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## SOLUTIONS : 10<sup>th</sup> CBSE MATHS 2023 STANDARD SET 1 CODE 30/5/1

### SECTION A

This section comprises multiple choice questions (MCQs) of 1 mark each.

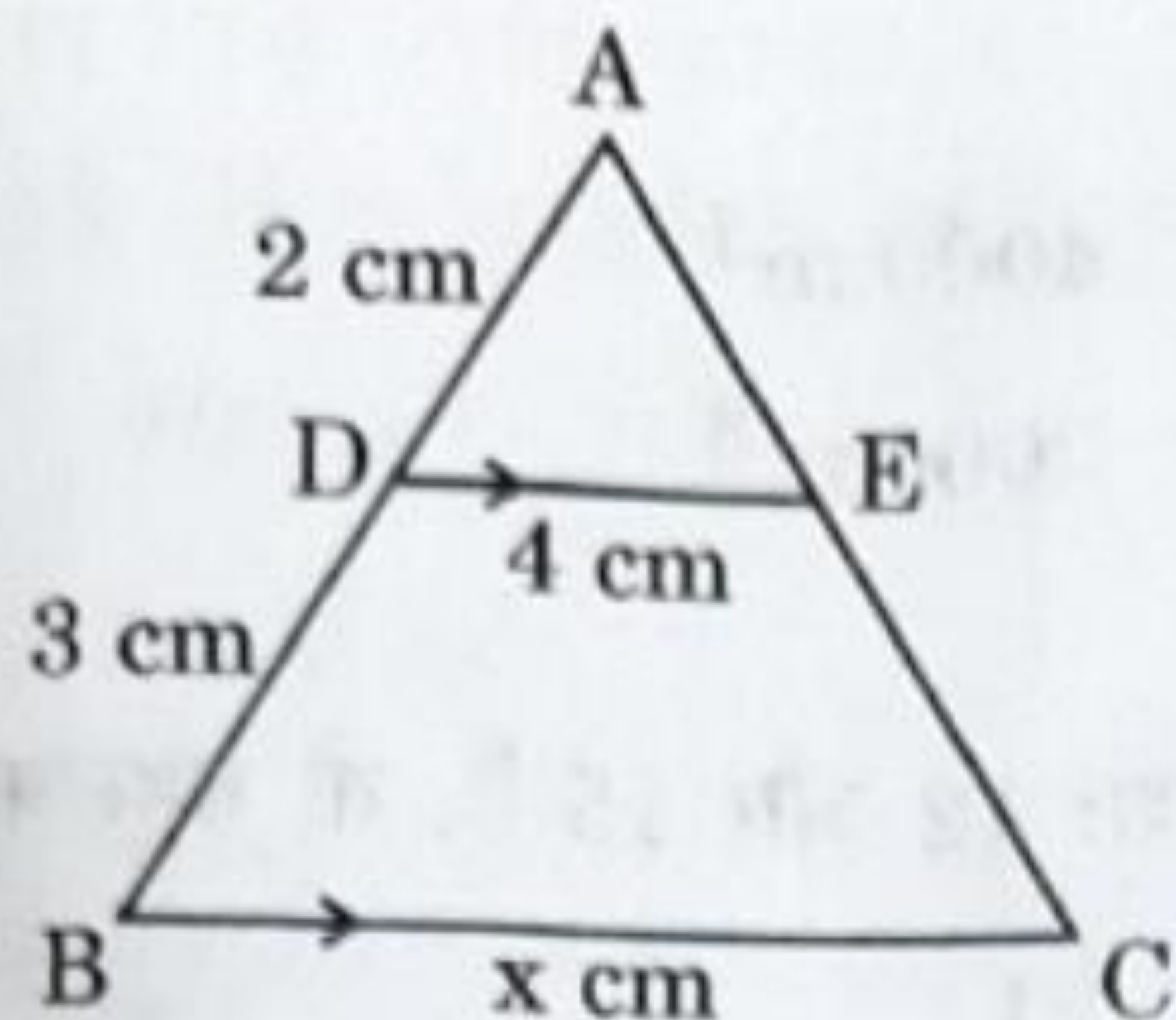
- The number of polynomials having zeroes  $-3$  and  $5$  is :  
 (a) only one  
 (b) ☒ infinite (B) obvious  
 (c) exactly two  
 (d) at most two
- The pair of equations  $ax + 2y = 9$  and  $3x + by = 18$  represent parallel lines, where  $a, b$  are integers, if :  
 (a)  $a = b$   
 (b)  $3a = 2b$   
 (c)  $2a = 3b$   
 (d) ☒  $ab = 6$  (D)  $\frac{a}{3} = \frac{2}{b} \neq \frac{1}{2} \Rightarrow ab = 6$
- The common difference of the A.P. whose  $n^{\text{th}}$  term is given by  $a_n = 3n + 7$ , is :  
 (a) 7  
 (b) ☒ 3 (B)  
 (c)  $3n$   
 (d) 1

30/5/1

Page 3

P.T.O.

4. In the given figure,  $DE \parallel BC$ . The value of  $x$  is :



$$\frac{2}{5} = \frac{4}{x} \Rightarrow \boxed{x = 10}$$

(D)

- A quadratic equation whose roots are  $(2 + \sqrt{3})$  and  $(2 - \sqrt{3})$  is :  
 (a) ☒  $x^2 - 4x + 1 = 0$  (A)  
 (b)  $x^2 + 4x + 1 = 0$   
 (c)  $4x^2 - 3 = 0$   
 (d)  $x^2 - 1 = 0$

Sum of zeroes = 4

Product = 1



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6. If  $\tan \theta = \frac{5}{12}$ , then the value of  $\frac{\sin \theta + \cos \theta}{\sin \theta - \cos \theta}$  is :

(a) ☒  $-\frac{17}{7}$

(c)  $\frac{17}{13}$

(b)  $\frac{17}{7}$

(d)  $-\frac{7}{13}$

(A)

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

$$= \frac{5/12 + 1}{5/12 - 1} = -\frac{17}{7}$$

7. The distance between the points  $P\left(-\frac{11}{3}, 5\right)$  and  $Q\left(-\frac{2}{3}, 5\right)$  is :

(a) 6 units

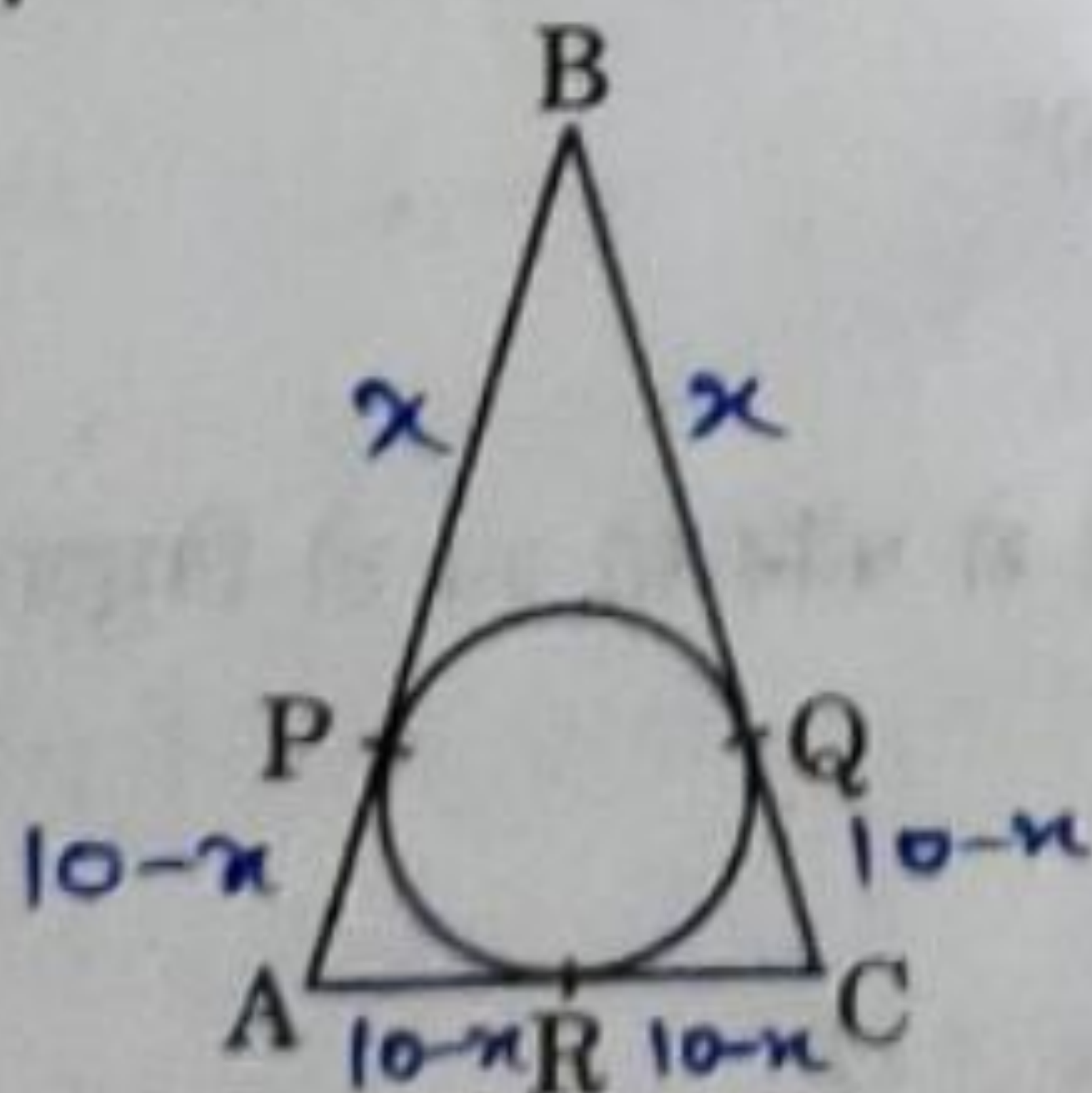
(c) 2 units

(b) 4 units

(d) ☒ 3 units

(D)

8. In the given figure,  $AB = BC = 10$  cm. If  $AC = 7$  cm, then the length of  $BP$  is :



$$20 - 2x = 7$$

$$2x = 13$$

$$x = 6.5$$

(a) 3.5 cm

(d) ☒ 6.5 cm

(b) 7 cm

(d) 5 cm

(C)

(C)

9. Water in a river which is 3 m deep and 40 m wide is flowing at the rate of 2 km/h. How much water will fall into the sea in 2 minutes ?

