Transweb Educational Services Pvt Ltd
B -147, Sector -6 Noida, UP - 201301,
www.askiitians.com
Email: info@askiitians.com
Tel: 1800-2000-838

Class: X
Subject: Math's
Topic: Constructions
No. of Questions: 20
Duration: 60 Min
Maximum Marks: 60

1. By geometrical construction, a line segment can be divided in the ratio

A. $2-\sqrt{3}:2-\sqrt{3}$

B. $\sqrt{6}+1:\sqrt{6}-1$

C. 1 : 1

D. $\sqrt{9}-1:\sqrt{9}+1$

Ans. C

Solution: Only integral division is possible

2. To divide a line segment PQ in the ration 7 : 3 internally, first a ray PX is drawn so that ∠QPX is an acute angle and then at equal distances, points are marked on the ray PX such that the minimum number of these points is :

A. 7

B. 3

C. 10

D. 4

Ans. C

Solution: 10 points so that last point will be founded to end of line segment 7th point 11 to alone line segment will give the required ratio.

3. To draw a pair of tangents to a circle which are inclined to each other at an angle of 35^o, it is required to draw tangents at the end points of those two radii of the circle, the angle between them should be:

A. 145^o

B. 70^o

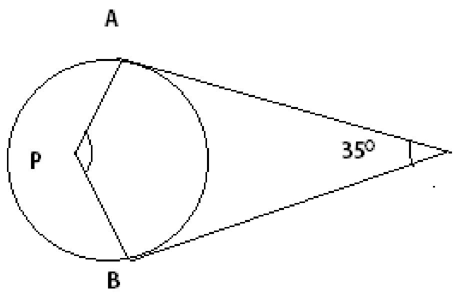
C. 140^o

D. 105^o

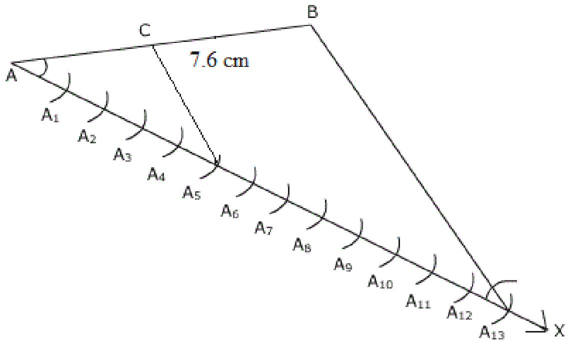
Ans. A

∠APB-90-90-35

$=145^0$



4. In each of the following, give the justification of the construction also: Draw a line segment of length 7.6 cm and divide it in the ratio 5:8 Measure the two parts.



Solution:

1. Draw any ray AX, making an acute angle with AB.

2. Locate 13(=5+8) points A_1, A_2, A_3………. A_{13} on AX so that $AA1 = A_1A_2$…. A_{12} A_{13}

3. Join BA_{13}

4. Through the point A_5 (m=5), Draw a line parallel to BA_{13} (by making an angle equal to $\angle$ AA_{13} B at A5 intersecting AB at C. Then

AC: CB=5:8

Let us see how this method gives us the required division.

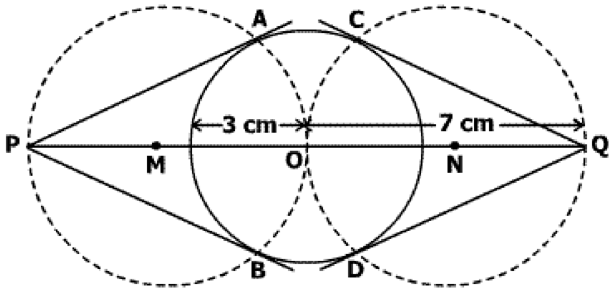
Since A_5C is parallel to A_{13} B therefore $\frac{AA_5}{A_5A_{13}} = \frac{AC}{CB}$.(By the basic proportionality theorem)

By construction, $\frac{AA_5}{A_5A_{13}} = \frac{5}{8}$. Therefore $\frac{AC}{CB} = \frac{5}{8}$

This shows C divides AB in the ratio 5:8.

