circle at points *A* and *B*.



2

Q. 4. Let *ABC* be a right triangle in which $AB = 6$ cm, $BC = 8$ cm and $\angle B = 90°$. *BD* is the perpendicular from B on AC. The circle through B, C and D is drawn. Construct the tangents from A to this circle. A

Sol. Steps of construction :

(i) Draw a line segment BC = 8 cm.

(ii) Make a right angle at the point *B i.e.*, $\angle CBX = 90°$

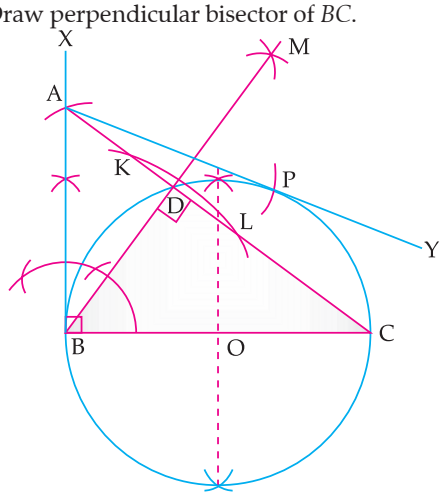
(iii) Draw a arc of radius 6 cm as centre *B* which intersect *BX* at the point *A*.

(iv) Join *AC* $\therefore$ *ABC* is required right angle triangle.

(v) Draw an arc taking centre *B* which intersects *AC* at the point *K* and *L* respectively taking *K* and *L* as centre draw two arcs of same radius which intersect at the point *M*.

(vi) Join BM $\therefore$ $\angle BDC = 90°$

(vii) Draw perpendicular bisector of *BC*.



1

(viii) Draw a circle taking radius equal to *OB* and centre *O* which passes through *B, D* and *C*.

(ix) Draw an arc taking centre *A* and radius equal to *AB* to intersect the circle at point *P* $\therefore$ *AP* and *AB* are the tangents. **1**

Long Answer Type Questions — 5 marks each

Q. 1. Draw a line segment *AB* of length 7 cm. Taking A as centre, draw a circle of radius 3 cm and taking *B* as centre, draw another circle of radius 2 cm. Construct tangents to each circle from the centre of the other circle. A **[CBSE Delhi Set-I, 2020]**

Sol. Steps of construction :

(i) Draw a line segment $AB = 7$ cm. ½

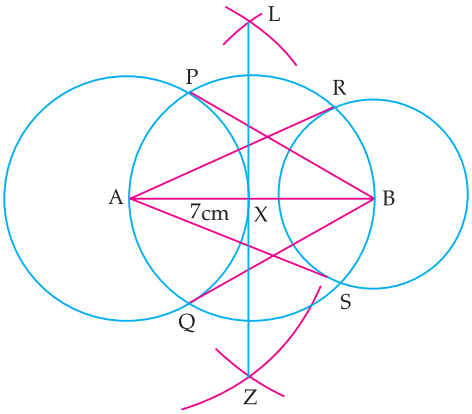
(ii) With A as centre and radius 3 cm draw a circle. ½

(iii) With B as centre and radius 2 cm draw another circle. ½

(iv) Taking AB as diameter draw another circle, which intersects first two circles at P and Q, R and S. **1**

(v) Join B to P and Q, A to R and S.

Hence, BP, BQ, AR and AS are the required tangents. **1**

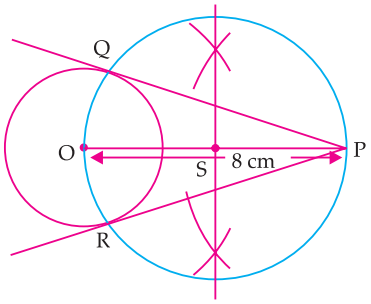


1½

AI **Q. 2. Draw a circle of radius 2 cm with centre O and take a point P outside the circle such that $OP = 6.5$ cm. From P, draw two tangents to the circle.** A **[CBSE OD Set-I, 2020]**

Sol. Steps of construction : **2½**

(i) Draw a line segment $OP = 6.5$ cm.



2½

(ii) Taking O as centre and radius 2 cm, draw a circle.

(iii) Taking OP as diameter draw another circle which intersects the first circle at Q and R.

(iv) Join P to Q and P to R.

Hence PQ and PR are two tangents.

Q. 3. Draw two tangents to a circle of radius 4 cm, which are inclined to each other at an angle of 60°.

A **[CBSE OD Set-II, 2020]**

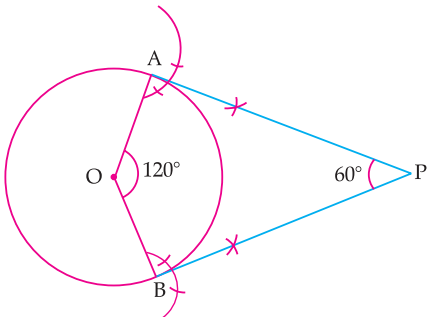
Sol. Steps of construction : **2½**

(i) Draw a circle of radius 4 cm with O as centre.

(ii) Draw two radii OA and OB inclined to each other at an angle of 120°.

(iii) Draw $AP \perp$ OA at A and $BP \perp OB$ at B. Which meet at P.

(iv) PA and PB are the required tangents inclined to each other an angle of 60°.



2½

Q. 4. Draw a circle of radius 3.5 cm. From a point P, 6 cm from its centre, draw two tangents to the circle.

A **[CBSE OD Set-III, 2020]**

Sol. Steps of construction : **2½**

(i) Draw a line segment $OP = 6$ cm.

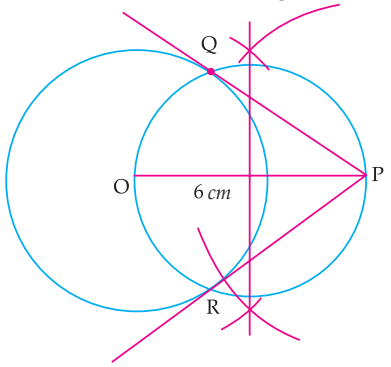
(ii) From the point O, draw a circle of radius = 3.5 cm.

(iii) Draw a perpendicular bisector of OP. Let M be the mid point of OP.

(iv) Taking M as centre and OM as radius draw a circle.

(v) This circle intersects the given circle at Q and R.

(vi) Join PQ and PR, which are tangents to the circle.



2½

AI **Q. 5. Construct a pair of tangents to a circle of radius 3 cm which are inclined to each other at an angle of 60°.** A **[CBSE SQP, 2020]**

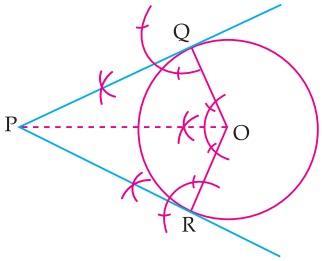
Sol. Correct construction of given circle **2**

Correct construction of two tangents **3**

[CBSE SQP Marking Scheme, 2020]

Detailed Solution:

(i) Draw a circle of 3.0 cm.



(ii) Join O to R.

(iii) Construct 90° angle at point R as ∠ORP

(iv) Construct 120° angle at point O which meet at point Q.

(v) Construct 90° angle at point Q as ∠OQP

Hence, PR & PQ are the required tangents.

Q. 6. Drawn two concentric circles of radii 2 cm and 5 cm. Take a point P on the outer circle and construct a pair of tangents PA and PB to the smaller circle. Measure PA. A [CBSE OD, Set-1, 2019]

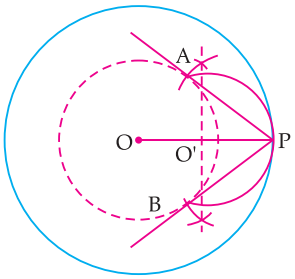
Sol. Constructing two concentric circle of radii 2 cm and 5 cm **1½**

Drawing two tangents PA and PB **2**

PA = 4.5 cm (approx) **1½**

[CBSE Marking Scheme, 2019]

Detailed Solution:



2

Steps of construction :

(i) Draw a circle with radius 3 cm and centre O. **1½**

(ii) Draw another circle with radius 5 cm and same centre O.