(a) 800 m<sup>3</sup>

(c) ☒ 8000 m<sup>3</sup>

(b) 4000 m<sup>3</sup>

(d) 2000 m<sup>3</sup>

(C)

10. If the mean and the median of a data are 12 and 15 respectively, then its mode is :

(a) 13.5

(c) 6

(B)

(b) ☒ 21

(d) 14

$$3(\text{med}) - 2(\text{mean}) = \text{mode}$$

$$3(15) - 2(12) = \text{mode}$$

$$45 - 24 = \text{mode}$$

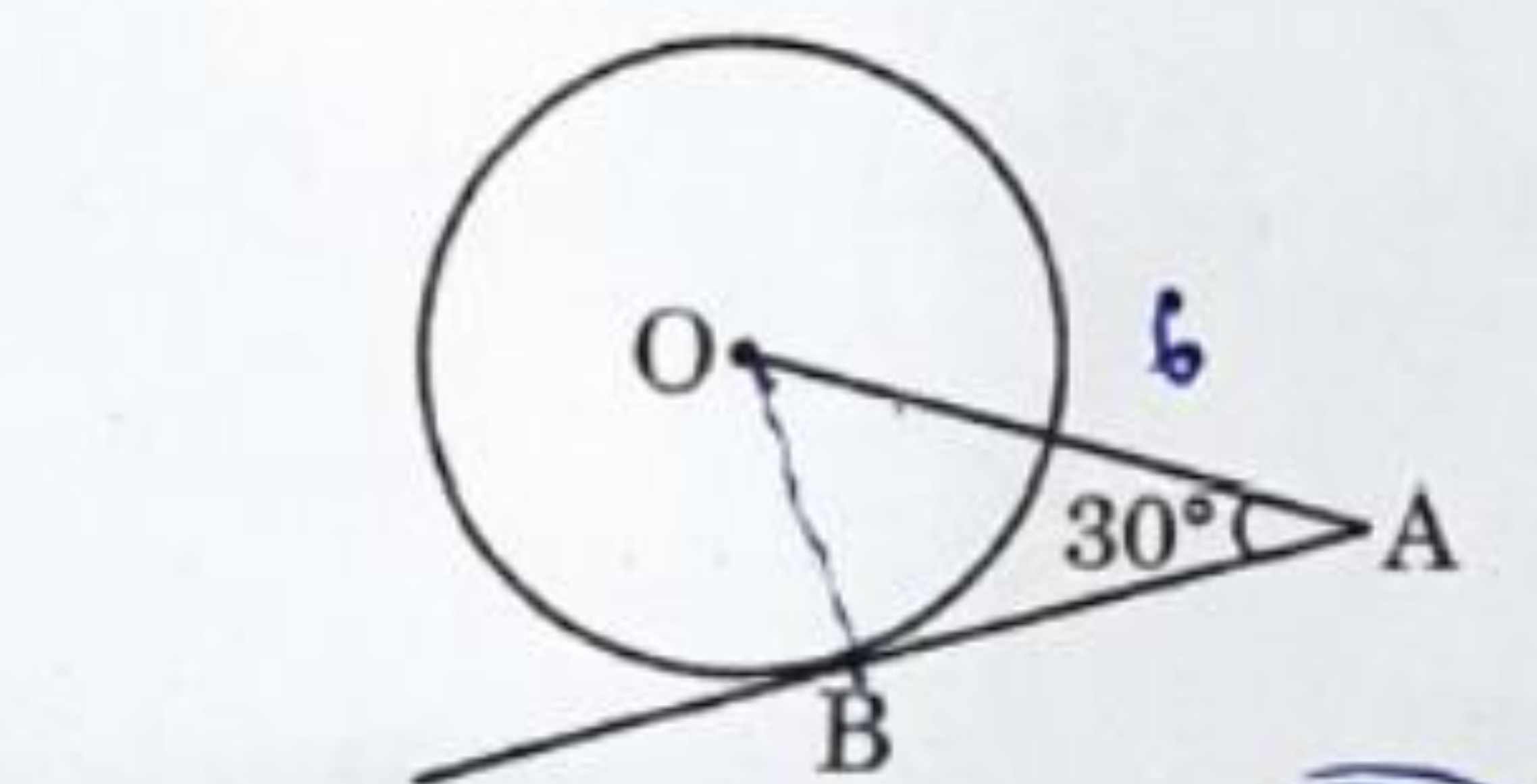
$$21 = \text{mode}$$



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11. In the given figure, AB is a tangent to the circle centered at O. If  $OA = 6$  cm and  $\angle OAB = 30^\circ$ , then the radius of the circle is :



$$OB = 6 \sin 30^\circ = 3$$

- (a) 3 cm (b)  $3\sqrt{3}$  cm  
(c) 2 cm (d)  $\sqrt{3}$  cm
12.  $\left( \frac{2 \tan 30^\circ}{1 + \tan^2 30^\circ} \right)$  is equal to :
- (a)  $\sin 60^\circ$  (b)  $\cos 60^\circ$   
(c)  $\tan 60^\circ$  (d)  $\sin 30^\circ$
13. In  $\triangle ABC$  and  $\triangle DEF$ ,  $\frac{AB}{DE} = \frac{BC}{FD}$ . Which of the following makes the two triangles similar ?

- (a)  $\angle A = \angle D$  (b)  $\angle B = \angle D$   
(c)  $\angle B = \angle E$  (d)  $\angle A = \angle F$

14. The 11<sup>th</sup> term from the end of the A.P. : 10, 7, 4, ....., -62 is :

- (a) 25 (b) 16  
(c) -32 (d) 0

$$T_{11}(\text{end}) = -62 + 10(3) = -32$$

15. Two coins are tossed together. The probability of getting at least one tail is :

- (a)  $\frac{1}{4}$  (b)  $\frac{1}{2}$   
(c)  $\frac{3}{4}$  (d) 1

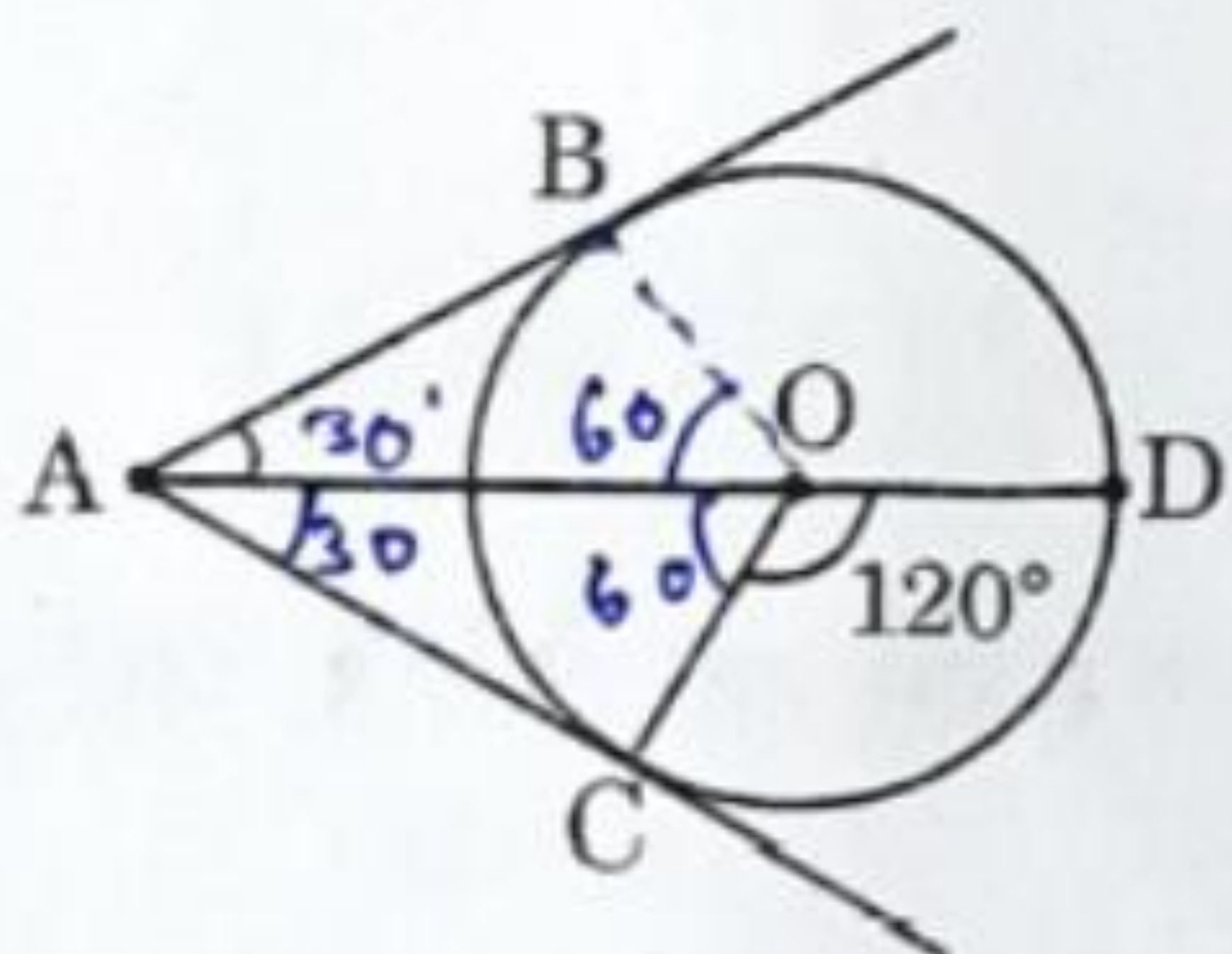
$$\begin{aligned} \text{at least one tail} &= TH, HT, TT \\ P &= \frac{3}{4} \end{aligned}$$



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16. In the given figure, AC and AB are tangents to a circle centered at O. If  $\angle COD = 120^\circ$ , then  $\angle BAO$  is equal to :



(A)

- (a) ☒  $30^\circ$  (b)  $60^\circ$   
(c)  $45^\circ$  (d)  $90^\circ$
17. Which of the following numbers **cannot** be the probability of happening of an event ?

