# BOARD OF SECONDARY EDUCATION (AP)

## SUMMATIVE ASSESSMENT – I

## TENTH CLASS MATHEMATICS MODEL PAPER

## PAPER – II (ENGLISH VERSION)

**Time: 2 hrs. 45 mins.** **PART – A & B** **Maximum Marks: 40**

**INSTRUCTIONS:**

i) **In the time duration of 2 hrs. 45 mins., 15 minutes of time is allotted to read and understand the question paper.**

ii) **Answer the questions under PART – A in a separate answer book.**

iii) **Write the answers to the questions under PART – B on the question paper itself and attach it to the answer book of PART – A.**

**Time: 2 hrs.** **PART – A** **Marks: 30**

**INSTRUCTIONS:**

i) **PART – A comprises of three Sections I, II, III.**

ii) **All the questions are compulsory.**

iii) **There is no overall choice. However, there is an internal choice to the questions under Section – III.**

### SECTION – I

**INSTRUCTIONS:**

i) **Answer ALL the questions.**

ii) **Each question carries ONE mark.** **$4 \times 1 = 4$**

**1.** Find the co–ordinates of the point which divides the line segment joining the points (–3, 4) and (5, 8) in the ratio 1 : 3 internally.

**2.** If $\sin(A - B) = \frac{1}{2}$, $\cos(A + B) = \frac{1}{2}$, $0^\circ < A + B \leq 90^\circ$, $A > B$, find A, B.

**3.** Sangeeta and Reshma play a tennis match. It is known that the probability of Sangeeta winning the match is 0.62. What is the probability of Reshma winning the match?

**4.** Write the principle to find mean in step deviation method and explain the terms in it.

### SECTION – II

**INSTRUCTIONS:**

i) **Answer ALL the questions.**

ii) **Each question carries TWO marks.** **$5 \times 2 = 10$**

**5.** Find the area of the triangle whose lengths of sides are 15 m, 17 m, 21 m. use Heron's formula.

**6.** Prove that a line joining the mid points of any two sides of a triangle is parallel to the third side.

**7.** Show that $\sqrt{\dfrac{1 + \cos\theta}{1 - \cos\theta}} = \operatorname{cosec}\theta + \cot\theta.$

**8.** 5 black, 3 red and 2 green balls are in a bag. What is the percentage of probability for taking a red ball at random.

**9.** Prepare the required table that is used to a less than Ogive of the following data.

| Classes | more than or equal to 5 | more than or equal to 10 | more than or equal to 15 | more than or equal to 20 | more than or equal to 25 |
|---|---|---|---|---|---|
| frequency | 30 | 28 | 16 | 14 | 12 |

## SECTION – III

**INSTRUCTIONS:**

**i) Answer ALL the questions.**

**ii) Each question carries FOUR marks.**

**iii) Each question has Internal Choice.** **4 × 4 = 16**

**10.** a) Show that the points (–4, –7), (–1, 2), (8, 5) and (5, –4) taken in order are the vertices of a rhombus and find its area.

**(OR)**

b) Prove that the parallelogram circumscribing a circle is Rhombus.

**11.** a) If $\operatorname{cosec}\theta + \cot\theta = k$ then find $\dfrac{k^2 - 1}{k^2 + 1}$.

**(OR)**

b) In a right angle triangle ABC, right angle at B, if $\tan A = \sqrt{3}$ than find the value of

i) sin A cos C + cos A sin C

ii) cos A cos C – sin A sin C

**12.** a) One card is drawn from a well-shuffled deck of 52 cards. Find the probability of getting

i) a black face card

ii) the jack of diamonds

iii) a red ace card

iv) a king of hearts

**(OR)**

b) If the median of 60 observations, given below is 28.5, find the values of x and y.

| Class Interval | 0 – 10 | 10 – 20 | 20 – 30 | 30 – 40 | 40 – 50 | 50 – 60 |
|---|---|---|---|---|---|---|
| Frequency | 5 | x | 20 | 15 | y | 5 |

**13.** a) Construct a triangle of sides 5 cm, 6 cm and 7 cm. Then construct a triangle similar to it whose sides are 3/4 of the corresponding sides of the first triangle.

**(OR)**

b) Draw a circle of radius 4 cm from a point 8 cm away from its centre, construct the pair of tangents to the circle.