(iii) Take a point P on the circumference of larger circle and join O to P.

(iv) Taking OP as diameter draw another circle which intersects the smaller circle at A and B. **1½**

(v) Join A and B to P.

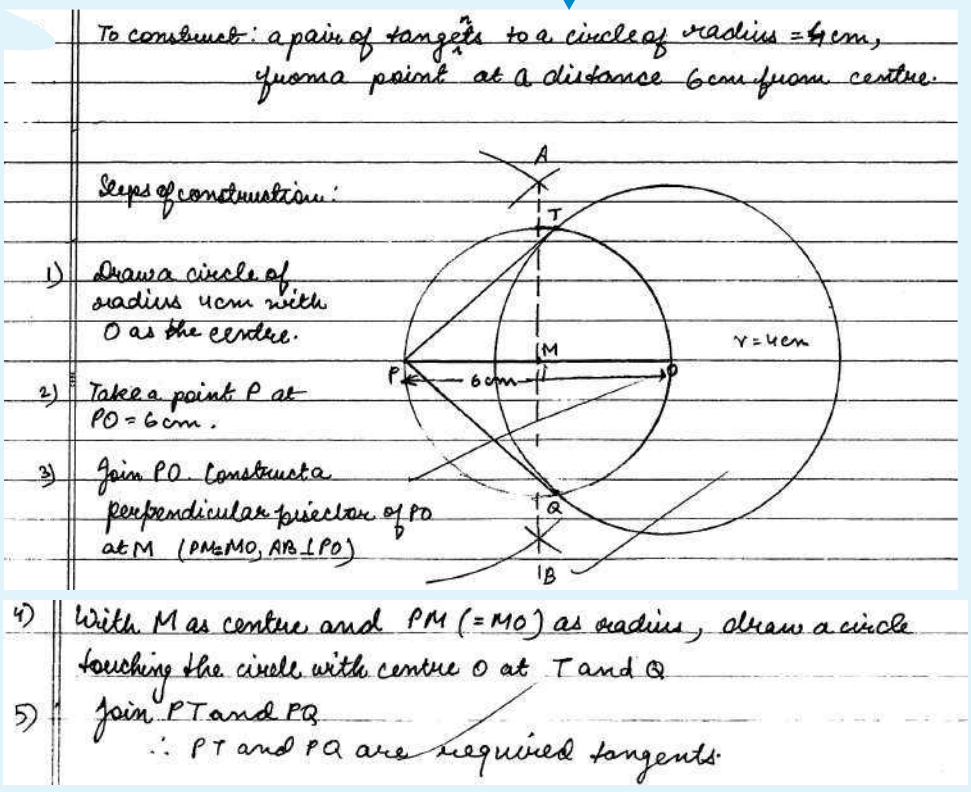
Hence AP and BP are the required tangents.

Measure $PA = \sqrt{5^2 - 2^2} = \sqrt{21}$ =4.6 cm (Approx.)

Q. 7. Construct a pair of tangents to a circle of radius 4 cm from an external point at a distance 6 cm from the centre of the circle. A [CBSE Delhi Region, 2019]

Topper Answer, 2019

Sol.



5

Q. 8. 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. A [Foreign Set II, 2017]

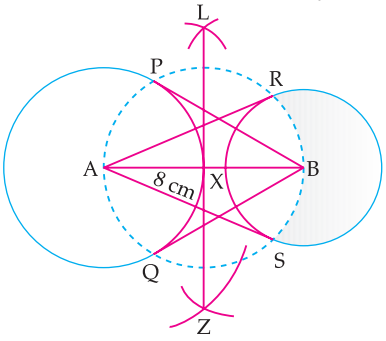
Sol. Steps of construction :

(i) Construct a line segment AB = 8 cm. **1½**

(ii) With A as centre and radius 4 cm draw a circle.

(iii) With B as centre and radius 3 cm draw another circle.

(iv) Taking AB as diameter draw third circle. Which intersects first two circles at P and Q, and R and S. **1**



2½

(v) Join B to P, B to Q, A to R and A to S.

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

Q. 9. Draw a circle of radius 4 cm. Draw two tangents to the circle inclined at an angle of 60° to each other.

A **[O.D. Set I, 2016] [Foreign Set I, II, III 2015]**

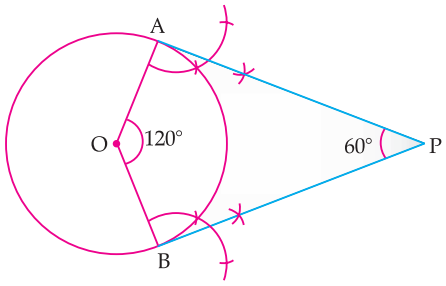
Sol. Steps of construction :

(i) Draw a circle of radius 4 cm with O as centre.

(ii) Draw two radii OA and OB inclined to each other at an angle of 120°.

(iii) Draw AP ⊥ OA at A and BP ⊥ OB at B. Which meet at P.

(iv) PA and PB are the required tangents inclined to each other an angle of 60°. **2**



3

TOPIC - 3
Construction of a Triangle Similar to a Given Triangle

Revision Notes

➢ **Construction of triangles similar to a given triangle:**

(a) Steps of construction (when $m < n$):

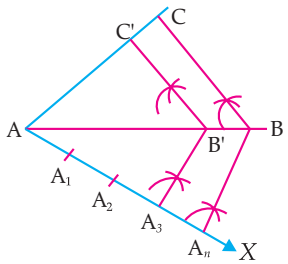
Step I. Construct the given triangle ABC by using the given data.

Step II. Take any one of the three sides of the given triangle as base. Let AB be the base of the given triangle.

Step III. At one end, say A, of base AB. Construct an acute $\angle BAX$ below the base AB.

Step IV. Along AX mark off n points $A_1, A_2, A_3, \ldots\ldots, A_n$ such that $AA_1 = A_1A_2 = \ldots\ldots\ldots = A_{n-1}A_n$

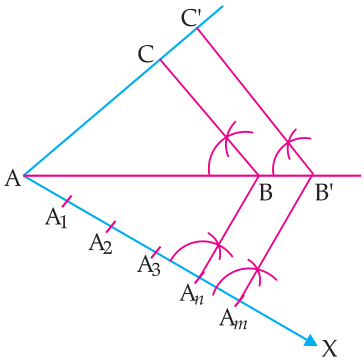
Step V. Join A_nB.



Step VI. Draw A_3B' parallel to A_nB which meets AB at B'.

Step VII. From B' draw $B'C' \,||\, CB$ meeting AC at C'.

Triangle $AB'C'$ is the required triangle each of whose sides is $\left(\frac{m}{n}\right)^{th}$ of the corresponding sides of ΔABC.



(b) Steps of construction (when $m > n$):

Step I. Construct the given triangle by using the given data.

Step II. Take any one of the three sides of the given triangle and consider it as the base. Let AB be the base of the given triangle.

Step III. At one end, say A, of base AB. Construct an acute angle $\angle BAX$ below the base AB *i.e.*, on the opposite side of the vertex C.

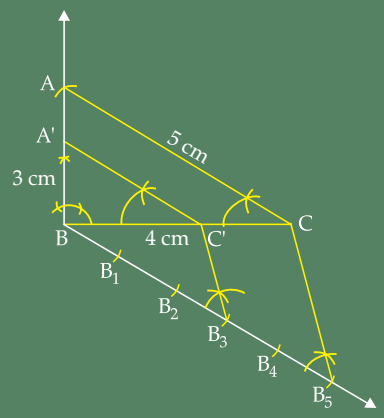
Step IV. Along AX mark off m (larger of m and n) points $A_1, A_2, A_3, \ldots\ldots A_m$ such that $AA_1 = A_1A_2 = \ldots\ldots\ldots = A_{m-1}A_m$.