(a) 0

(b) ☒  $\frac{7}{0.01}$  (it is more than 1)

(c) 0.07

(d)  $\frac{0.07}{3}$

18. If every term of the statistical data consisting of  $n$  terms is decreased by 2, then the mean of the data :

(a) ☒ decreases by 2

(A)

(b) remains unchanged

(c) decreases by  $2n$

(d) decreases by 1

19. Assertion (A) : If the points A(4, 3) and B(x, 5) lie on a circle with centre O(2, 3), then the value of  $x$  is 2. T

Reason (R) : Centre of a circle is the mid-point of each chord of the circle. F

(C)

20. Assertion (A) : The number  $5^n$  cannot end with the digit 0, where  $n$  is a natural number. T

Reason (R) : Prime factorisation of 5 has only two factors, 1 and 5. T

(A)



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21. (a) The line segment joining the points A(4, -5) and B(4, 5) is divided by the point P such that AP : AB = 2 : 5. Find the coordinates of P.

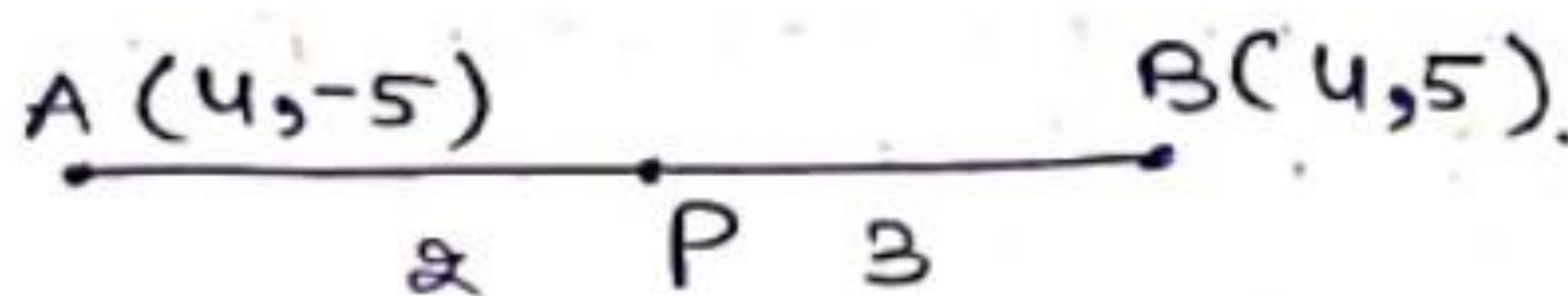
Set-3  
25

OR

(4, -1)

- (b) Point P(x, y) is equidistant from points A(5, 1) and B(1, 5). Prove that x = y.

Q. 21

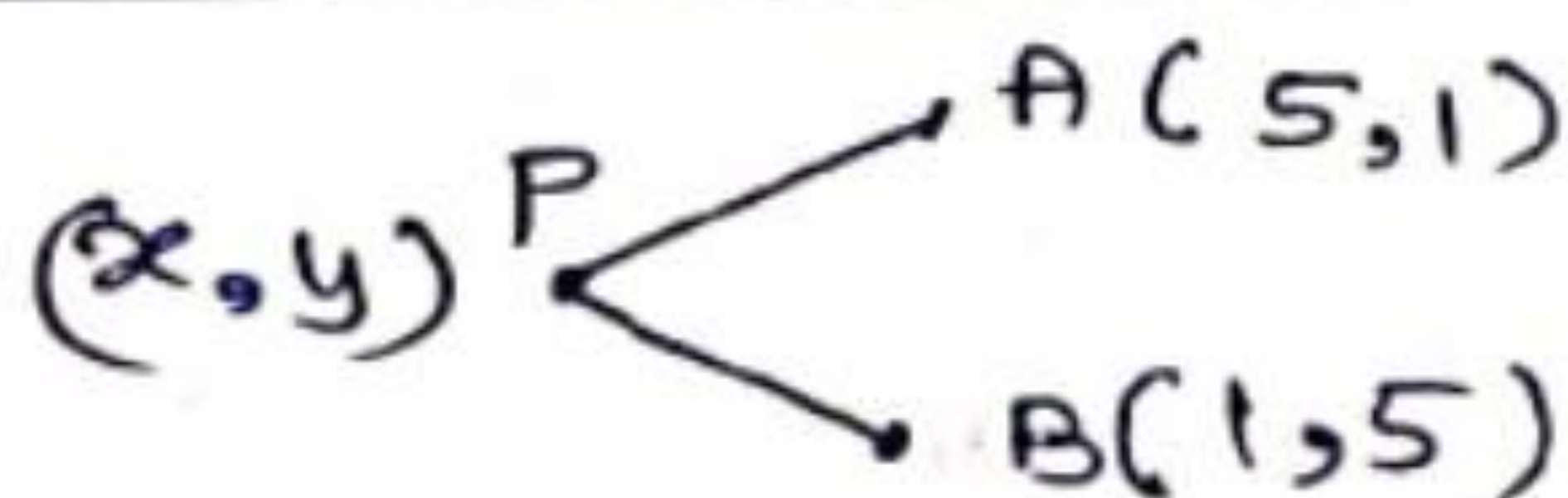


$$\frac{AP}{AB} = \frac{2}{5} \Rightarrow \frac{AP}{PB} = \frac{2}{3}$$

$$\Rightarrow P = \left( \frac{12+8}{5}, \frac{-15+10}{5} \right) \quad (\text{section formula})$$

$$= (4, -1) \text{ Ans.}$$

21 (OR)



$$PA^2 = PB^2$$

$$\Rightarrow (x-5)^2 + (y-1)^2 = (x-1)^2 + (y-5)^2$$

$$\Rightarrow \cancel{x^2} + \cancel{y^2} - 10x - 2y + 26 = \cancel{x^2} + \cancel{y^2} - 2x - 10y + 26$$

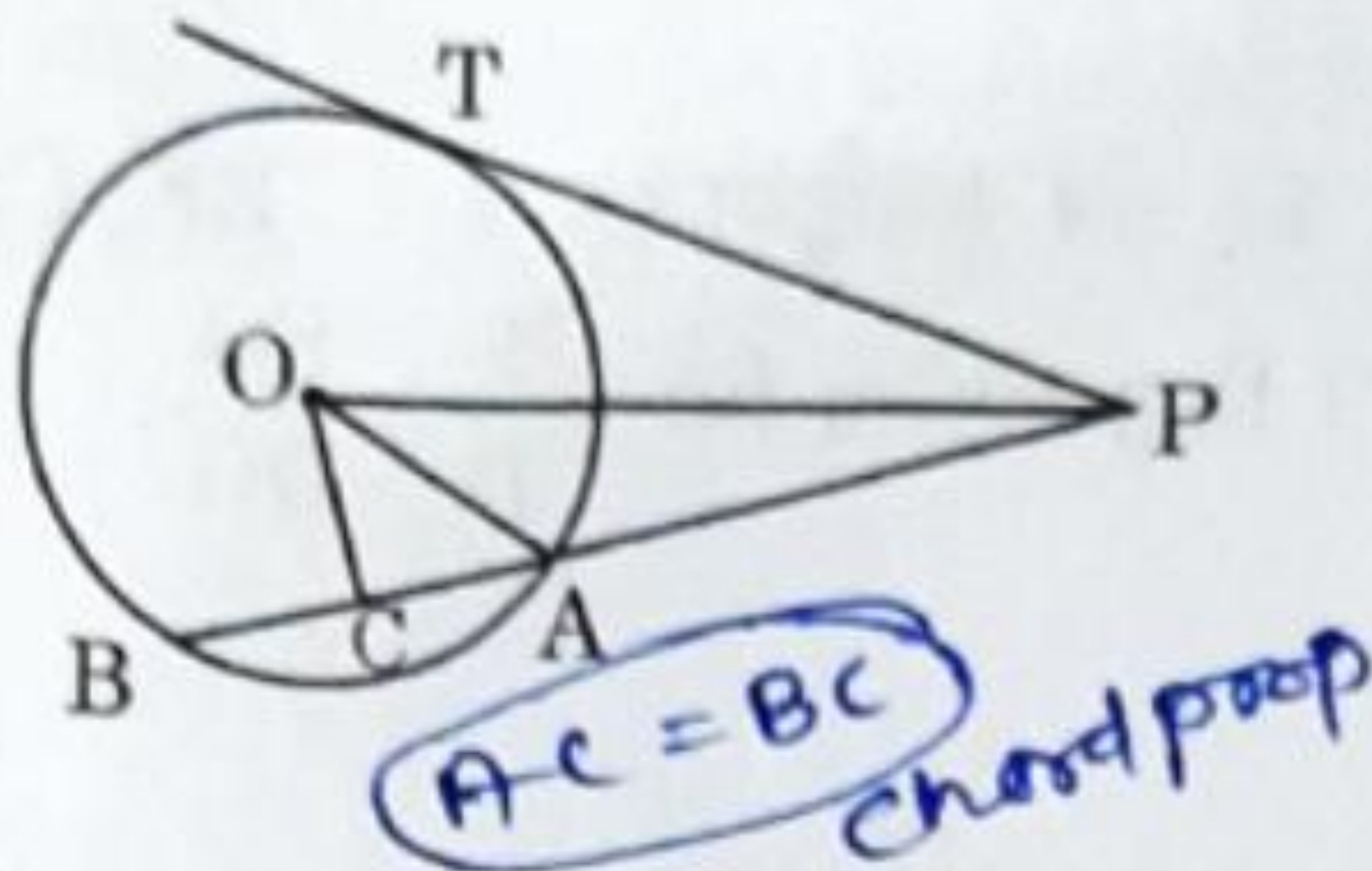
$$\Rightarrow -8x = -8y \Rightarrow \boxed{x=y} \text{ Hence Proved}$$