5. Draw a circle of radius 3cm. Take two points p and Q on one of its extended diameter each at a distance of 7 cm from its centre. Draw tangents to the circle from these two points P and Q.

Solution:



Two points P and Q on the diameter of a circle with radius 3cm OP=OQ=7 cm.

Required

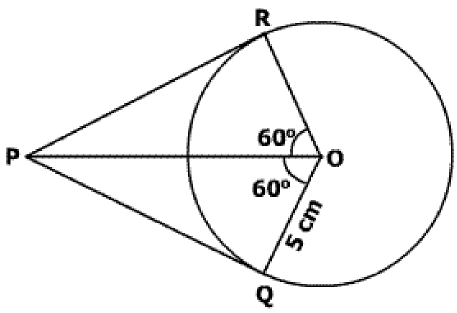
To construct the tangents to the circle from the given points P and Q.

Steps of construction

A. Draw a circle of radius 3 cm with centre O.
B. Extend its diameter both sides and cut OP=OQ=7cm.
C. Bisect OP and OQ. Let M and N be the mid-points of OP and OQ respectively.
D. With M as centre and OM as radius, draw a circle. Let it intersect (0,3) at two points A and B. again taking N as centre ON as radius draw a circle to intersect circle (0,3) at two points C and D.
E. Join PA, PB,QC and QD. These are the required tangents from P and Q to circle (0,3).

6. Draw a pair of tangents to a circle of radius 5 cm which are inclined to each other at an angle of 60^o.

Solution:



We have to draw tangents at the ends of two radius which are inclined to each other at 120^o

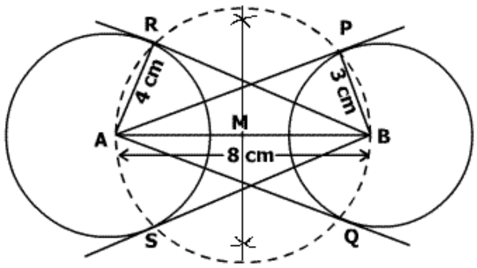
Steps of construction

Transweb Educational Services Pvt Ltd
B -147, Sector -6 Noida, UP - 201301,
www.askiitians.com
Email: info@askiitians.com
Tel: 1800-2000-838

A. Draw a circle of radius 5 cm with centre O.
B. Take a point Q on the circle and join it to P.
C. From OQ, Draw ∠QOR= 120^{o+}
D. Take an external point P.
E. Join PR and PQ perpendicular to OR and OQ respectively intersecting at P.

Therefore the required tangents are RP and QP.

7. Draw a line segment AB of length 8 cm. Taking A as centre, draw a circle of Radius 4 cm and taking B as centre, draw another circle of radius 3 cm. construct tangents to each circle from the centre of the other circle.



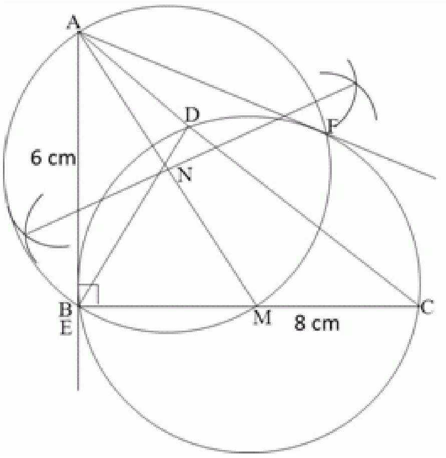
Solution:

Steps of construction

A. Draw a line segment AB of length 8 cm. Also bisects AB such that, M is the mid point of AB.
B. With M as centre draw a circle such that it touches A and B.
C. With A as centre draw a circle of radius $ cm, and with B as centre draw a circle of radius 3 cm.
D. These two circles touches the bigger circle at P,Q.R and S.
E. Now join RB and SB they are the tangents from the point B.
F. Similarly join PA and QA they are the tangents from the point A.

8. Let ABC be a right triangle in which AB= 6 cm, BC=8cm and ∠B= 90^o. BD is the perpendicular from B on AC. The circle through B,C,D is drawn.

Construct the tangents from A to this Circle.