Step V. Join A_n to B and draw a line through A_m parallel to A_nB, intersecting the extended line segment AB at B'.
Step VI. Draw a line through B' parallel to BC intersecting the extended line segment AC at C'.
$\Delta AB'C'$ so obtained is the required triangle.

How is it done on the GREENBOARD?

Q.1. Construct a right triangle whose hypotenuse and one side measure 5 cm and 4 cm respectively. Then construct another triangle whose sides are $\frac{3}{5}$ times of the corresponding sides of this triangle.

Solution:



Steps of Construction:

Step I: (i) Draw a line segment BC = 4 cm.

(ii) Draw an angle of 90° at B.

(iii) Taking C as centre and radius equal to hypotenuse = 5 cm draw an arc to intersect at A. Join A to C.

Step II: Draw a line making an acute angle with side BC and divide it in five equal sections and mark B_1, B_2, B_3, B_4, B_5.

Step III: Join B_5 to C, and draw a parallel line B_3C' to B_5C which meets BC at C'.

Step IV: Draw a parallel line A'C' to AC.

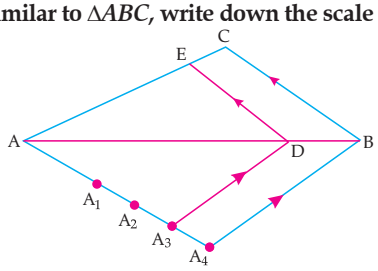
Hence, A'BC' is the required triangle.

Very Short Answer Type Questions — 1 mark each

Q. 1. When construction of a triangle similar to a given triangle in the scale factor $\frac{5}{3}$, then what is the nature of given triangle ? R

Sol. Given triangle is smaller than the constructed triangle. **1**

AI **Q. 2. In figure, ΔADE is constructed similar to ΔABC, write down the scale factor.** R



Sol. Scale factor = $\frac{3}{4}$ **1**

AI **Q. 3. When are the two triangles said to be similar ?** R

Sol. Two triangles are said to be similar when their corresponding sides are proportional and angles are equal. **1**

Short Answer Type Questions-I — 2 marks each

Q. 1. Construct a triangle similar to a given equilateral ΔPQR with side 5 cm such that each of its side is $\frac{6}{7}$ of the corresponding sides of ΔPQR. A

Sol. Steps of construction :

(i) Draw a line segment $QR = 5$ cm.

(ii) With Q as centre and radius $= PQ = 5$ cm, draw an arc.

(iii) With R as centre and radius $= PR = 5$ cm, draw another arc meeting the arc drawn in step 2 at the point P.

(iv) Join PQ and PR to obtain ΔPQR.

(v) Below QR, construct an acute $\angle RQX$.

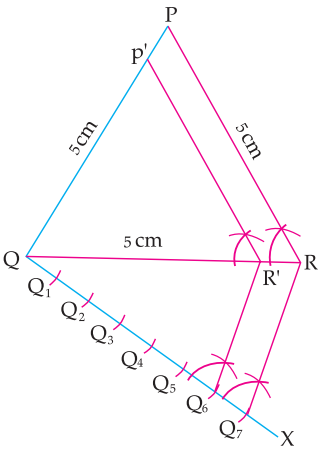
(vi) Along QX, mark off seven points $Q_1, Q_2, \ldots\ldots Q_7$ such that $QQ_1 = Q_1Q_2 = Q_2Q_3 = \ldots\ldots = Q_6Q_7$.

(vii) Join Q_7R.

(viii) Draw $Q_6R' \parallel Q_7R$.

(ix) From R' draw $R'P' \parallel RP$.

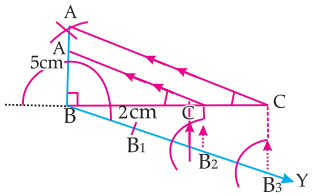
Hence, $P'QR'$ is the required triangle. **1**



1

Q. 2. Draw a right angled ΔABC in which $BC = 12$ cm, $AB = 5$ cm, and $\angle B = 90°$. Construct a triangle similar to it and of scale factor $\frac{2}{3}$. Is the new triangle also a right triangle ? A

Sol. Here, scale factor or ratio factor is $\frac{2}{3} < 1$, So, triangle to be constructed will be smaller than given ΔABC.



1

Steps of construction :

(i) Draw $BC = 12$ cm.

(ii) Draw $\angle CBA = 90°$ with scale and compass.

(iii) Cut $BA = 5$ cm.

(iv) Join AC. ΔABC is the given triangle.

(v) Draw an acute $\angle CBY$ such that A and Y are in opposite direction with respect to BC.

(vi) Divide BY in 3 equal segments by marking arc at same distance at B_1, B_2, and B_3.

(vii) Join B_3C.

(viii) Draw $B_2C' \parallel B_2C$ by making equal alternate angles at B_2 and B_3.

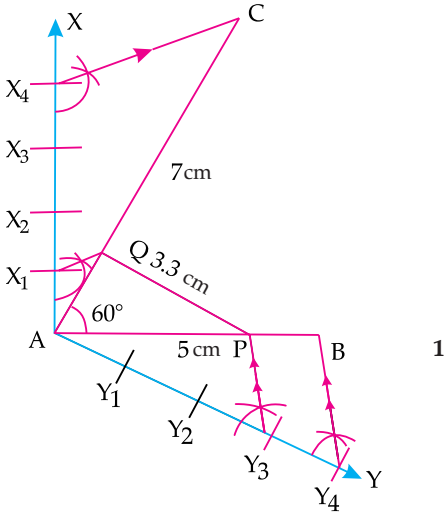
(ix) From point C', draw $C'A' \parallel CA$ by making equal alternate angles at C and C'.

$\Delta A'BC'$ is the required triangle of scale factor $\frac{2}{3}$.

This triangle is also a right triangle. **1**

Q. 3. Two line-segments AB and AC include an angle of 60°, where $AB = 5$ cm and $AC = 7$ cm. Locate points P and Q on AB and AC respectively such that $AP = \frac{3}{4} AB$ and $AQ = \frac{1}{4} AC$. Join P and Q and measure the length PQ. A

Sol.



1

Steps of construction :

(i) Draw $\angle BAC = 60°$ such that $AB = 5$ cm and $AC = 7$ cm.

(ii) Draw acute angle CAX and mark X_1, X_2, X_3, and X_4 equally spaced.

(iii) Join X_4C.

(iv) Draw $X_1Q \parallel X_4C$.

(v) Similarly, draw $\angle BAY$ and divide AY in 4 equal parts, *i.e.*, Y_1, Y_2, Y_3 and Y_4.

(vi) Join Y_4B and draw $Y_3P \parallel Y_4B$.

(vii) Join PQ and measure it.

(viii) PQ is equal to 3.3 cm. **1**

Short Answer Type Questions-II — 3 marks each

Q. 1. Construct a right-angled triangle whose base is 5 cm and sum of its hypotenuse and other side is 10 cm. Construct another triangle whose sides are 1·4 times the corresponding sides of the previously drawn triangle. Give the justification of the construction. A

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

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

Steps of construction :

(i) Draw a line segment BC of length 5 cm.

(ii) At B, draw $\angle XBC = 90°$. Taking B as centre and radius as 10 cm, draw an arc that intersects the ray BX at Y.

(iii) Join CY and draw its perpendicular bisector to intersect BY at A. Join AC.

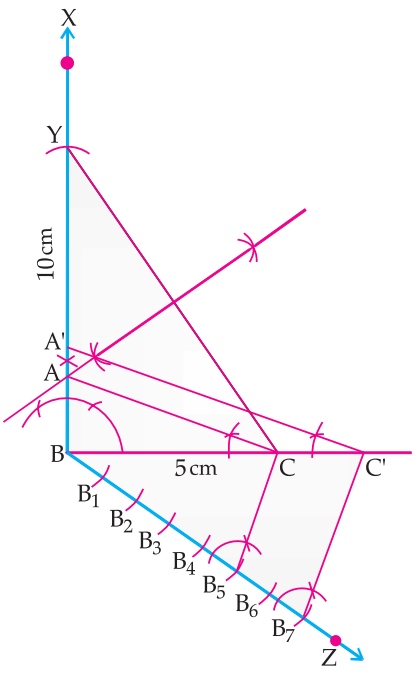
(iv) Draw a ray BZ making an acute angle with line segment BC.