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22. In the given figure, PT is a tangent to the circle centered at O. OC is perpendicular to chord AB. Prove that  $PA \cdot PB = PC^2 - AC^2$ .



$$\begin{aligned} PC^2 - AC^2 &= (PC - AC)(PC + AC) \\ &= (PA)(PC + BC) \\ &= \underline{PA \cdot PB} \end{aligned}$$

23. Using prime factorisation, find HCF and LCM of 96 and 120.

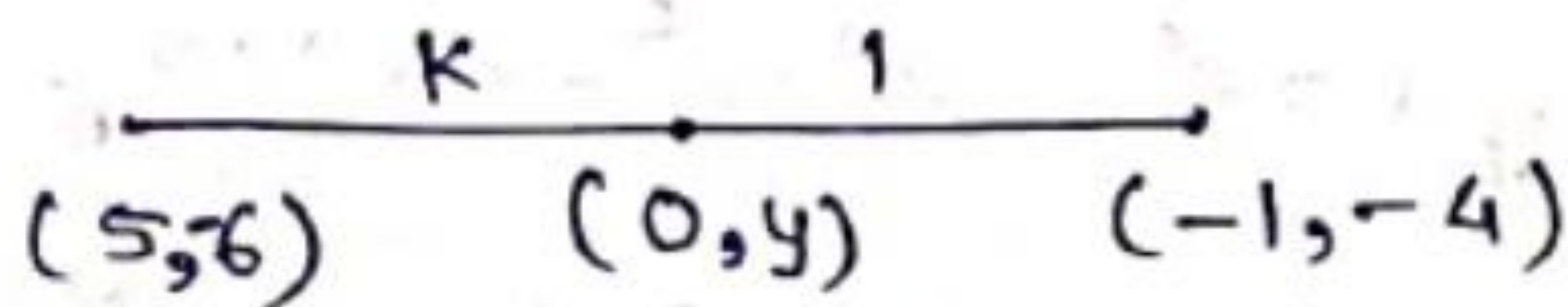
$$96 = 2^5 \times 3, \quad 120 = 2^3 \times 3 \times 5 \Rightarrow \begin{aligned} \text{HCF} &= 2^3 \times 3 = 24 \\ \text{LCM} &= 2^5 \times 3 \times 5 = 480 \end{aligned}$$

24. Find the ratio in which y-axis divides the line segment joining the points (5, -6) and (-1, -4).

SET-23  
Q.23

5:1

Q. 24



any point on y axis is (0, y)

Let (0, y) divides the line seg into ratio k:1

$$\Rightarrow 0 = \frac{-k + 5}{k + 1} \Rightarrow k = 5$$

Ratio = 5:1

Ans. 5:1

25. (a) If  $a \cos \theta + b \sin \theta = m$  and  $a \sin \theta - b \cos \theta = n$ , then prove that  $a^2 + b^2 = m^2 + n^2$ .

Square & add

OR

- (b) Prove that :

$$\sqrt{\frac{\sec A - 1}{\sec A + 1}} + \sqrt{\frac{\sec A + 1}{\sec A - 1}} = 2 \operatorname{cosec} A$$

Set-3  
22



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25

a

$$a \cos \theta + b \sin \theta = m \quad \text{--- (1)}$$

$$a \sin \theta - b \cos \theta = n \quad \text{--- (2)}$$

$$\textcircled{1}^2 + \textcircled{2}^2 \Rightarrow (a \cos \theta + b \sin \theta)^2 + (a \sin \theta - b \cos \theta)^2 = m^2 + n^2$$

$$\Rightarrow a^2 \cos^2 \theta + 2ab \sin \theta \cos \theta + b^2 \sin^2 \theta + a^2 \sin^2 \theta - 2ab \sin \theta \cos \theta + b^2 \cos^2 \theta = m^2 + n^2$$

$$\Rightarrow \underline{a^2 + b^2 = m^2 + n^2}$$

OR

25

(b)

$$\text{LHS} = \sqrt{\frac{\sec A - 1}{\sec A + 1}} + \sqrt{\frac{\sec A + 1}{\sec A - 1}}$$

$$= \frac{\sec A - 1}{\tan A} + \frac{\sec A + 1}{\tan A}$$

(multiply num & den  
of both by  $\sec A - 1$  &  
 $\sec A + 1$ , resp)

$$= \frac{2 \sec A}{\tan A}$$

$$= \frac{2}{\sin A} = 2 \operatorname{cosec} A = \text{RHS}$$

(Hence Proved)

26. (a) Prove that  $\sqrt{3}$  is an irrational number.**OR**SE 9-3  
30

(b) The traffic lights at three different road crossings change after every 48 seconds, 72 seconds and 108 seconds respectively. If they change simultaneously at 7 a.m., at what time will they change together next?



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26

(a) Refer NCERT (it's simple Q, repeated Q)

OR

b) we need to find LCM in this Q.

$$\text{LCM}(48, 72, 108) = ?$$

$$48 = 2^4 \times 3$$

$$72 = 2^3 \times 3^2$$

$$108 = 2^2 \times 3^3$$

$$\text{LCM} = 2^4 \times 3^3 = 16 \times 27$$

$$= \underline{432}$$

$$432 \text{ seconds} = \frac{432}{60} = 7 + \frac{12}{60}$$

$$= 7 \text{ min } 12 \text{ sec.}$$

So the time when they change simultaneously after 7 AM is

$$= \underline{07:07:12 \text{ A-M}}$$

27. If  $p^{\text{th}}$  term of an A.P. is  $q$  and  $q^{\text{th}}$  term is  $p$ , then prove that its  $n^{\text{th}}$  term is  $(p + q - n)$ .

$$q = a + (p-1)d \quad \text{--- (1)}$$

$$p = a + (q-1)d \quad \text{--- (2)}$$

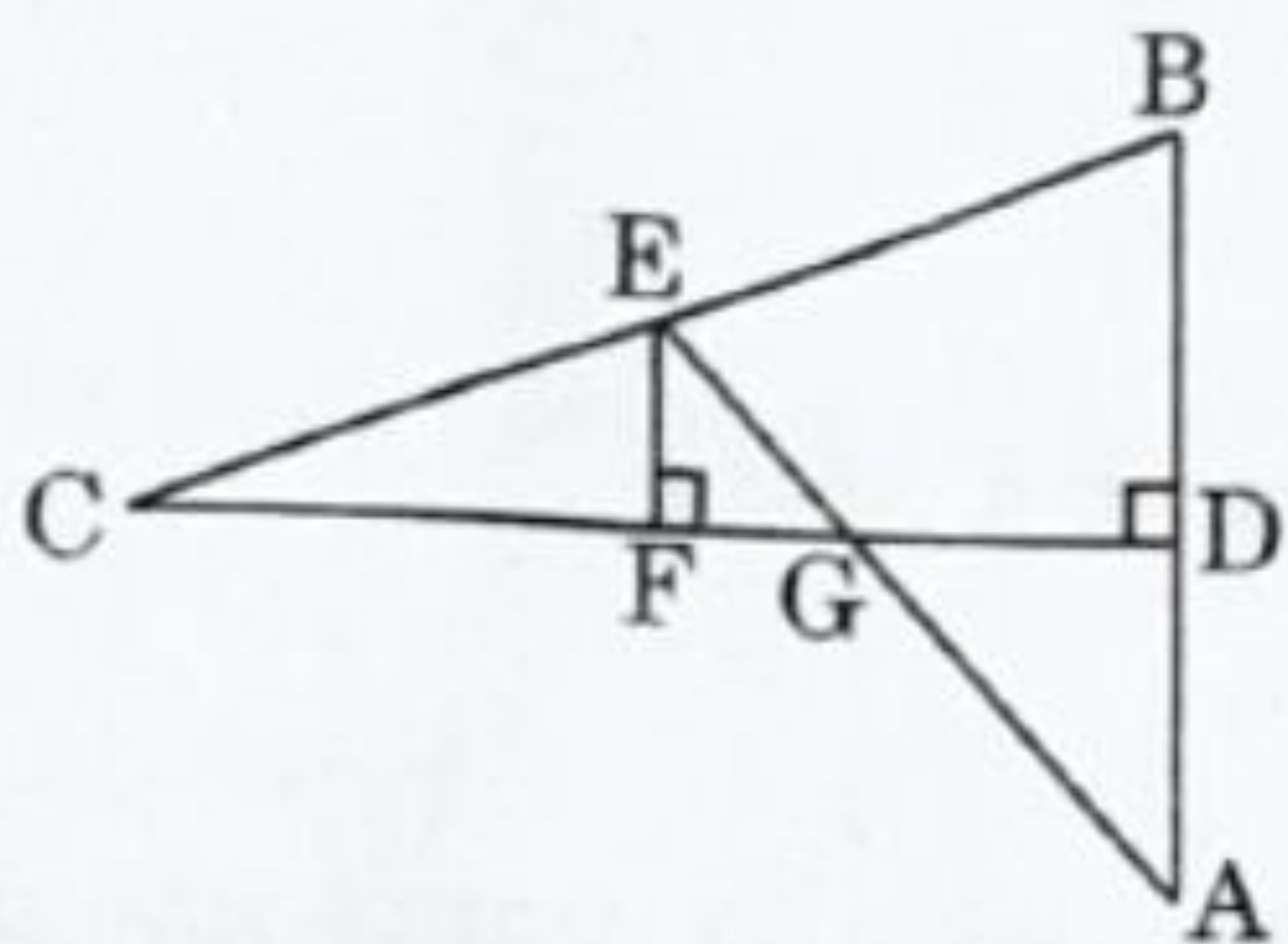
$$\text{①} - \text{②} \Rightarrow d = -1, \quad a = q + p - 1$$

$$T_n = q + p - 1 + (n-1)(-1)$$

$$= q + p - 1 - n + 1$$

$$= p + q - n$$

28. (a) In the given figure, CD is the perpendicular bisector of AB. EF is perpendicular to CD. AE intersects CD at G. Prove that  $\frac{CF}{CD} = \frac{FG}{DG}$ .