**Time: 30 Minutes** **PART – B** **Marks: 10**

**INSTRUCTIONS:**

i) **Answer ALL the questions.**

ii) **Each question carries $\frac{1}{2}$ Mark.**

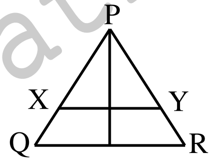
iii) **Answers are to be written in question paper only.**

iv) **Marks will not be awarded in any case of over writing and rewriting or erased answers.**

v) **Write the CAPITAL LETTER (A, B, C, D) showing the correct answer for the following questions in the brackets provided against them.**

**$20 \times \frac{1}{2} = 10$**

**14.** In the adjacent figure if PX : XQ = 3 : 1 then area of trapezium XYRQ : area of $\Delta$ PXY = ( )

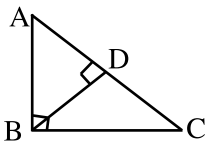



A) 1 : 3 B) 1 : 9 C) 9 : 7 D) 7 : 9

**15.** $\Delta$ ABC ~ $\Delta$ DEF. If AB = 11, BC = 10, DE = 5.5 cm, then EF = ......... cm. ( )

A) 4.5 B) 5 C) 10.5 D) 5.5

**16.** In the given figure, $\angle ABC = 90°$ and BD ⊥ AC if AB = 5.7, BD = 3.8 and CD = 5.4, then the value of BC = ( )




A) 6.1 B) 7.1 C) 8.1 D) 9.1

**17.** ABC is a triangle AB = AC, D is any point on BC then $AB^2 - AD^2$ = ( )

A) BD.CD B) BC.AD C) AB.AC D) AD.BD

**18.** If the line AB touches the circle with centre 'O' at 'P' then $\angle APO$ = ( )

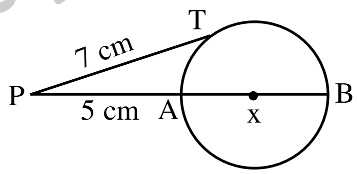
A) 30° B) 60° C) 90° D) 180°

**19.** The radius of a circle is 7 cm. The length of the tangent to the circle from an external point which is at a distance of 25 cm from the centre is ............ cm. ( )

A) 24 B) 14 C) 26 D) 16

**20.** In the figure, the value of x is ( )

A) 5.8 cm B) 6.8 cm
C) 4.8 cm D) 3.8 cm




**21.** $\sin^2 22\frac{1}{2}° + \sin^2 67\frac{1}{2}° =$ ( )

A) 0 B) –1 C) 1 D) can't find

**22.** If $\cos\theta = \frac{2x}{1+x^2}$, then $\tan\theta =$ ( )

A) $\frac{1}{1+x^2}$ B) $\frac{2x}{1-x^2}$ C) $\frac{1+x^2}{2x}$ D) $\frac{1-x^2}{2x}$

**23.** If cosec θ − cot θ = 5 then cosec θ = ( )

A) $\frac{5}{13}$ B) $\frac{13}{5}$ C) 1 D) 0

**24.** $\cos^2 5° + \cos^2 25° + \cos^2 65° + \cos^2 85° + \cos^2 90° =$ ( )

A) 0 B) 4 C) 1 D) 2

**25.** The probability of getting at least one head when a coin tossed twice is ( )

A) $\frac{1}{4}$ B) $\frac{1}{2}$ C) $\frac{3}{4}$ D) 1

**26.** One card is drawn from a well shuffled deck of 52 cards. The probability that the card will not be a face card is ( )

A) $\frac{10}{13}$ B) $\frac{3}{13}$ C) $\frac{1}{13}$ D) $\frac{9}{13}$

**27.** A dice is thrown. The probability of getting perfect number is ( )

A) 1 B) $\frac{1}{6}$ C) $\frac{1}{3}$ D) $\frac{1}{2}$

**28.** If 10 is added to each and every item of a data, then the arithmetic mean is ( )

A) increased by 10 B) increased by 10 times

C) not increased D) None

**29.** In hundred numbers 20 are fours, 40 are fives, 30 are sixes, remaining are tens then A.M. is ( )

A) 3.5 B) 5.6 C) 4.7 D) 5.8

**30.** Which of the following is useful to find median? ( )

A) Histogram B) Frequency curve

C) Ogive curves D) All

**31.** Angle made by the line with X − axis passing through (−a, a) and $(0, a + a\sqrt{3})$ is ( )

A) 60° B) 30° C) 45° D) 0°

**32.** Two vertices of a triangle are (−4, 6), (2, −2). If its centroid is (0, 3) find third vertex. ( )

A) (4, −6) B) (−2, 2) C) (−2, 5) D) (2, 5)