(v) Locate 7 points $B_1, B_2, B_3, B_4, B_5, B_6$ and B_7 on BZ such that $BB_1 = B_1B_2 = B_2B_3 = B_3B_4 = B_4B_5 = B_5B_6 = B_6B_7$.

(vi) Join CB_5 and draw a line $C'B_7$ parallel to CB_5 to intersect extended line segment BC at point C'.

(vii) Draw a line through C' parallel to AC intersecting the ray BX at A'.

$\Delta A'BC'$ is the required triangle. **2**



1

AI **Q. 2. Construct a triangle whose perimeter is 13·5 cm and the ratio of the three sides is 2 : 3 : 4.** A

Sol. Steps of construction:

(i) Draw a line segment PR of length 13·5 cm.

(ii) **At the point** P draw a ray PQ making an acute angle RPQ with PR.

(iii) **On** PQ mark $(2 + 3 + 4)$ 9 points $P_1, P_2, P_3, P_4, P_5, P_6, P_7, P_8, P_9$ such that $PP_1 = P_1P_2 = P_2P_3 = P_3P_4 = P_4P_5 = P_5P_6 = P_6P_7 = P_7P_8 = P_8P_9$.

(iv) Join P_9R.

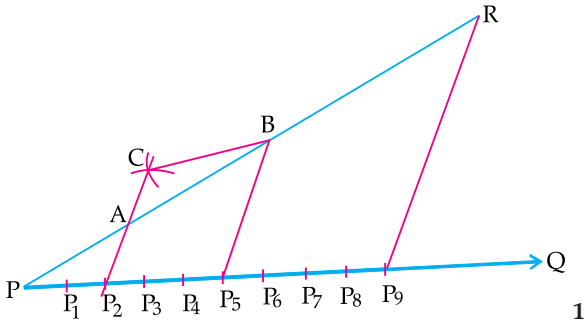
(v) Through P_2 and P_5 draw lines P_2A and P_5B respectively parallel to P_9R intersecting PR at A and B respectively.

(vi) With A as centre and radius AP draw an arc. **2**

(vii) With B as centre and radius BR draw another arc to intersect first arc.

(viii) Join A to C and B to C.

ABC is the required triangle.



1

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

Sol. Steps of construction:

(i) The rhombus $ABCD$ is drawn in which $AB = 4$ cm and $\angle ABC = 60°$.

(ii) Join AC. $ABCD$ is divided into two triangles ABC and ADC.

(iii) At the point A draw a ray AX making an acute angle BAX with AB.

(iv) Along AX mark off three points A_1, A_2, A_3 such that $AA_1 = A_1A_2 = A_2A_3$.

(v) Join A_3B. from A_2 draw $A_2B' \parallel A_3B$.

(vi) From B' draw $B'C' \parallel BC$.

(vii) From C draw $C'D' \parallel CD$.

(viii) So, $\Delta AB'C'$ similar to ΔABC with scale factor $\frac{2}{3}$.

It can be observed that :

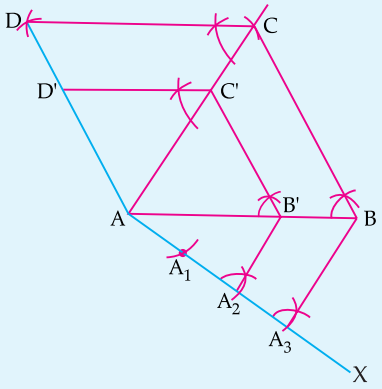
$$\frac{AB'}{AB} = \frac{2}{3} = \frac{AC'}{AC}$$

Also,
$$\frac{AC'}{AC} = \frac{C'D'}{CD}$$

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

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

Thus, $AB'C'D'$ is a rhombus. **2**



1

Long Answer Type Questions — 5 marks each

AI **Q. 1. Construct a ΔABC in which $AB = 4$ cm, $BC = 5$ cm and $AC = 6$ cm. Then construct another triangle whose sides are $\frac{2}{3}$ times the corresponding sides of ΔABC. Give the justification of the construction.**

A [CBSE, Delhi Set-II, 2020]

Sol. Steps of construction:

(i) Draw a line segment $BC = 5$ cm.

(ii) With B as centre and radius $= AB = 4$ cm, draw an arc.

(iii) With C as centre and radius $= AC = 6$ cm, draw another arc, intersecting the arc drawn in step (ii) at the point A.

(iv) Join AB and AC to obtain ΔABC.

(v) Below BC, make an acute angle $\angle CBX$.

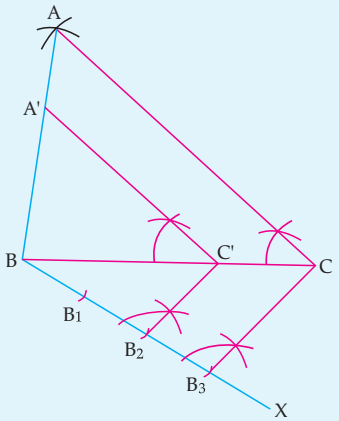
(vi) Along BX mark off three points B_1, B_2, B_3 such that $BB_1 = B_1B_2 = B_2B_3$.

(vii) Join B_3C.

(viii) From B_2, draw $B_2C' \parallel B_3C$.

(ix) From C', draw $C'A' \parallel CA$, meeting BA at the point A'.

Then $A'BC'$ is the required triangle. **3**



[CBSE Marking Scheme 2020] **2**

Justification:

Consider,

$$\frac{BC}{BC'} = \frac{BB_3}{BB_2} = \frac{3}{2} \quad ...(i)$$

Also, as $A'C' \| AC$, we can say that

$$\angle A'C'B = \angle ACB$$

(Corresponding angles) ...(ii)

Now, in $\Delta A'B'C'$ and ΔABC,

$\angle B = \angle B$ (Common)

$\angle A'C'B = \angle ACB$ [From (ii)]

$\therefore$ $\Delta A'BC' = \angle ABC$ (By cpct)

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

From eq. (i), we have

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

$\therefore$ $$\frac{AC}{A'C'} = \frac{BC}{BC'}$$

$$= \frac{AB}{A'B} = \frac{3}{2}.$$ **1**

AI **Q. 2. Draw a ΔABC with $BC = 7$ cm, $\angle B = 45°$ and $\angle A = 105°$. Then construct another triangle whose sides are $\frac{3}{4}$ times the corresponding sides of ΔABC. Give the justification of the construction.**

A [CBSE, Delhi Set-III, 2020]

Sol. In ΔABC,

$\angle A + \angle B + \angle C = 180°$

[Angle sum property of a triangle]

$\Rightarrow$ $105° + 45° + \angle C = 180°$

$\Rightarrow$ $\angle C = 30°$ **1**

Steps of Construction:

(i) Draw BC = 7 cm.

(ii) Construct $\angle CBY = 45°$ and $\angle BCZ = 30°$.

(iii) Rays BY and CZ intersect at A.

(iv) ΔABC is given.

(v) From B, draw a ray BX below BC making acute angle with BC.

(vi) Along it mark 4 points B_1, B_2, B_3, B_4 such that $BB_1 = B_1B_2 = B_2B_3 = B_3B_4$.