Solution:

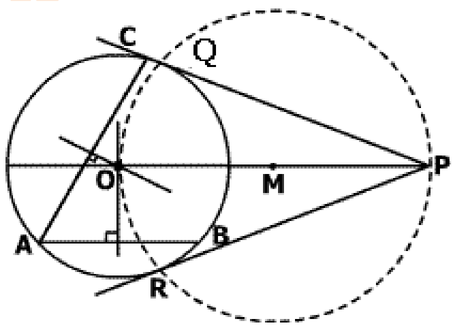
Steps of construction

A. Draw a triangle with AB= 6cm, BC=8 cm and ∠B=90°.
B. Construct BD perpendicular to AC.
C. Draw a circle through B,C,D
D. Let M be the mid-point of BC obtained by bisecting BC.
E. Join AM and bisect it. Let N be the mid-point of AM.
F. With N as centre and AN as radius draw a circle such that it touches the circle through B,C,D at the points E and F.
G. Join AE and AF.
H. Thus AE and AF are the required tangents.

9. Draw a circle with the help of a bangle. Take a point outside the circle. Construct the pair of tangents from this point the circle.

Solution: Given

Bangle, point P outside the circle.



Required

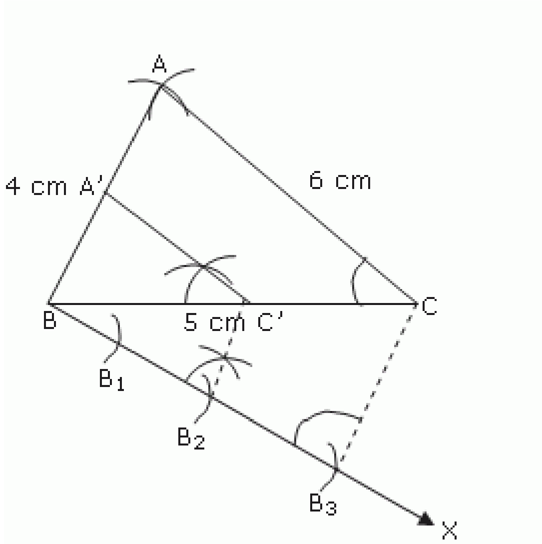
To construct the pair of tangents from P to the circle.

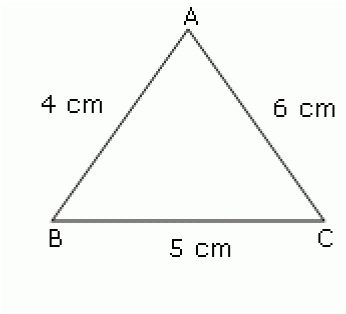
Steps of construction

A. Draw a circle with the help of a bangle.
B. Draw two chords AB and AC. Perpendicular bisectors of AB and AC. Intersect each other at O, which is the centre of the circle.
C. Taking a point p, outside the circle, join OP.
D. Let M be the mid-point of OP. taking M as centre and OM as radius draw a circle which intersect the given circle at Q and R.
E. Join PQ and PR. Thus PQ and PR are the required tangents.

10. Construct a triangle of sides 4 cm, 5 cm and 6 cm and then a triangle similar to it whose sides are $\frac{2}{3}$ of the corresponding sides of the first triangle.

Solution:





Steps of construction

A. Draw a line segment BC= 5cm
B. With B as centre and radius equal to 4 cm draw an arc
C. With C as centre and radius equal to 6 cm draw an arc
D. Join AB and AC. Then, Δ ABC is the required triangle.
E. Below BC, make an acute angle $\angle$CBX
F. Along BX, mark off three points B_1,B_2,B_3 such that BB1= B_1B_2=B_2B_3

Transweb Educational Services Pvt Ltd
B -147, Sector -6 Noida, UP - 201301,
www.askiitians.com
Email: info@askiitians.com
Tel: 1800-2000-838

G. Join B_3C
H. From B_2, draw $B_2C||B_3o$, meeting BC at C'
I. From C' draw C' A|| CA meeting BA at A'
J. Then Δ A'B'C is the required triangle, each of whose sides is two-third of the corresponding sides of Δ ABC.