OR

SET-3  
30

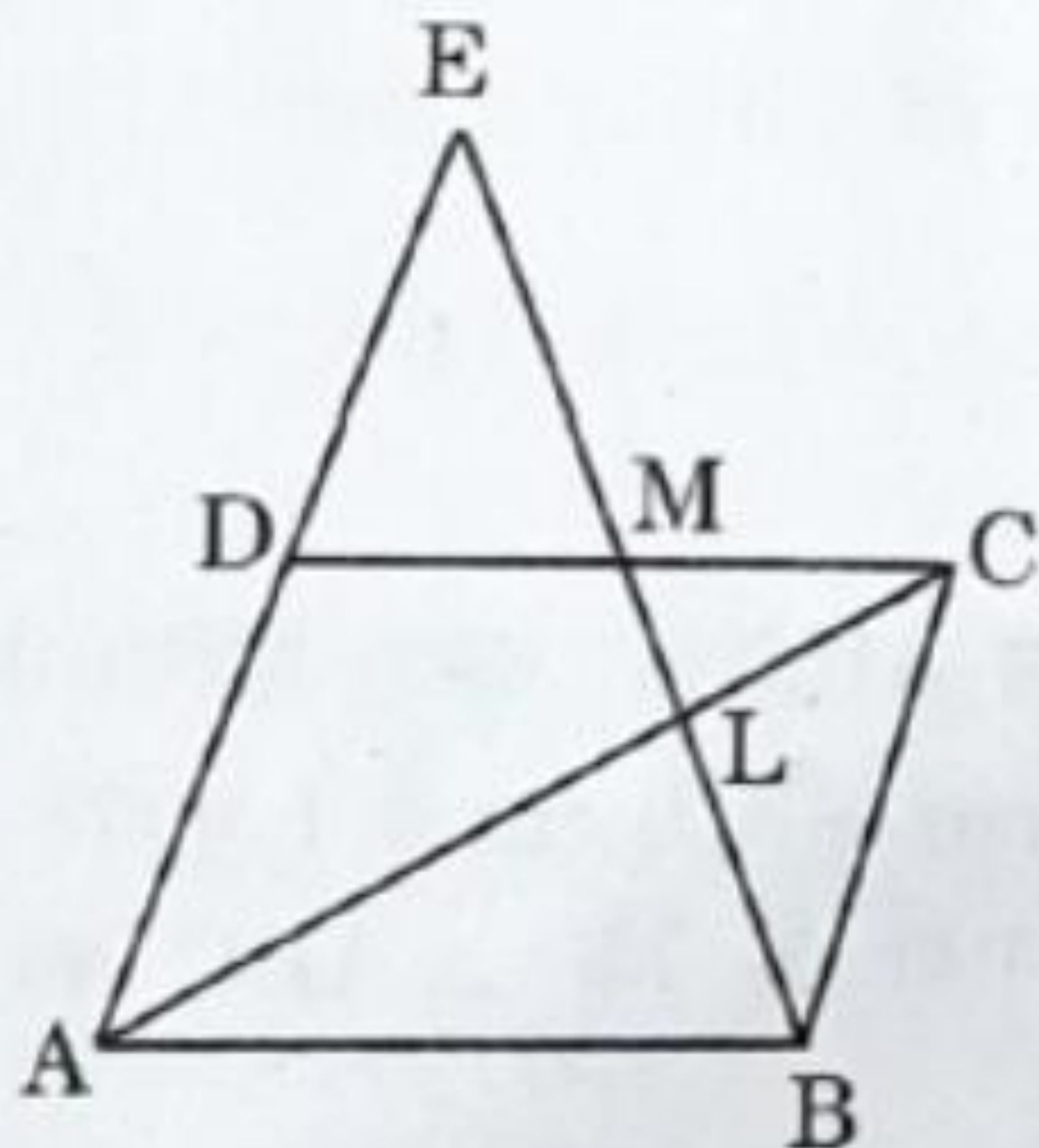


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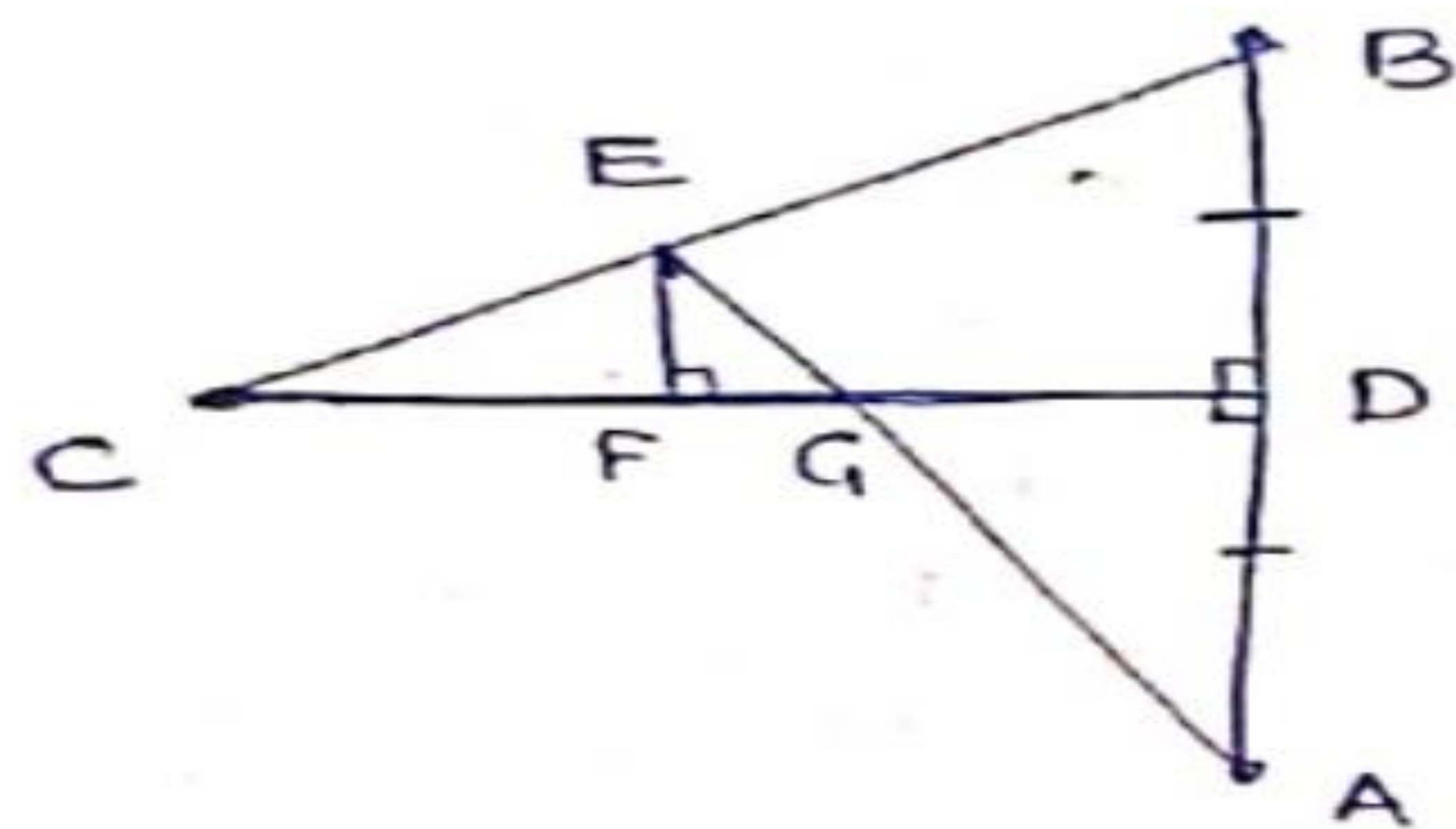
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28

- (b) In the given figure, ABCD is a parallelogram. BE bisects CD at M and intersects AC at L. Prove that  $EL = 2BL$ .



28



$AD = BD$  (given)

To prove:  $\frac{CF}{CD} = \frac{FG}{DQ}$

Sol<sup>n</sup>

$$\textcircled{1} \quad \triangle CFE \sim \triangle CDB \quad (AA)$$

$$\Rightarrow \frac{CF}{CD} = \frac{FE}{DB} \quad (CPST)$$

$$\Rightarrow \frac{CF}{CD} = \frac{FE}{DA} \quad (AD = BD) \quad \text{---} \textcircled{1}$$