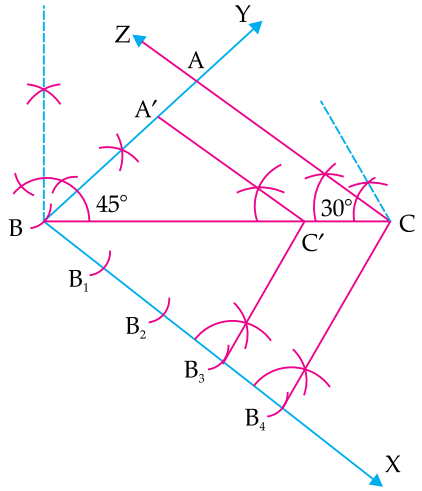
(vii) Join B_4C. Make $\angle BB_4C$ at B_3 such that the ray intersects BC at C'.

$\therefore \quad \angle BB_4C = \angle BB_3C'$.

So, $\quad B_4C \parallel B_3C'$.

(viii) From C', make $\angle BC'A' = \angle BCA$ so that $C'A' \parallel CA$.

Thus, $A'BC'$ is the required triangle. **1**



Justification:

Here, $\quad B_3C' \parallel B_4C$ (By Construction)

$\therefore \quad \dfrac{BC}{BC'} = \dfrac{3}{1}$

Now, $\quad \dfrac{BC}{BC'} = \dfrac{BC' + C'C}{BC'}$

$= \dfrac{BC'}{BC'} + \dfrac{C'C}{BC'}$

$= 1 + \dfrac{1}{3} = \dfrac{4}{3}$

$\therefore \quad \dfrac{BC'}{BC} = \dfrac{3}{4}$

and $\quad C'A' \parallel CA$

So, $\quad \Delta BC'A' \sim \Delta BCA$

Hence, $\quad \dfrac{BC'}{BC} = \dfrac{BA'}{BA}$

$= \dfrac{C'A'}{CA} = \dfrac{3}{4}$. **1**

AI Q. 3. Construct a triangle with sides 5 cm, 6 cm and 7 cm and then construct another triangle whose sides are $\frac{3}{4}$ times the corresponding sides of the first triangle. A [CBSE OD Set-I, 2020]

Sol. Steps of construction:

(i) Draw a line segment $BC = 5$ cm.

(ii) With B and C as centres and radii 7 cm and 6 cm draw two arcs, which intersects at A.

(iii) Join BA and CA to obtain ΔABC.

(iv) Below BC make an acute angle CBX. **3**

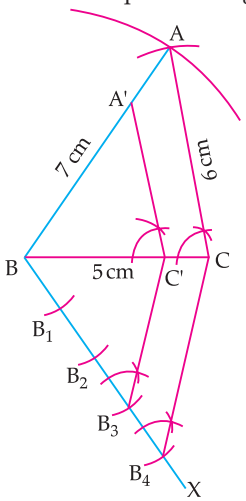
(v) Mark B_1, B_2, B_3, B_4 on BX such that $BB_1 = B_1B_2 = B_2B_3 = B_3B_4$.

(vi) Join B_4 to C.

(vii) Draw a line segment $B_3C' \parallel B_4C$ to meet BC at C'.

(viii) Draw line segment $C'A' \parallel CA$ to meet AB at A'.

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



2

Q. 4. Construct a triangle ABC with sides 3 cm, 4 cm and 5 cm. Now, construct another triangle whose sides are $\frac{4}{5}$ times the corresponding sides of ΔABC.

A [CBSE OD Set-II, 2020]

Sol. Steps of construction:

(i) Draw a line segment $BC = 5$ cm.

(ii) With B as centre and radius 3 cm, draw an arc.

(iii) With C as a centre and radius 4 cm, draw another arc meeting the previous arc at the point A.

(iv) Join AB and AC to obtain ΔABC.

(v) Below BC make an acute angle $\angle CBX$. **2**

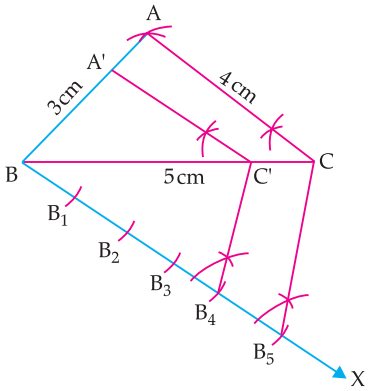
(vi) Along BC mark off five points B_1, B_2, B_3, B_4, B_5 such as $BB_1 = B_1B_2 = B_2B_3 = B_3B_4 = B_4B_5$.

(vii) Join B_5C.

(viii) From B_4, draw $B_4C' \parallel B_5C$.

(ix) From C', draw $CA' \parallel CA$ meeting BA at the point A'.

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



2

Justification:

Here, $B_4C' \parallel B_5C$ (By Construction)

$\therefore \quad \frac{BC'}{BC} = \frac{4}{5}$

Now, $\frac{BC}{BC'} = \frac{BC'+C'C}{BC'}$

$= \frac{BC'}{BC'} + \frac{C'C}{BC'}$

$= 1 + \frac{1}{4} = \frac{5}{4}$

$\therefore \quad \frac{BC'}{BC} = \frac{4}{5}$

and $C'A' \parallel CA$ (Given)

So, $\Delta BC'A' \sim \Delta BCA$

Hence, $\frac{BC'}{BC} = \frac{BA'}{BA} = \frac{C'A'}{CA} = \frac{4}{5}$. **1**

Q. 5. Construct a ΔABC with $AB = 6$ cm, $BC = 5$ cm and $\angle B = 60°$. Now construct another triangle whose sides are $\frac{2}{3}$ times the corresponding sides of ΔABC. A [CBSE OD Set-III, 2020]

Sol. Steps of Construction:

(i) Draw a line segment $BC = 5$ cm.

(ii) At point B, draw a line By making an angle of 60°.

(iii) With B as centre mark an arc of 6 cm which cuts BY at A.

(iv) Join CA.

(v) Draw a ray BX making an acute angle with BC.

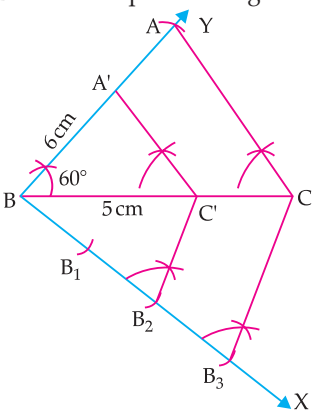
(vi) Locate three points B_1, B_2, B_3 on the line segment BX at equal distance.

(vii) Join B_3C.

(viii) Draw through B_2 a line parallel to B_3C intersecting line segment BC at C'.

(ix) Through C' draw a line parallel to AC intersecting line segment AB at A. **2**

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



2

Justification:

Here, $B_2C' \parallel B_3C$ (By Construction)

$\therefore \quad \frac{BC'}{BC} = \frac{2}{3}$

Now, $\frac{BC}{BC'} = \frac{BC'+C'C}{BC'}$

$= \frac{BC'}{BC'} + \frac{C'C}{BC'}$

$= 1 + \frac{1}{2} = \frac{3}{2}$

$\therefore \quad \frac{BC'}{BC} = \frac{2}{3}$

and $C'A' \parallel CA$ (Given)

So, $\Delta BC'A' \sim \Delta BCA$

Hence, $\frac{BC'}{BC} = \frac{BA'}{BA} = \frac{C'A'}{CA} = \frac{3}{2}$. **1**

Q. 6. Draw a triangle ABC with side BC = 6.5 cm, $\angle B = 30°$, $\angle A = 105°$, Then construct another triangle whose sides are $\frac{3}{4}$ times the corresponding sides of the ΔABC. A [CBSE SQP 2020]

Sol. Correct construction of given triangle. **2**

Correct construction of similar Δ with scale factor $\frac{3}{4}$. [CBSE Marking Scheme, 2020] **3**

Detailed Solution:

See the solution of Q.2. From LATQ.

Q. 7. Construct a ΔABC in which CA = 6 cm, AB = 5 cm and $\angle BAC = 45°$. Then construct a triangle whose sides are $\frac{3}{5}$ of the corresponding sides of ΔABC.