**33.** The centre of the circle is (2, −1). One end of the diameter is (5, 3), find the second end. ( )

A) (7, 2) B) (3, 4) C) (−1, −5) D) (3, 2)

# ANSWERS

## PART – A

## SECTION – I

**1. Find the co-ordinates of the point which divides the line segment joining the points (–3, 4) and (5, 8) in the ratio 1 : 3 internally.**

**A:** Given points are A (–3, 4); B (5, 8)

Ratio $m_1 : m_2 = 1 : 3$

$$\text{Required Point } P(x, y) = \left(\frac{m_1x_2 + m_2x_1}{m_1 + m_2}, \frac{m_1y_2 + m_2y_1}{m_1 + m_2}\right)$$

$$= \left(\frac{1 \times 5 + 3(-3)}{1 + 3}, \frac{1 \times 8 + 3 \times 4}{1 + 3}\right)$$

$$= (-1, 5)$$

**2. If $\sin (A - B) = \frac{1}{2}$, $\cos (A + B) = \frac{1}{2}$, $0° < A + B \leq 90°$, $A > B$, find A, B.**

**A.** Given $\sin (A - B) = \frac{1}{2} = \sin 30°$ and $\cos (A + B) = \frac{1}{2} = \cos 60°$

$\therefore A - B = 30°$

$A + B = 60°$

$2A = 90° \Rightarrow A = 45°$

Substitute $A = 45°$ in $A - B = 30°$, we get $B = 15°$

**3. Sangeeta and Reshma play a tennis match. It is known that the probability of Sangeeta winning the match is 0.62. What is the probability of Reshma winning the match?**

**A:** Given that the probability of Sangeeta winning the match is P(E) = 0.62

Probability of Reshma winning the match is P(F) = 1 – P(E)

= 1 – 0.62

= 0.38

**4. Write the principle to find mean in step deviation method and explain the terms in it.**

**A:** In step deviation method, mean $\overline{x} = a + \left(\frac{\Sigma f_i u_i}{\Sigma f_i}\right) \times h$

Here a = assumed mean

$f_i$ = frequencies

$u_i = \frac{x_i - a}{h}$

$x_i$ = mid values

h = height of the class

## SECTION – II

**5. Find the area of the triangle whose lengths of sides are 15 m, 17 m, 21 m. use Heron's formula.**

**A:** Sides of the triangle are a = 15 m, b = 17 m, c = 21 m

By Heron's formula,

Area of triangle = $\sqrt{s(s-a)(s-b)(s-c)}$

where $s = \frac{a+b+c}{2}$

$\therefore\ s = \frac{15+17+21}{2} = \frac{53}{2} = 26.5$

Area of triangle = $\sqrt{26.5(26.5-15)(26.5-17)(26.5-21)}$

$= \sqrt{26.5 \times 11.5 \times 9.5 \times 5.5}$

$= \sqrt{\frac{265}{10} \times \frac{115}{10} \times \frac{95}{10} \times \frac{55}{10}}$

$= \sqrt{\left(\frac{5}{10} \times 53\right) \times \left(\frac{5}{10} \times 23\right) \times \left(\frac{5}{10} \times 19\right) \times \left(\frac{5}{10} \times 11\right)}$

$= \frac{5}{10} \times \frac{5}{10} \times \sqrt{53 \times 23 \times 19 \times 11}$

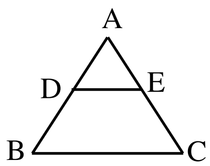
$= 0.25 \times \sqrt{254771}$

$= 0.25 \times 504.75$

$= 126.19$ sq.m.

**6. Prove that a line joining the mid points of any two sides of a triangle is parallel to the third side.**

**A:** Given: In Δ ABC, D and E mid points of AB, AC




To prove: DE // BC

Proof: Since D, E are mid points of AB, AC then AD = DB

$\Rightarrow \frac{AD}{DB} = 1 \longrightarrow (1)$

and also AE = EC $\Rightarrow \frac{AE}{EC} = 1 \longrightarrow (2)$

From (1) and (2) $\frac{AD}{DB} = \frac{AE}{EC}$

If a line divides the two sides in the same ratio then that line is parallel to third side.