$$\textcircled{2} \quad \triangle FEG \sim \triangle DAG \quad (AA)$$

$$\Rightarrow \frac{FE}{DA} = \frac{FG}{DQ} \quad \text{---} \textcircled{2}$$

from  $\textcircled{1}$  &  $\textcircled{2}$

$$\boxed{\frac{CF}{CD} = \frac{FG}{DQ}}$$

Hence Proved

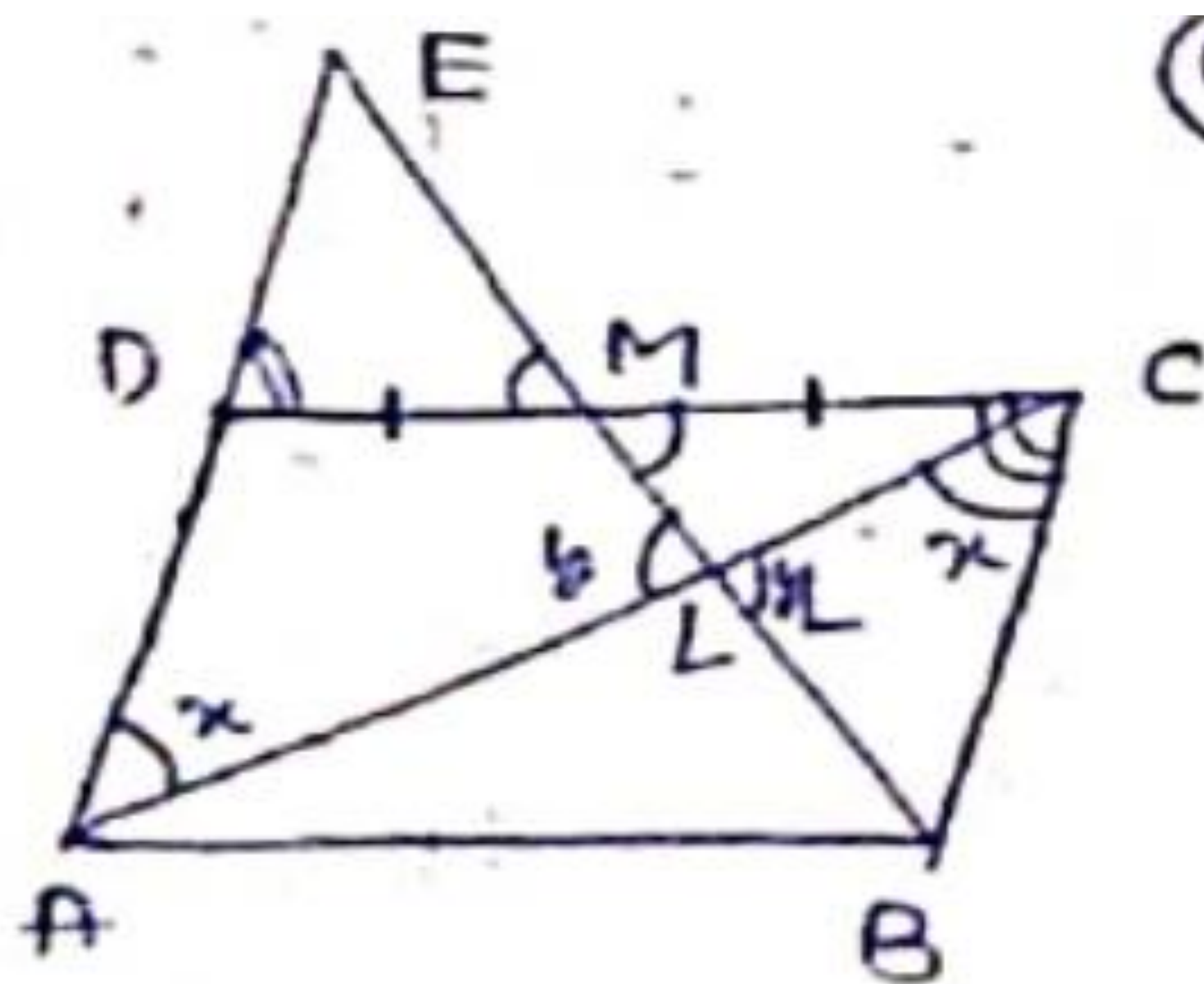


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28

(OR)



(OR)

Given

- i) ABCD is a || gm  
ii) DM = MC.

Sol<sup>n</sup> (i)  $\triangle DME \cong \triangle CMB$  (ASA)

$\Rightarrow \underline{EM = MB}, \underline{DE = BC}$  (CPCT)

(ii)  $\triangle AEL \sim \triangle CBL$  (AA,  $x = x, y = y$ )

$\Rightarrow \frac{AE}{BC} = \frac{EL}{BL} \Rightarrow \frac{EL}{BL} = \frac{AD + DE}{BC}$

$\Rightarrow \frac{EL}{BL} = \frac{2DE}{DE} \quad (BC = DE = AD)$

$\Rightarrow \boxed{EL = 2BL}$  Hence Proved

29. Two people are 16 km apart on a straight road. They start walking at the same time. If they walk towards each other with different speeds, they will meet in 2 hours. Had they walked in the same direction with same speeds as before, they would have met in 8 hours. Find their walking speeds.

$A \rightarrow 5 \text{ km/hr} \quad B \rightarrow 3 \text{ km/hr}$

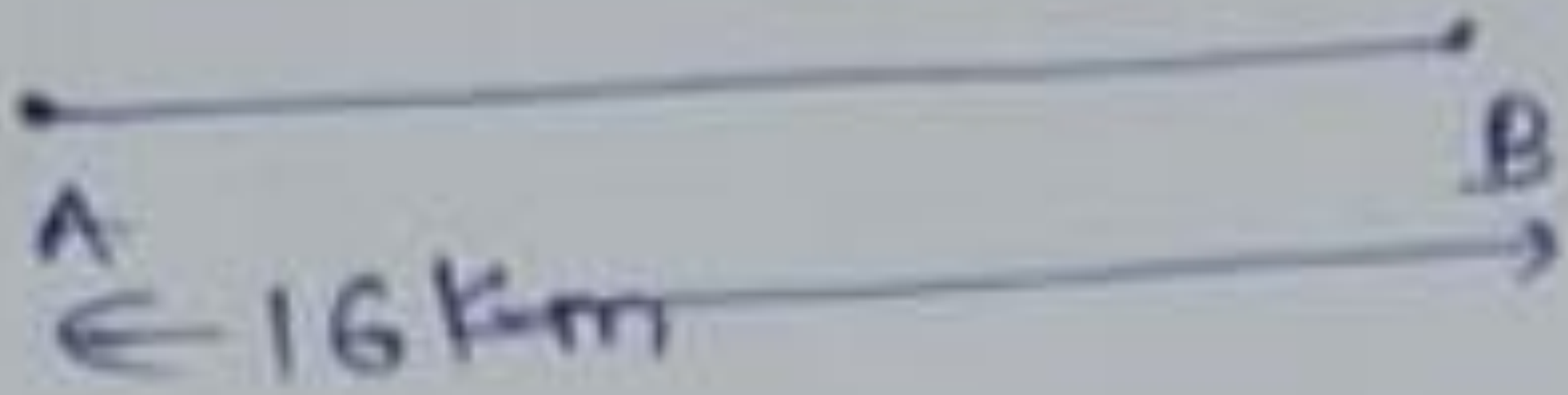


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29. Speeds of persons =  $x, y$  km/hr. ( $A \rightarrow x, B \rightarrow y$ )

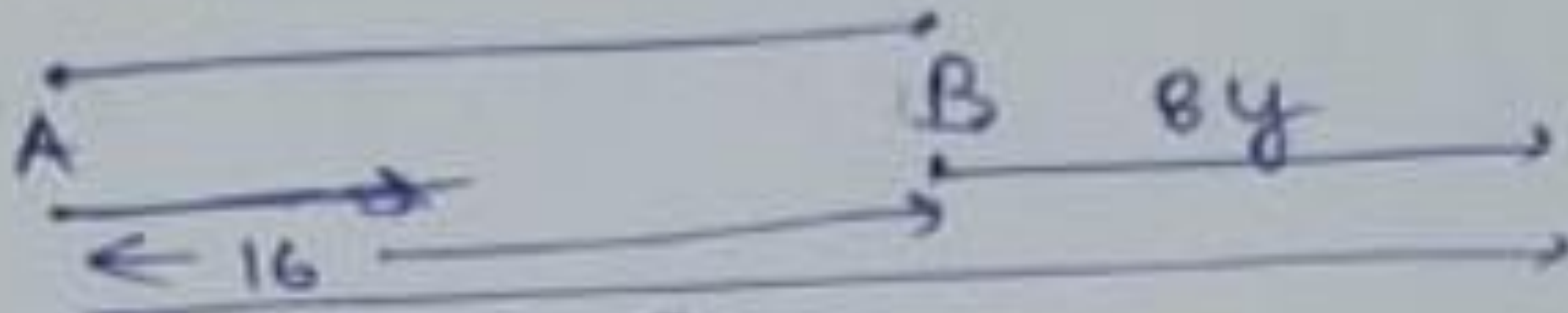
Case-I If they move in opp direction, they meet in 2 hrs.



So distance travelled by A + distance travelled by B = 16

$$\Rightarrow 2x + 2y = 16 \Rightarrow \boxed{x + y = 8} \text{ --- (1)}$$

Case-II If they move in ~~opp~~ same direction, they meet in 8 hrs.



dist(A) - dist(B) = 16

$$8x - 8y = 16$$

$$x - y = 2 \text{ --- (2)}$$

Solving (1) & (2)

$$\begin{aligned} x + y &= 8 \\ x - y &= 2 \end{aligned}$$

$$\Rightarrow \boxed{x = 5, y = 3} \text{ km/hr Ans.}$$

Speed of A = 5 km/hr, 3 km/hr.