Justification

Since A'C'||AC, so Δ ABC ~ Δ A'BC'

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

Solution:

A. Draw a line segment BC= 6 cm
B. With B as centre and with radius 5 cm, draw an arc.
C. With C as centre and with radius 7 cm, draw another arc, intersecting the previously drawn are at A.
D. Join AB and AC. Then, ΔABC is the required triangle.
E. Below BC, make an acute angle $\angle$CBX.
F. Along BX, mark off seven points B_1, B_2, B_2....B_7 such that $BB_1 = B_1B_2$....

B_6B_7

G. Join B_5 to C (5 being smaller of 5 and 7 in $\frac{7}{5}$) and draw a line through B_7 parallel to B_7 parallel to B_5 C, intersecting the extended line segment BC at C'.
H. Draw a line through C' parallel to CA intersecting the extended line segment BA at A'. then A' BC' is the required triangle.

For justification of construction

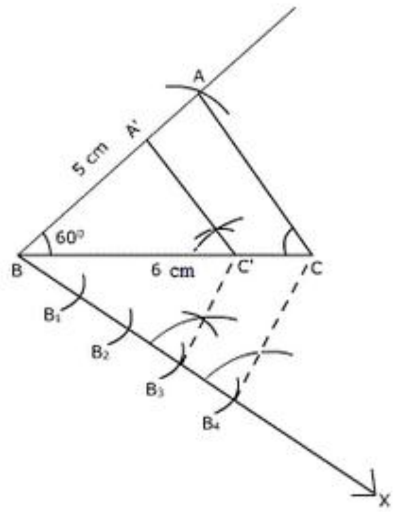
$$\Delta ABC \sim \Delta A'BC'$$

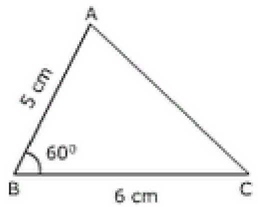
$$\text{Therefore } \frac{AB}{A'B} = \frac{AC}{A'C'} = \frac{BC}{BC'}$$

$$\text{But } \frac{BC}{BC'} = \frac{BB_5}{BB_7} = \frac{5}{7}$$

$$\text{So } \frac{BC'}{BC} = \frac{7}{5} \text{ and thus } \frac{A'B}{AB} = \frac{A'C'}{AC} = \frac{BC'}{BC} = \frac{5}{7}$$

12. Draw a triangle ABC with side BC= 6 cm, AB= 5 cm and ∠ ABC = 60°. Then construct a triangle whose sides are ¾ of the corresponding sides of the triangle ABC.





Solution:

Steps of construction

(i) Draw a triangle ABC with BC = 6 cm, AB = 5 cm and ∠ ABC = 60°.

(ii) Draw any ray BX making an acute angle with BC on the side opposite to the vertex X.

(iii) Locate 4(the greater of 3 and 4 in $\frac{3}{4}$) points B_1, B_2, B_3, B_4 on BX so that $BB_1 = B_1B_2 = B_2B_3 = B_3B_4$.

(iv) Join B_4C and draw a line through B_3(the 3rd point, 3 being smaller of 3 and 4 in $\frac{3}{4}$) parallel to B_4C to intersect BC at C'.

(v) Draw a line through C' parallel to the line CA to intersect BA at A'. Then Δ A'BC' is the required triangle.

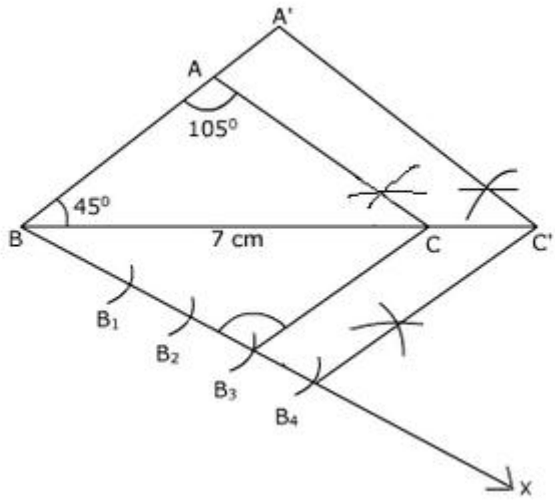
Justification of the construction

Δ ABC ~ Δ A'BC'. Therefore $\frac{AB}{A'B} = \frac{AC}{A'C'} = \frac{BC}{BC'}$

But $\frac{BC}{BC'} = \frac{BB_3}{BB_4} = \frac{3}{4}$

So $\frac{AB}{A'B} = \frac{AC}{A'C'} = \frac{BC}{BC'} = \frac{3}{4}$

13. Draw a triangle ABC with side BC= 7 cm, ∠B=45°, ∠ A= 105°. Then, construct a triangle whose sides are 4/3 times the corresponding sides of Δ ABC.