∴ DE // BC

**7. Show that $\sqrt{\frac{1+\cos\theta}{1-\cos\theta}} = \operatorname{cosec}\theta + \cot\theta$.**

**A:** L.H.S. = $\sqrt{\frac{1+\cos\theta}{1-\cos\theta}}$

$$= \frac{\sqrt{1 + \cos\theta}}{\sqrt{1 - \cos\theta}}$$

Rationalising denominator, we get

$$= \frac{\sqrt{1 + \cos\theta}\ \sqrt{1 + \cos\theta}}{\sqrt{1 - \cos\theta}\ \sqrt{1 + \cos\theta}}$$

$$= \frac{\left(\sqrt{1 + \cos\theta}\right)^2}{\sqrt{1 - \cos^2\theta}}$$

$$= \frac{1 + \cos\theta}{\sqrt{\sin^2\theta}}$$

$$= \frac{1 + \cos\theta}{\sin\theta}$$

$$= \frac{1}{\sin\theta} + \frac{\cos\theta}{\sin\theta}$$

$= \operatorname{cosec}\theta + \cot\theta$ = RHS

**8. 5 black, 3 red and 2 green balls are in a bag. What is the percentage of probability for taking a red ball at random.**

**A:** Bag contains 5 black, 3 red and 2 green balls.

$\therefore$ Total number of balls = 5 + 3 + 2 = 10

Probability for taking a red ball = $\dfrac{\text{Number of favourable out comes to red}}{\text{Total number of out comes}} = \dfrac{3}{10}$

**9. Prepare the required table that is used to a less than Ogive of the following data.**

| Classes | more than or equal to 5 | more than or equal to 10 | more than or equal to 15 | more than or equal to 20 | more than or equal to 25 |
|---|---|---|---|---|---|
| frequency | 30 | 28 | 16 | 14 | 12 |

**A:** For less than Ogive we required

| **Classes** | **Frequency** | **Upper boundaries** | **Less than Cumulative frequency** |
|---|---|---|---|
| 5 – 10 | 30 | 10 | 30 |
| 10 – 15 | 28 | 15 | 58 |
| 15 – 20 | 16 | 20 | 74 |
| 20 – 25 | 14 | 25 | 88 |
| 25 – 30 | 12 | 30 | 100 |

## SECTION – III

**10. a) Show that the points (–4, –7), (–1, 2), (8, 5) and (5, –4) taken in order are the vertices of a rhombus and find its area.**

**A:** Let the points be A(–4, –7), B(–1, 2), C(8, 5), D(5, –4)

distance between $(x_1, y_1), (x_2, y_2) = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

distance between A(–4, –7), B(–1, 2) is $AB = \sqrt{(-1+4)^2 + (2+7)^2}$

$= \sqrt{(9 + 81)}$

$= \sqrt{90}$

distance between B(–1, 2), C(8, 5) is $BC = \sqrt{(8+1)^2 + (5-2)^2}$

$= \sqrt{81 + 9}$

$= \sqrt{90}$

distance between C(8, 5), D(5, –4) is $CD = \sqrt{(5-8)^2 + (-4-5)^2}$

$= \sqrt{9 + 81}$

$= \sqrt{90}$

distance between D(5, –4), A(–4, –7) is $DA = \sqrt{(-4-5)^2 + (-7+4)^2}$

$= \sqrt{81 + 9}$

$= \sqrt{90}$

distance between A(–4, –7), C(8, 5) is $AC = \sqrt{(8+4)^2 + (5+7)^2}$

$= \sqrt{144 + 144}$

$= \sqrt{288}$

distance between B(–1, 2), D(5, –4) is $BD = \sqrt{(5+1)^2 + (-4-2)^2}$

$= \sqrt{36 + 36}$

$= \sqrt{72}$

$\therefore AB = BC = CD = DA = \sqrt{90}$

$AC \neq BD$

Hence ABCD is rhombus.

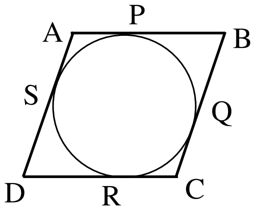
**(OR)**

**b) Prove that the parallelogram circumscribing a circle is rhombus.**

**A:** Given ABCD is a parallelogram.

AB // CD and AB = CD

AD // BC and AD = BC




To prove ABCD is a rhombus.

Since A is an external point AP and AS are two tangents.