30. Prove that :

$$\frac{\tan \theta}{1 - \cot \theta} + \frac{\cot \theta}{1 - \tan \theta} = 1 + \sec \theta \operatorname{cosec} \theta$$



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30

$$\begin{aligned} \text{LHS} &= \frac{\tan \theta}{1 - \cot \theta} + \frac{\cot \theta}{1 - \tan \theta} \\ &= \frac{\sin \theta / \cos \theta}{1 - \frac{\cos \theta}{\sin \theta}} + \frac{\cos \theta / \sin \theta}{1 - \frac{\sin \theta}{\cos \theta}} \\ &= \frac{\sin^2 \theta}{(\sin \theta - \cos \theta) \cos \theta} + \frac{\cos^2 \theta}{(\cos \theta - \sin \theta) (\sin \theta)} \\ &= \frac{\sin^3 \theta - \cos^3 \theta}{\sin \theta \cos \theta (\sin \theta - \cos \theta)} \\ &= \frac{(\sin \theta - \cos \theta) (\sin^2 \theta + \cos^2 \theta + \sin \theta \cos \theta)}{\sin \theta \cos \theta (\sin \theta - \cos \theta)} = 1 + \frac{1}{\sin \theta \cos \theta} \\ &= 1 + \sec \theta \csc \theta \\ &= \text{RHS} \end{aligned}$$

31. Find the mean of the following frequency distribution :

Self C  
29

Classes	25 - 30	30 - 35	35 - 40	40 - 45	45 - 50	50 - 55	55 - 60
Frequency	14	22	16	6	5	3	4

31

Class	$x_i$	$f_i$	$u_i = \frac{x_i - a}{h}$	$f_i u_i$
25-30	27.5	14	-3	-42
30-35	32.5	22	-2	-44
35-40	37.5	16	-1	-16
40-45	42.5	6	0	0
45-50	47.5	5	1	5
50-55	52.5	3	2	6
55-60	57.5	4	3	12
		$\Sigma = 70$		$\Sigma = -79$

Ans 36.86 Ans.

assumed mean ( $a$ ) = 42.5  
 $h = 5$

mean ( $\bar{x}$ ) =  $\bar{u} \times h + a$   
or

$a + \frac{\Sigma f_i u_i}{\Sigma f_i} \times h$

$$= 42.5 + \frac{(-79)}{70} \times 5$$

$$= 42.5 - \frac{79}{14}$$

$$= 42.5 - 5.64 = 36.86$$

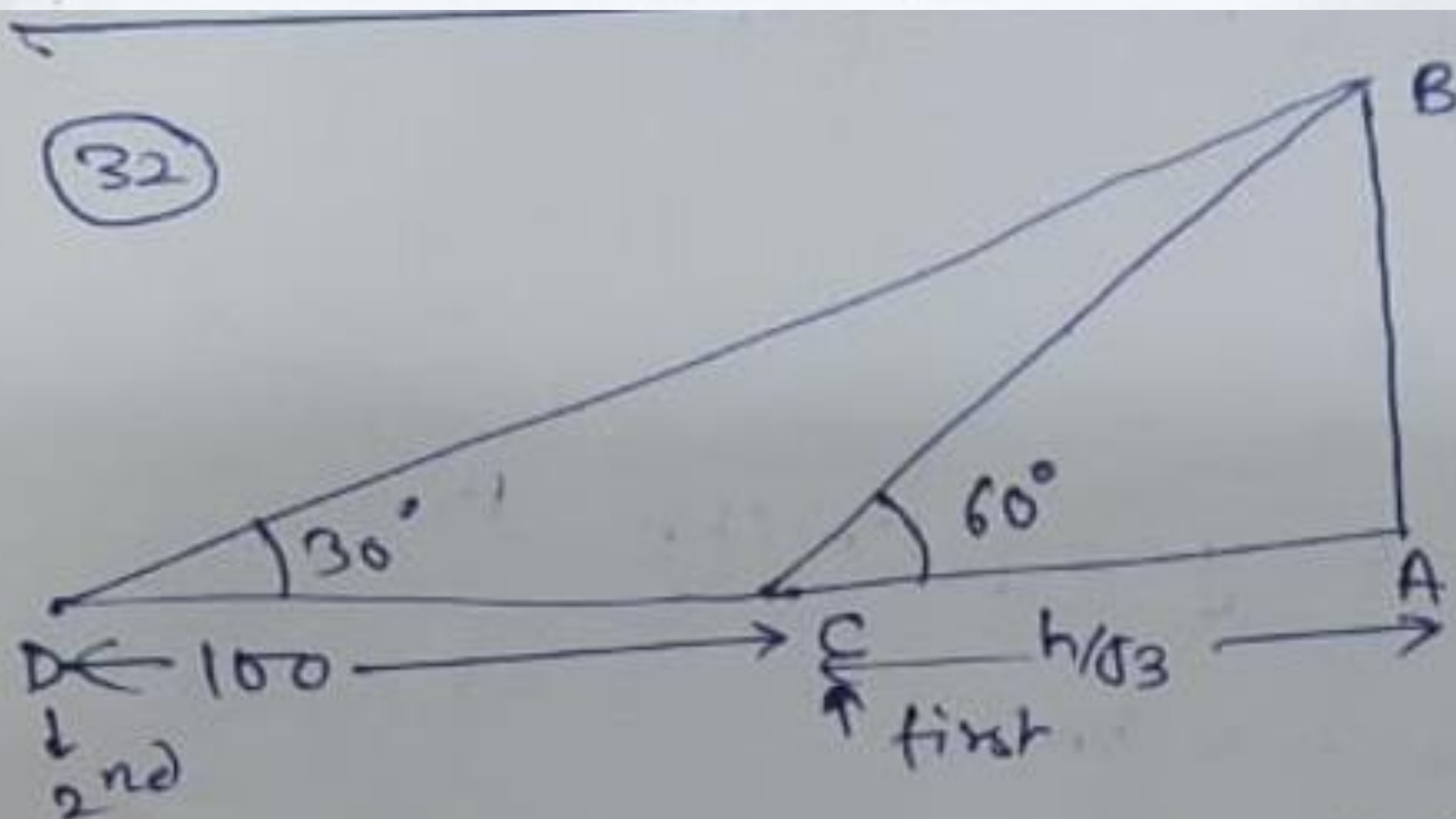


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32. One observer estimates the angle of elevation to the basket of a hot air balloon to be  $60^\circ$ , while another observer 100 m away estimates the angle of elevation to be  $30^\circ$ . Find :

- (a) The height of the basket from the ground.  $50\sqrt{3}$  m
- (b) The distance of the basket from the first observer's eye.  $100$  m
- (c) The horizontal distance of the second observer from the basket.  $100\sqrt{3}$



B : Basket

C, D = persons (observers)

$$CD = 100$$

$$\text{let } AB = h$$

using  $\triangle DAB \Rightarrow AD = \sqrt{3}h$  (use  $\tan 30^\circ$ )

using  $\triangle ABC \Rightarrow AC = \frac{h}{\sqrt{3}}$  (use  $\tan 60^\circ$ )

$$\Rightarrow AD - AC = 100$$

$$\Rightarrow \sqrt{3}h - \frac{h}{\sqrt{3}} = 100 \Rightarrow \frac{2h}{\sqrt{3}} = 100 \Rightarrow h = 50\sqrt{3}$$

(a)  $h = 50\sqrt{3}$  meters

(b) distance BC = ?  $\sin 60^\circ = \frac{h}{BC} \Rightarrow \frac{\sqrt{3}}{2} = \frac{h}{BC} \Rightarrow BC = \frac{2h}{\sqrt{3}} = \frac{2 \times 50\sqrt{3}}{\sqrt{3}} = 100$

(c) horizontal distance of the second observer (D) from basket  
=  $AD = \sqrt{3}h = 100\sqrt{3}$  m

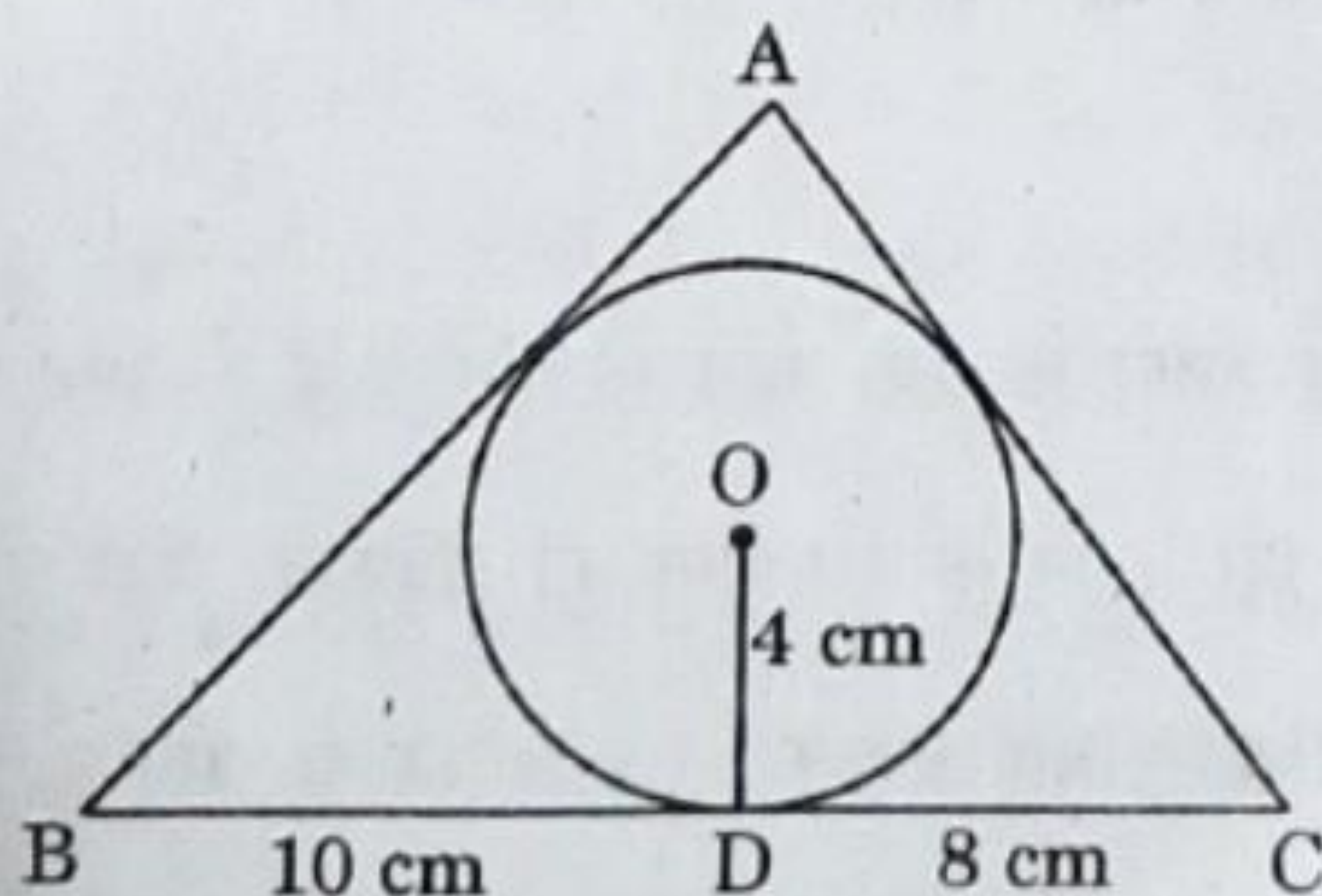


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33. (a) A triangle ABC is drawn to circumscribe a circle of radius 4 cm such that the segments BD and DC are of lengths 10 cm and 8 cm respectively. Find the lengths of the sides AB and AC, if it is given that area  $\Delta ABC = 90 \text{ cm}^2$ .