A [CBSE Delhi Set-I, 2019]

Sol. Correct construction of ΔABC. **2**

Correct construction of triangle similar to triangle ABC. [CBSE Marking Scheme, 2019] **3**

Detailed Solution:

Steps of Construction:

(i) Draw a line segment $AB = 5$ cm.

(ii) At A make $\angle BAY = 45°$

(iii) Take A as a centre and radius $AC = 6$ cm, draw an arc cutting AY at C.

(iv) Join BC to obtain the triangle ABC.

(v) Draw any ray AX making an acute angle with AB on the side apposite to the vertex C.

(vi) Mark off 5 points

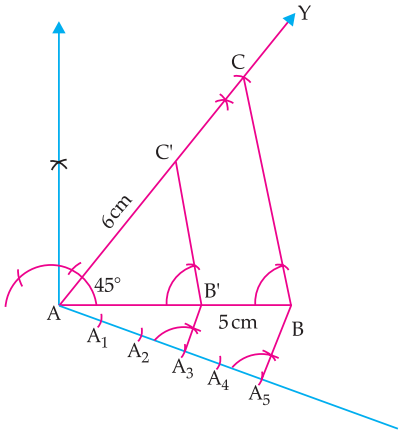
Say A_1, A_2, A_3, A_4, A_5 on AX, so that $AA_1 = A_1A_2 = A_2A_3 = A_3A_4 = A_4A_5$.

(vii) Join A_5B

(viii) Draw A_3B parallel to A_5B which meets AB at B'.

(ix) From B', draw $B'C' \parallel CB$ meeting AC at C'.

Triangle AB'C' is the required triangle, each of whose sides is $\left(\frac{3}{5}\right)^{th}$ of the corresponding sides of ΔABC. **3**



2

Q. 8. Construct a triangle ABC with side $BC = 6$ cm, $\angle B = 45°$, $\angle A = 105°$. Then construct another triangle whose sides are $\frac{3}{4}$ times the corresponding sides of ΔABC. A [CBSE Delhi Set-II, 2019]

Sol. Correct construction of ΔABC **2**
Correct construction of triangle similar to ΔABC **3**
[CBSE Marking Scheme, 2019]

Detailed Solution:

See the Detailed Solution of Q.2 from LATQ.

Q. 9. Construct an equilateral ΔABC with each side 5 cm. Then construct another triangle whose sides are $\frac{2}{3}$ times the corresponding sides of ΔABC.

A [CBSE OD Set-I, 2019]

Sol. Construction of an equilateral triangle of side 5 cm **2**
Construction another similar Δ with scale factor $\frac{2}{3}$. [CBSE Marking Scheme, 2019] **3**

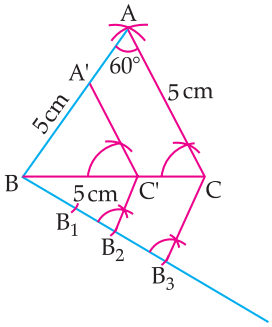
Detailed Solution:

Steps of Construction:

(i) Draw a line segment $BC = 5$ cm.

(ii) With B as a centre and radius $BC = 5$ cm, draw another arc. **1½**

(iii) With C as a centre and radius $AC = 5$ cm, draw another arc meeting the arc drawn in step 2 at the point A.



2

(iv) Join AB and AC to obtain ΔABC.

(v) Below BC, construct an acute angle $\angle CBX$.

(vi) Along BX mark off 3 points B_1, B_2, B_3 such that $BB_1 = B_1B_2 = B_2B_3$. **1½**

(vii) Join B_3C

(viii) Form $B_2C' \parallel B_3C$

(ix) Form C', draw $C'A' \parallel CA$.

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

COMMONLY MADE ERROR

- Some candidates follow incorrect methods for construction.

ANSWERING TIP

- Read the construction based questions carefully and solve them as per requirement.

Q. 10. Draw a ΔABC with sides 6 cm, 8 cm and 9 cm and then construct a triangle similar to ΔABC whose sides are $\frac{3}{5}$ of the corresponding sides of ΔABC.

A [CBSE SQP, 2018] [CBSE Comptt. Set-I, II, III, 2018]

Sol. Correct construction of ΔABC **2**
Correct construction of similar triangle. **3**
[CBSE Marking Scheme, 2018]

Detailed Solution:

Steps of Construction:

(i) Draw a line segment $BC = 8$ cm.

(ii) With B as a centre and radius 6 cm, draw an arc.

(iii) With C as a centre and radius 9 cm, draw another arc meeting the arc drawn in step 2 at the point A.

(iv) Join AB and AC to obtain ΔABC.

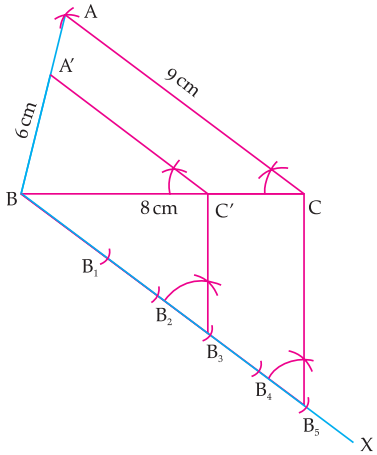
(v) Below BC make an acute angle $\angle CBX$. **3**

(vi) Along BX mark off five points B_1, B_2, B_3, B_4, B_5 such that $BB_1 = B_1B_2 = B_2B_3 = B_3B_4 = B_4B_5$.

(vii) Join B_5C.

(viii) From B_3 draw $B_3C' \parallel B_5C$

(ix) From C', draw $C'A' \parallel CA$ meeting BA at the point A'.
Hence $A'BC'$ in the required triangle.



2

Q. 11. Draw a ΔABC in which $BC = 6$ cm, $AB = 5$ cm and $\angle ABC = 60°$. Then construct another triangle whose sides are $\frac{3}{4}$ of the corresponding sides of ΔABC.

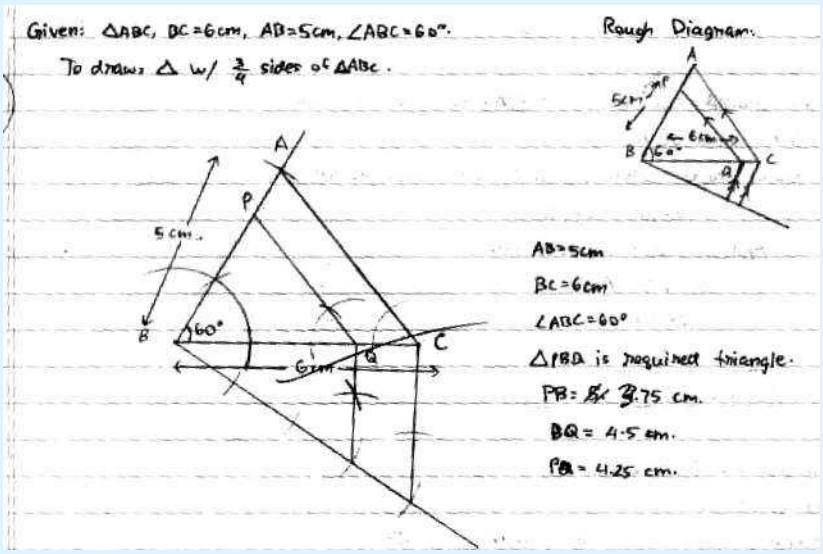
A [CBSE Delhi/OD Set-I, 2018] [Delhi Comptt. Set-I, 2017] [Delhi CBSE Board Term-2, 2015]

Sol. Correct construction of ΔABC **2**

Correct construction of Δ similar to ΔABC [CBSE Marking Scheme, 2018] **3**

Detailed Solution:

Topper Answer, 2017



5

Alternate Method:

Steps of Construction:

(i) Construct a triangle ABC in which $BC = 6$ cm. $AB = 5$ cm and $\angle ABC = 60°$.

(ii) Draw a ray BX such that $\angle CBX$ is an acute angle.