AP = AS, Let AP = AS = x

similarly BP = BQ = y

CQ = CR = w

DS = DR = z

But AB = CD

$\Rightarrow x + y = z + w \longrightarrow (1)$

BC = DA

$\Rightarrow y + w = x + z$

$\Rightarrow x - y = w - z \longrightarrow (2)$

from (1) & (2)

$$\begin{array}{r} x + y = z + w \\ x - y = w - z \\ \hline 2x = 2w \end{array}$$

$\therefore x = w$

from (1), $x + y = z + w$

$x + y = z + x$

$\therefore y = z$

$BC = y + w$

$= z + x \quad (\because x = w, y = z)$

$\therefore BC = AB$

$\therefore AB = BC = CD = DA$

$\therefore$ ABCD is a rhombus.

**11.** a) If $\operatorname{cosec}\theta + \cot\theta = k$ then find $\dfrac{k^2 - 1}{k^2 + 1.}$

**A:** Given $\operatorname{cosec}\theta + \cot\theta = k$

$\Rightarrow k^2 = (\operatorname{cosec}\theta + \cot\theta)^2$

$= \operatorname{cosec}^2\theta + \cot^2\theta + 2\operatorname{cosec}\theta \cdot \cot\theta$

$k^2 - 1 = \operatorname{cosec}^2\theta + \cot^2\theta + 2\operatorname{cosec}\theta \cdot \cot\theta - 1$

$= \operatorname{cosec}^2\theta - 1 + \cot^2\theta + 2\operatorname{cosec}\theta \cdot \cot\theta$

$= \cot^2\theta + \cot^2\theta + 2\operatorname{cosec}\theta \cdot \cot\theta$

$= 2\cot^2\theta + 2\operatorname{cosce}\theta \cdot \cot\theta$

$= 2\cot\theta(\cot\theta + \operatorname{cosec}\theta)$

$k^2 + 1 = \operatorname{cosec}^2\theta + \cot^2\theta + 2\operatorname{cosec}\theta \cdot \cot\theta + 1$

$= \operatorname{cosec}^2\theta + \cot^2\theta + 1 + 2\operatorname{cosec}\theta \cdot \cot\theta$

$= \operatorname{cosec}^2\theta + \operatorname{cosec}^2\theta + 2\operatorname{cosec}\theta \cdot \cot\theta$

$= 2\operatorname{cosec}^2\theta + 2\operatorname{cosce}\theta \cdot \cot\theta$

$= 2\operatorname{cosec}\theta(\operatorname{cosec}\theta + \cot\theta)$

$\therefore \dfrac{k^2 - 1}{k^2 + 1} = \dfrac{2\cot\theta(\cot\theta + \operatorname{cosec}\theta)}{2\operatorname{cosec}\theta(\operatorname{cosec}\theta + \cot\theta)}$

$$= \cot\theta \ \frac{1}{\text{cosec}\,\theta}$$

$$= \frac{\cos\theta}{\sin\theta} . \ \sin\theta$$

$$= \cos\theta$$

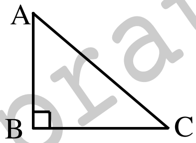
**(OR)**

**b) In a right angle triangle ABC, right angle at B, if tan A = $\sqrt{3}$ than find the value of**

**i) sin A cos C + cos A sin C**

**ii) cos A cos C – sin A sin C**

**A:** Given that ABC is a right angled triangle and $\angle B = 90°$




$\tan A = \sqrt{3} = \tan 60°$

$\therefore\ A = 60°$

then $C = 30°\ (90° - 60°)$

i) $\sin A \cos C + \cos A \sin C = \sin 60° \cos 30° + \cos 60° . \sin 30°$

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

$$= \frac{3}{4} + \frac{1}{4} \quad = \frac{3+1}{4} = \frac{4}{4} = 1$$

ii) $\cos A \cos C - \sin A \sin C = \cos 60°. \cos 30° - \sin 60° . \sin 30°$

$$= \frac{1}{2} . \frac{\sqrt{3}}{2} - \frac{\sqrt{3}}{2} . \frac{1}{2}$$

$$= \frac{\sqrt{3}}{4} - \frac{\sqrt{3}}{4} = 0$$

**12. a) One card is drawn from a well-shuffled deck of 52 cards. Find the probability of getting**

**i) a black face card**

**ii) the jack of diamonds**

**iii) a red ace card**

**iv) a king of hearts**

**A:** Total no.of cards = 52

$$\text{Probability} = \frac{\text{No.of favourable out comes}}{\text{Total No.of out comes}}$$

i) No. of black face cards = 6

$$\left.\begin{array}{l}\text{Probability of getting}\\ \text{a black face card}\end{array}\right\} = \frac{6}{52} = \frac{3}{6}$$