Solution:

Steps of construction

(i) Draw a triangle ABC with BC = 7cm, ∠ B = 45° and ∠ A = 105°.

(ii) Draw any ray BX making an acute angle with BC on the side opposite to the vertex X.

(iii) Locate 4(the greater of 3 and 4 in $\frac{4}{3}$) points B_1, B_2, B_3, B_4 on BX so that $BB_1 = B_1B_2 = B_2B_3 = B_3B_4$.

(iv) Join B_4C' and draw a line through B_3(the 3rd point, 3 being smaller of 3 and 4 in $\frac{4}{3}$) parallel to B_4C' to intersect BC' at C.

(v) Draw a line through C' parallel to the line CA to intersect BA at A'. Then Δ A'BC' is the required triangle.

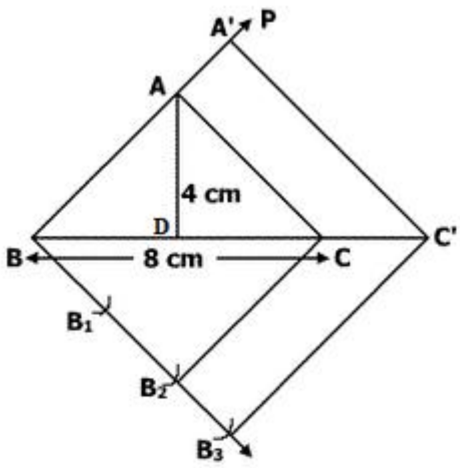
Justification of the construction

Δ ABC ~ Δ A'BC'. Therefore $\frac{A'B}{AB} = \frac{A'C'}{AC} = \frac{BC'}{BC}$

But $\frac{BC'}{BC} = \frac{BB_4}{BB_3} = \frac{4}{3}$

So $\frac{A'B}{AB} = \frac{A'C'}{AC} = \frac{BC'}{BC} = \frac{4}{3}$

14. Construct an isosceles triangle 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.

Solution: 

Given

An isosceles triangle whose base is 8 cm and altitude 4 cm. Scale factor: $1\frac{1}{2} = \frac{3}{2}$

Required

To construct a similar triangle to above whose sides are $1\frac{1}{2}$ times the above triangle.

Steps of construction

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

(ii) Draw a perpendicular bisector AD of BC.

(iii) Join AB and AC we get a isosceles ΔABC.

(iv) Construct an acute angle $\angle$ CBX downwards.

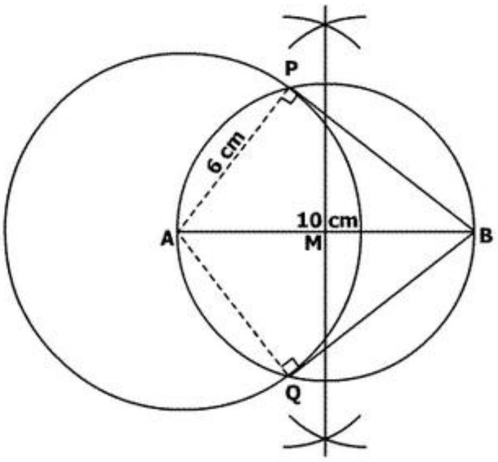
(v) On BX make 3 equal parts.

(vi)Join C to B_2 and draw a line through B_3 parallel to B_2C intersecting the extended line segment BC at C'.

(Vii)Again draw a parallel line C'A' to AC cutting BP at A'.

(Viii) ΔA'BC' is the required triangle.

15. Draw a circle of radius 6 cm. From a point 10 cm away from its centre, construct the pair of tangents to the circle and measure their lengths.