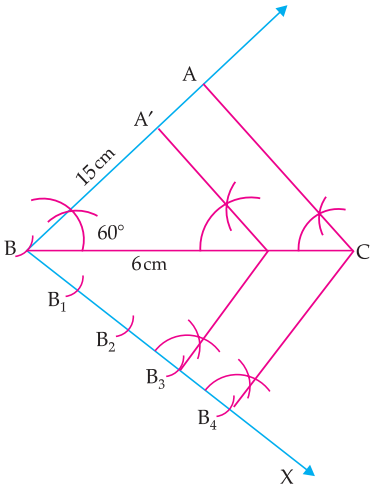
(iii) Locate 4 points B_1, B_2, B_3 and B_4 on the ray BX such that $BB_1 = B_1B_2 = B_2B_3 = B_3B_4$.

(iv) Join B_4C.

(v) Through B_3 draw a line parallel to B_4C which meet BC at C'.

(vi) Through C' draw a line parallel to AC which meet AB at A'.

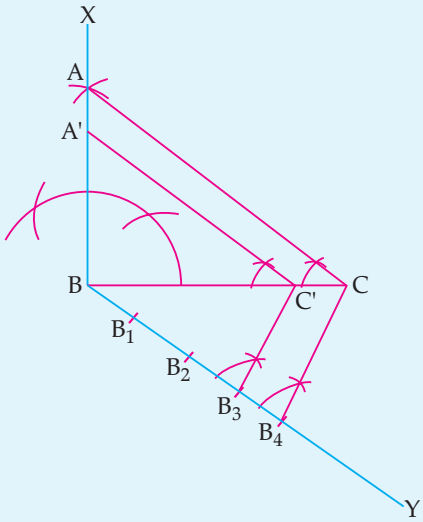
Hence $\Delta A'BC'$ is the required triangle.



Q. 12. Draw a right triangle in which sides (other than hypotenuse) are 8 cm and 6 cm. Then construct another triangle whose sides are $\frac{3}{4}$ times the (corresponding) sides of given triangle.

A [Delhi Comptt. Set-I, 2017]

Sol.



2

Steps of Construction:

(i) Draw a line segment $BC = 8$ cm.

(ii) Draw line segment BX making an angle of 90° at the point B of BC.

(iii) From B mark an arc on BX at a distance of 6 cm, Let it is A.

(iv) Join A to C.

(v) Making an acute angle draw a line segment BY from B.

(vi) Mark B_1, B_2, B_3 , B_4 on BY such that $BB_1 = B_1B_2 = B_2B_3 = B_3B_4$.

(vii) Join B_4 to C.

(viii) Draw a line segment $B_3C' \parallel$ to B_4C to meet BC at C'.

(ix) Draw line segment $C'A' \parallel$ to CA to meet AB at A' $A'BC'$ is the required triangle. **3**

[CBSE Marking Scheme, 2017]

Q. 13. Construct a right triangle whose hypotenuse and one side measures 10 cm and 8 cm respectively. Then construct another triangle whose sides are $\frac{4}{5}$ times the corresponding sides of this triangle.

A **[Board Term-2, 2015]**

Sol. Steps of construction :

(i) Draw a line segment $BC = 8$ cm.

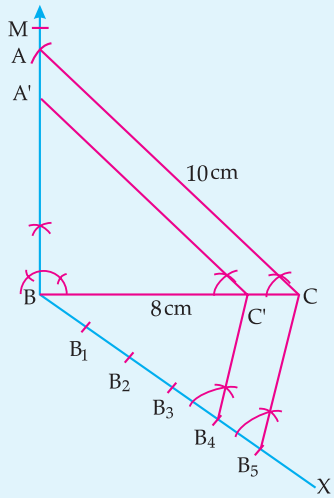
(ii) Construct $AM \perp BC$.

(iii) Taking C as centre and radius as 10 cm, draw an arc that intersects the ray BM at A.

(iv) Join CA to obtain ΔABC.

(v) Below BC, make an acute angle CBX.

(vi) Along BX mark off 5 points B_1, B_2, B_3, B_4, B_5 such that $BB_1 = B_1B_2 = B_2B_3 = \ldots\ldots = B_4B_5$.



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(vii) Join B_5C.

(viii) From B_4, Draw $B_4C' \parallel B_5C$.

(ix) From the point C' draw $C'A' \parallel CA$ meeting BA at point A'.

Hence $A'BC'$ is the required triangle. **3**

[CBSE Marking Scheme, 2015]

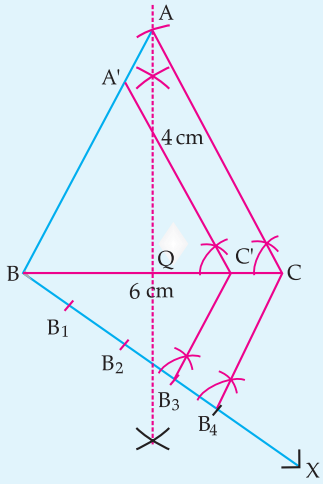
AI **Q. 14. Construct an isosceles triangle whose base is 6 cm and altitude 4 cm. Then construct another triangle with sides are $\frac{3}{4}$ times the corresponding sides of the isosceles triangle.**

A **[Delhi CBSE Board Term-2, 2015]**

Sol. Steps of Construction:

(i) Draw a line segment $BC = 6$ cm.

(ii) Draw a perpendicular bisector of BC which intersects the line BC at Q.



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(iii) Mark A on the line such that $QA = 4$ cm.

(iv) Join A to B and C.

(v) Draw a ray BX making an acute angle with BC.

(vi) Mark four points B_1, B_2, B_3 and B_4 on the ray BX. Such that $BB_1 = B_1B_2 = B_2B_3 = B_3B_4$.

(vii) Join B_4C.

(viii) Draw a line parallel to B_4C through B_3 intersecting line segment BC at C'.

(ix) Draw $C'A' \parallel CA$ from point C'

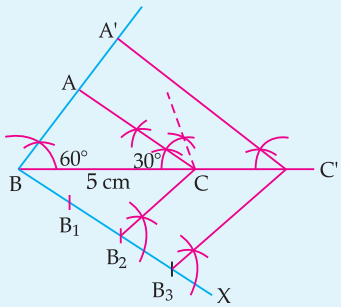
Hence $\Delta A'BC'$ is the required triangle. **3**

[CBSE Marking Scheme, 2015]

Q. 15. Draw triangle ABC such that $BC = 5$ cm, $\angle ABC = 60°$, $\angle ACB = 30°$. Now construct $\Delta A'BC'$ corresponds to ΔABC with $A'B : AB = 3 : 2$.

A **[Board Term-2, 2015]**

Sol.



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Steps of Construction:

(i) Draw a line segment BC of length 5 cm.

(ii) Draw the angles of 60° and 30° on the points B and C respectively, which intersect each other at A.

(iii) ΔABC is the given triangle.

(iv) Draw a ray BX making an acute angle with BC.

(v) Locate three points B_1, B_2, and B_3 on line segment BX. Such that $BB_1 = B_1B_2 = B_2B_3$.

(vi) Join B_2C.

(vii) Draw $B_3C' \parallel B_2C$ to intersect the extended line BC at C'.

(viii) Through C' draw a line parallel to AC intersecting extended line segment BA at A'.

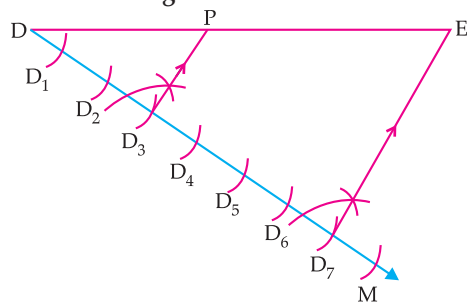
$\Delta A'BC'$ is the required triangle. **3**

[CBSE Marking Scheme, 2015]

Visual Case Based Questions — 4 marks each

Note: Attempt any four sub parts from each question. Each sub part carries 1 mark

Q. 1. A school conducted Annual Sports Day on a triangular playground. On the ground, parallel lines have been drawn with chalk powder at a distance of 1 m. 7 flower pots have been placed at a distance of 1 m from each other along DM as shown in the figure.