ii) No. of jack of diamonds = 1

$$\left.\begin{array}{l}\text{Probability of getting}\\ \text{the jack of diamonds}\end{array}\right\} = \frac{1}{52}$$

iii) No. of red colour ace cards = 2

Probability of getting a red ace card $= \frac{2}{52} = \frac{1}{26}$

iv) No. of king of hearts = 1

Probability of getting the king of hearts $= \frac{1}{52}$

**(OR)**

**b) If the median of 60 observations, given below is 28.5, find the values of x and y.**

| Class Interval | 0 – 10 | 10 – 20 | 20 – 30 | 30 – 40 | 40 – 50 | 50 – 60 |
|---|---|---|---|---|---|---|
| Frequency | 5 | x | 20 | 15 | y | 5 |

**A:**

| **Class Interval** | **Frequency** | **Less than cumulative frequency** | |
|---|---|---|---|
| 0 – 10 | 5 | 5 | |
| 10 – 20 | x | 5 + x | |
| 20 – 30 | 20 | 25 + x | – Median class |
| 30 – 40 | 15 | 40 + x | |
| 40 – 50 | y | 40 + x + y | |
| 50 – 60 | 5 | 45 + x + y | |
| Total | 45 + x + y | | |

Since total No.of observations = 60

$\therefore 45 + x + y = 60$

$\Rightarrow x + y = 15 \longrightarrow (1)$

$n = 60 \Rightarrow \frac{n}{2} = 30, f = 20; cf = 5 + x$

$l = \frac{20 + 20}{2} = 20; h = 10$

$$\text{Median} = l + \frac{\frac{n}{2} - cf}{f} \times h$$

$$28.5 = 20 + \frac{30 - 5 - x}{20} \times 10$$

$$28.5 - 20 = \frac{25 - x}{2}$$

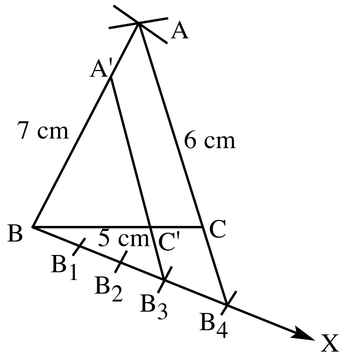
$8.5 \times 2 = 25 - x$

$\therefore x = 25 - 17 = 8$

$\Rightarrow y = 7$ (from 1)

**13. a) Construct a triangle of sides 5 cm, 6 cm and 7 cm. Then construct a triangle similar to it whose sides are 3/4 of the corresponding sides of the first triangle.**

**A:** Sides of a triangle are 5 cm, 6 cm and 7 cm




**Steps:**

1. Draw ΔABC with AB = 7 cm, BC = 5 cm and AC = 6 cm.

2. Draw a ray BX making an acute angle with BC on the side opposite to vertex A.

3. Locate 4 points $B_1$, $B_2$, $B_3$, $B_4$ on BX such that $BB_1 = B_1B_2 = B_2B_3 = B_3B_4$

4. Join $B_4$, C and draw a line from $B_3$ parallel to $B_4C$ intersecting BC at C'.

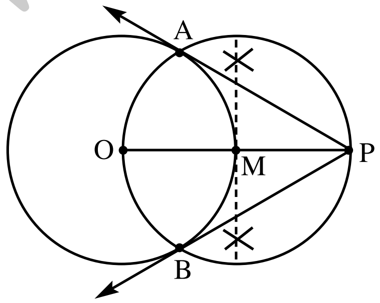
5. Draw a line through C' parallel to CA to intersect AB at A'.

So A' BC' is the required triangle

**(OR)**

**b) Draw a circle of radius 4 cm from a point 8 cm away from its centre, construct the pair of tangents to the circle.**

**A:**




**Construction Steps:**

1. Draw a circle of radius 4 cm with centre 'O'.

2. P is a point 8 cm away from centre 'O'.

3. Join O, P and draw perpendicular bisector of $\overline{OP}$.

4. M is the mid point of OP.

5. Draw a circle with centre M, whose radius MP = OM.

6. Two Circles are intersecting at A and B.

7. Join P, A; P,B.

8. Required tangents are PA and PB

**PART - B ANSWERS**

14-D; 15-B; 16-A; 17-A; 18-C; 19-A; 20-C; 21-C; 22-D; 23-B; 24-D; 25-C; 26-A; 27-B; 28-A; 29-B; 30-C; 31-A; 32-D; 33-C.

**Writer: Dr. T.S.V.S. Suryanarayana Murty**