Solution:

Steps of construction

1. Draw a line segment of length AB = 10 cm. Bisect AB by constructing a perpendicular bisector of AB. Let M be the mid-point of AB.
2. With M as centre and AM as radius, draw a circle. Let it intersect the given circle at the points P and Q.
3. Join PB and QB. Thus PB and QB are the required two tangents.

Justification of construction:

Join AP. Here ∠ APB is an angle in the semi-circle. Therefore, ∠ APB = 90°. Since AP is a radius of a circle, PB has to be a tangent to a circle. Similarly, QB is also a tangent to a circle.

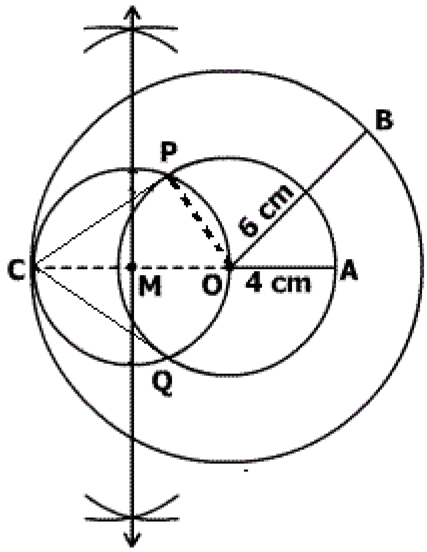
In a Rt Δ APB, $AB^2 = AP^2 + PB^2$ (By using pythagoras Theorem)

$PB^2 = AB^2 - AP^2 = 10^2 - 6^2 = 100 - 36 = 64$

∴ PB = 8 cm.

16. 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.

Transweb Educational Services Pvt Ltd
B -147, Sector -6 Noida, UP - 201301,
www.askiitians.com
Email: info@askiitians.com
Tel: 1800-2000-838



Solution:

Steps of construction

1. Draw a line segment of length OA = 4 cm. With O as centre and OA as radius, draw a circle.
2. With O as centre draw a concentric circle of radius 6 cm(OB).
3. Let C be any point on the circle of radius 6 cm, join OC.
4. Bisect OC such that M is the mid point of OC.
5. With M as centre and OM as radius, draw a circle. Let it intersect the given circle of radius 4 cm at the points P and Q.
6. Join CP and CQ. Thus CP and CQ are the required two tangents.

Justification of construction:

Join OP. Here ∠ OPC is an angle in the semi-circle. Therefore, ∠ OPC = 90°. Since OP is a radius of a circle, CP has to be a tangent to a circle. Similarly, CQ is also a tangent to a circle.

In Δ COP, Ð P = 90°

$\Rightarrow CO^2 = CP^2 + OP^2$

$\therefore CP^2 = CO^2 - OP^2 = 6^2 - 4^2$

$\therefore CP = 2\sqrt{5}$ cm

Transweb Educational Services Pvt Ltd
B -147, Sector -6 Noida, UP - 201301,
www.askiitians.com
Email: info@askiitians.com
Tel: 1800-2000-838

Q17.

To divide a line segment AB in the ratio p: q (p, q are positive

Integers) , draw a ray AX so that ∠BAX is an acute angle and then mark points on ray

AX at equal distances such that the minimum number of these points is

(A) Greater of p and q (B) p + q

© p + q – 1 (D) pq

Solution: Answer (B)

Q18.

To divide a line segment AB in the ratio 4 : 7, a ray AX is drawn first such that ∠BAX is an acute angle and then points A1,A2,A3 …... are located at equal distances on the ray AX and the point B is joined to:

- ○ A10
- ○ A12
- ○ A9
- ◉ A11

Ans. D
solution: End point of line segment is joined to the final point located on the ray

Q19

To draw a pair of tangents to a circle which are inclined to each other at an angle of 60°, it is required to draw tangents at end points of those two radii of the circle, the angle between them should be

(A) 135° (B) 90° (C) 60° (D) 120°

Ans D (Hint: 360-180-60=120)

Q20.

Two distinct tangents can be constructed from a point P to a circle of radius 2r situated at a distance:

- ○ Greater than r from the centre
- ○ 2r from the centre
- ○ less than 2r from the centre
- ◉ more than 2r from the centre

Ans D

Radius is 2r. So for two tangents point should be outside circle.