Now answer the following questions:

(i) PD_3 is parallel to:

(a) PD **(b) PE**

(c) ED_7 **(d) None of these.**

Sol. Correct Option: **(c)**

Explanation: In ΔED_7D,

$PD_3 \parallel ED_7$.

(ii) If $\angle PD_3D = 82°$, then the measure of $\angle ED_7D$ is:

(a) 98° **(b) 82°**

(c) 90° **(d) 45°**

Sol. Correct Option: **(b)**

Explanation: We have,

$PD_3 \parallel ED_7$

Then, $\angle ED_7D = \angle PD_3D$ (Corresponding angles)

$\therefore \quad \angle ED_7D = 82°$.

(iii) The ratio in which P divides DE, is:

(a) 3 : 4 **(b) 7 : 3**

(c) 3 : 7 **(d) 2 : 5**

Sol. Correct Option: **(a)**

Explanation: P divides DE in the ratio 3 : 4.

(iv) The ratio of DE to DP will be:

(a) 2 : 5 **(b) 3 : 4**

(c) 3 : 7 **(d) 7 : 3**

Sol. Correct Option: **(d)**

Explanation:

$DE = 7$ m

$[\because DD_1 = D_1D_2 = D_2D_3 = D_3D_4 = D_4D_5 = D_5D_6 = D_6D_7]$

and $DP = 3$ m

$[\because DD_1 = D_1D_2 = D_2D_3]$

$\therefore \quad \frac{DE}{DP} = \frac{7\text{ m}}{3\text{ m}} = \frac{7}{3}$

Hence, the ratio of DE to DP is 7 : 3.

(v) The total distance used for putting 7 flower pots is:

(a) 6 m **(b) 7 m**

(c) 5 m **(d) 8 m.**

Sol. Correct Option: **(b)**

Explanation: Since, 7 flower pots have been placed at a distance of 1 m from each other, then total distance = 7 m.

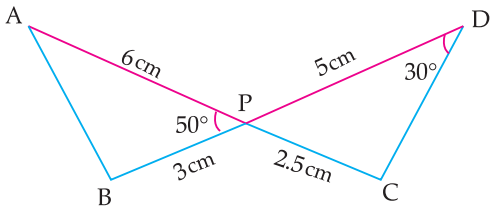
SELF ASSESSMENT TEST - 4

Maximum Time: 1 hour **MM: 25**

VERY SHORT ANSWER TYPE QUESTIONS:

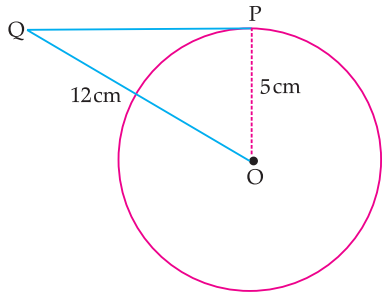
(1 mark each)

Q. 1. In the figure given below, two line segments AC and BD intersect each other at the point P such that $PA = 6$ cm, $PB = 3$ cm, $PC = 2.5$ cm, $PD = 5$ cm, $\angle APB = 50°$ and $\angle CDP = 30°$. Then, find $\angle PBA$.

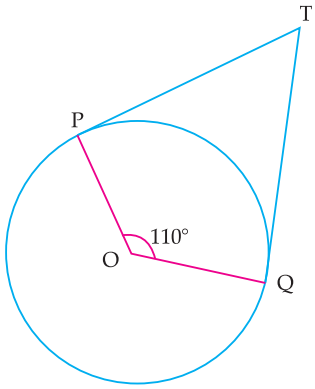


Q. 2. If the sides of two similar triangles are in the ratio 4 : 9, then find the ratio of the areas of the two triangles. U

Q. 3. A tangent PQ at a point P of a circle of radius 5 cm meets a line through the centre O at a point Q so that $OQ = 12$ cm. Find length of PQ. A + U



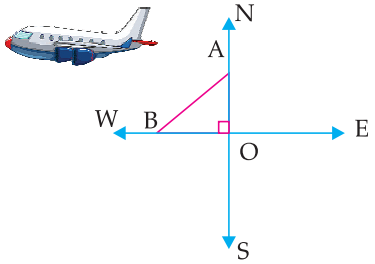
Q. 4. In the given figure, if TP and TQ are the two tangents to a circle with centre O so that $\angle POQ = 110°$, then find $\angle PTQ$. A + U



Q. 5. If a line segment AB is divided at point P such that $\frac{PB}{AB} = \frac{3}{7}$, then find the ratio of AP : PB.

VISUAL CASE BASED QUESTIONS

Q. 6. An aeroplane leaves an airport and flies due north at a speed of 1,000 km per hour. At the same time, another aeroplane leaves the same airport and flies due west at a speed of 1,200 km per hour.



(i) What is the distance travelled by aeroplane towards north after 1½ hours?

(a) 1000 (b) 1200

(c) 1500 (d) 1800

(ii) What is the distance travelled by aeroplane towards west after 1½ hours?

(a) 1000 (b) 1200

(c) 1500 (d) 1800

(iii) $\angle AOB$ is

(a) 90° (b) 45°

(c) 30° (d) 60°

(iv) How far apart will be the two planes after $1\frac{1}{2}$ hours ?

(a) $\sqrt{22,50,000}$ (b) $\sqrt{32,40,000}$

(c) $\sqrt{54,90,000}$ (d) none of these

(v) The given problem is based on which concept?

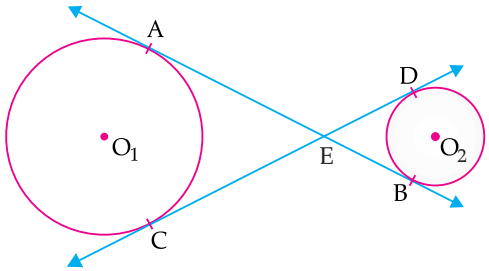
(a) Triangles

(b) Co-ordinate geometry

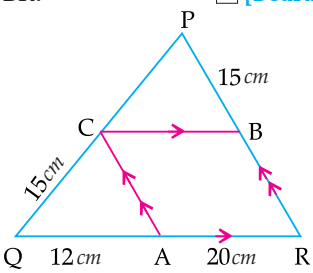
(c) Height and Distance

(d) None of these

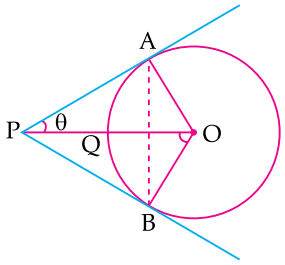
Q. 7. In Figure, common tangents AB and CD to the two circles with centres O_1 and O_2 intersect at E. Prove that AB = CD. A [CBSE OD, 2014]



Q. 8. In the given figure, *CB* || *QR* and *CA* || *PR*. If *AQ* = 12 cm, *AR* = 20 cm, *PB* = *CQ* = 15 cm, calculate *PC* and *BR*. A [Board Term-I, 2012]

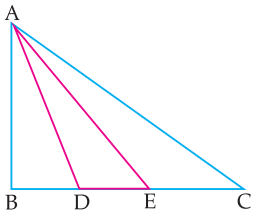


Q. 9. In the given figure, OP is equal to the diameter of a circle with centre O and PA and PB are tangents. Prove that ABP is an equilateral triangle.



A [Board Term-2, 2014]

Q. 10. In the given figure, *D* and *E* trisect *BC*. Prove that $8AE^2 = 3AC^2 + 5AD^2$.



U [Board Term-1, 2013, LK-59]

Q. 11. Draw an isosceles ΔABC in which $AB = AC = 6$ cm and $BC = 5$ cm. Construct a triangle PQR similar to ΔABC in which $PQ = 8$ cm. Also justify the construction. **5**