Set-3  
34

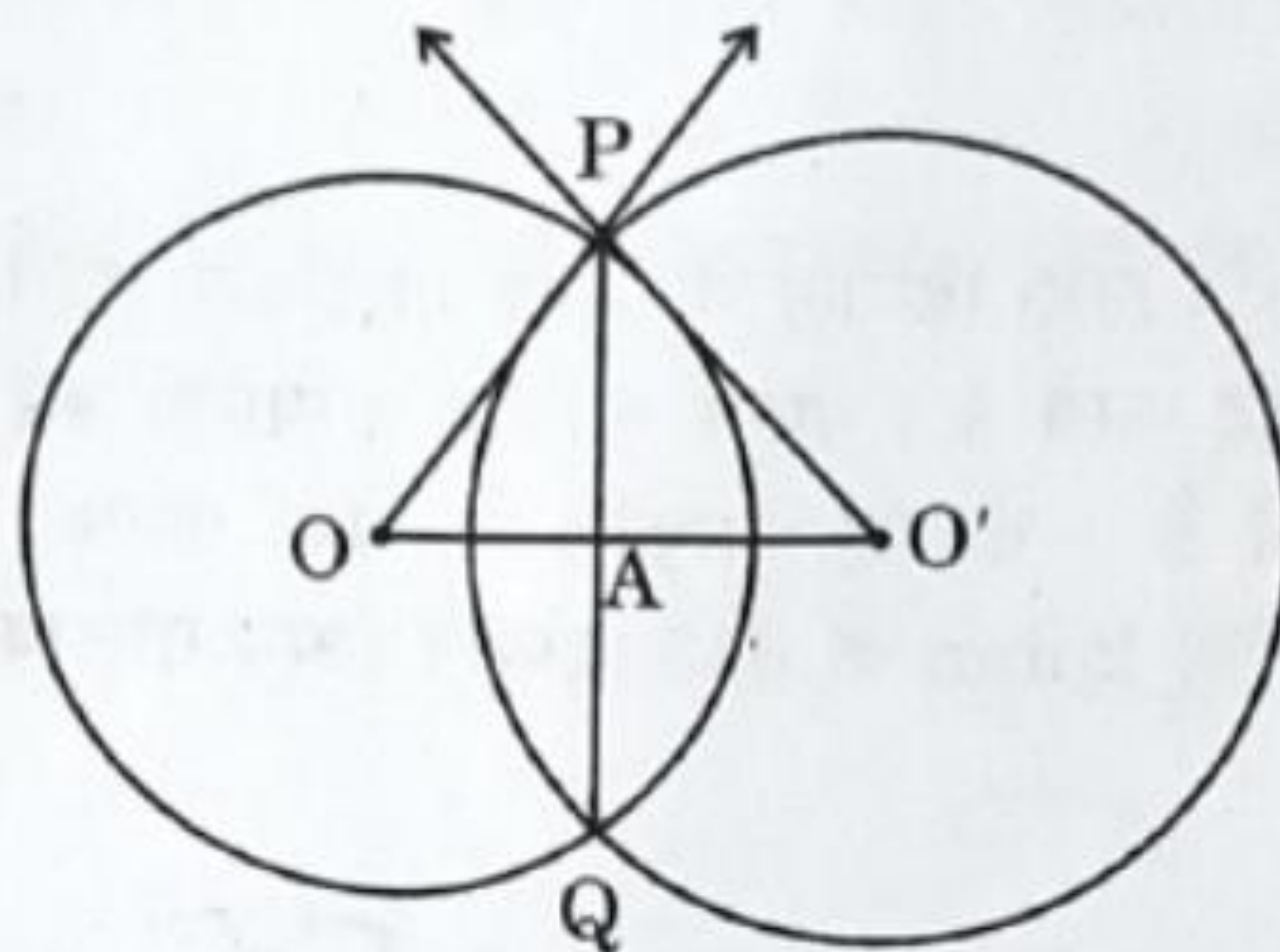


$$AB = 14.5 \text{ cm}$$

$$AC = 12.5 \text{ cm}$$

OR

- (b) Two circles with centres O and O' of radii 6 cm and 8 cm, respectively intersect at two points P and Q such that OP and O'P are tangents to the two circles. Find the length of the common chord PQ.



$$\underline{9.6 \text{ cm}}$$

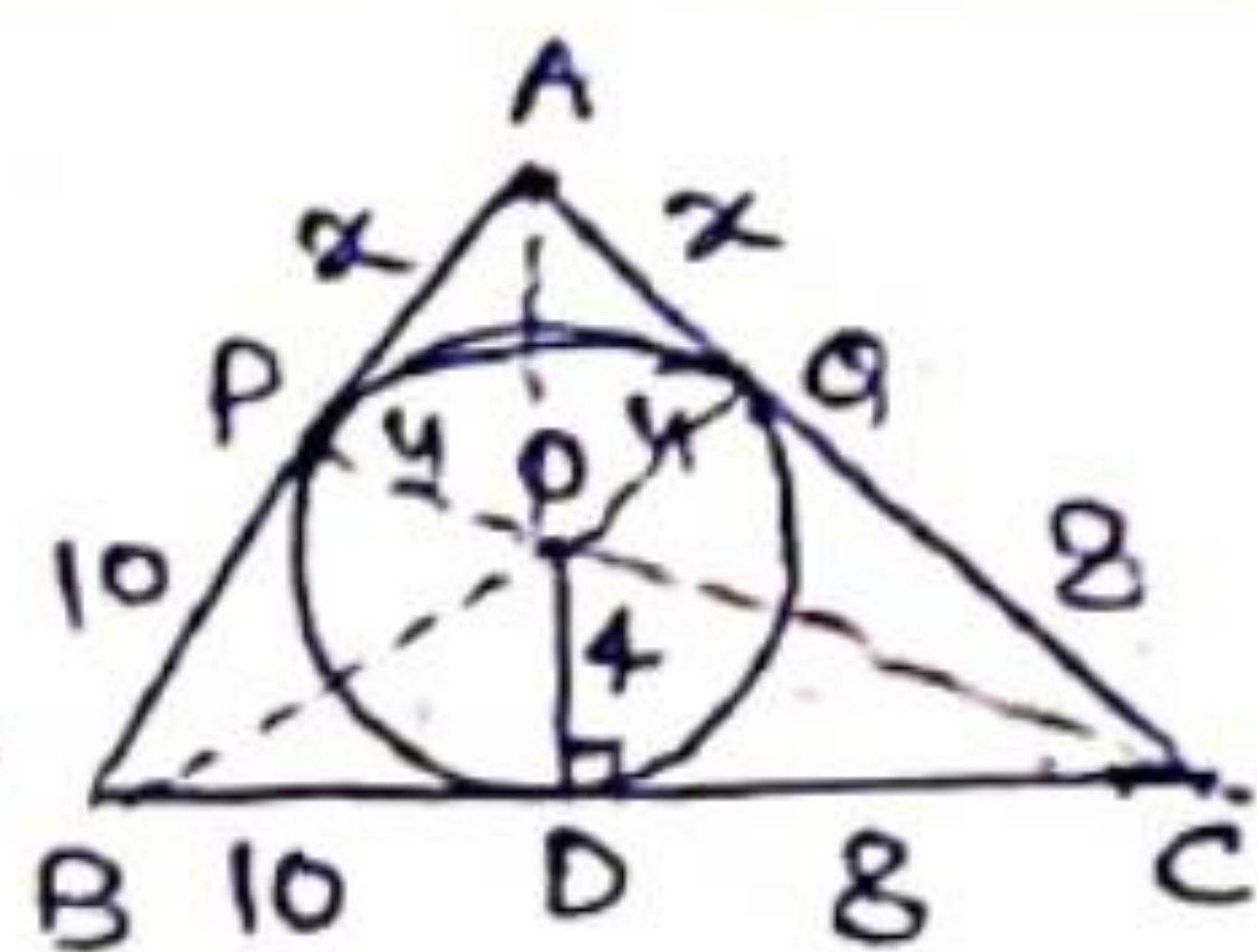


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33

(a)



$$AB = ?$$

$$AC = ?$$

$$\text{Let } AP = AQ = x \text{ (Thm 10.1)}$$

Construction: Join OP, OD, OQ (P, Q are points of contact)  
Join OA, OB, OC

$$\text{Ar}(\triangle ABC) = \text{Ar}(\triangle AOB) + \text{Ar}(\triangle BOC) + \text{Ar}(\triangle AOC)$$

$$= \frac{1}{2} \times 10 \times 4 + \frac{1}{2} \times 8 \times 4 + \frac{1}{2} \times (10+8) \times 4$$

$$90 = \frac{1}{2} \times 4 \times (x+10) + \frac{1}{2} \times 4 \times (18) + \frac{1}{2} \times 4 \times (x+8)$$

$$\Rightarrow 90 = 2[x+10+18+x+8]$$

$$\Rightarrow 45 = 2x + 36 \Rightarrow 2x = 45 - 36 \Rightarrow x = 4.5$$

$$\Rightarrow \text{AB} = 10 + x = 14.5$$

So

$$\text{AB} = 10 + x = 14.5 \text{ cm}$$

$$\text{AC} = 8 + x = 12.5 \text{ cm}$$

Ans

$$\text{AB} = 10 + x = 14.5$$

$$\text{AC} = 8 + x = 12.5$$

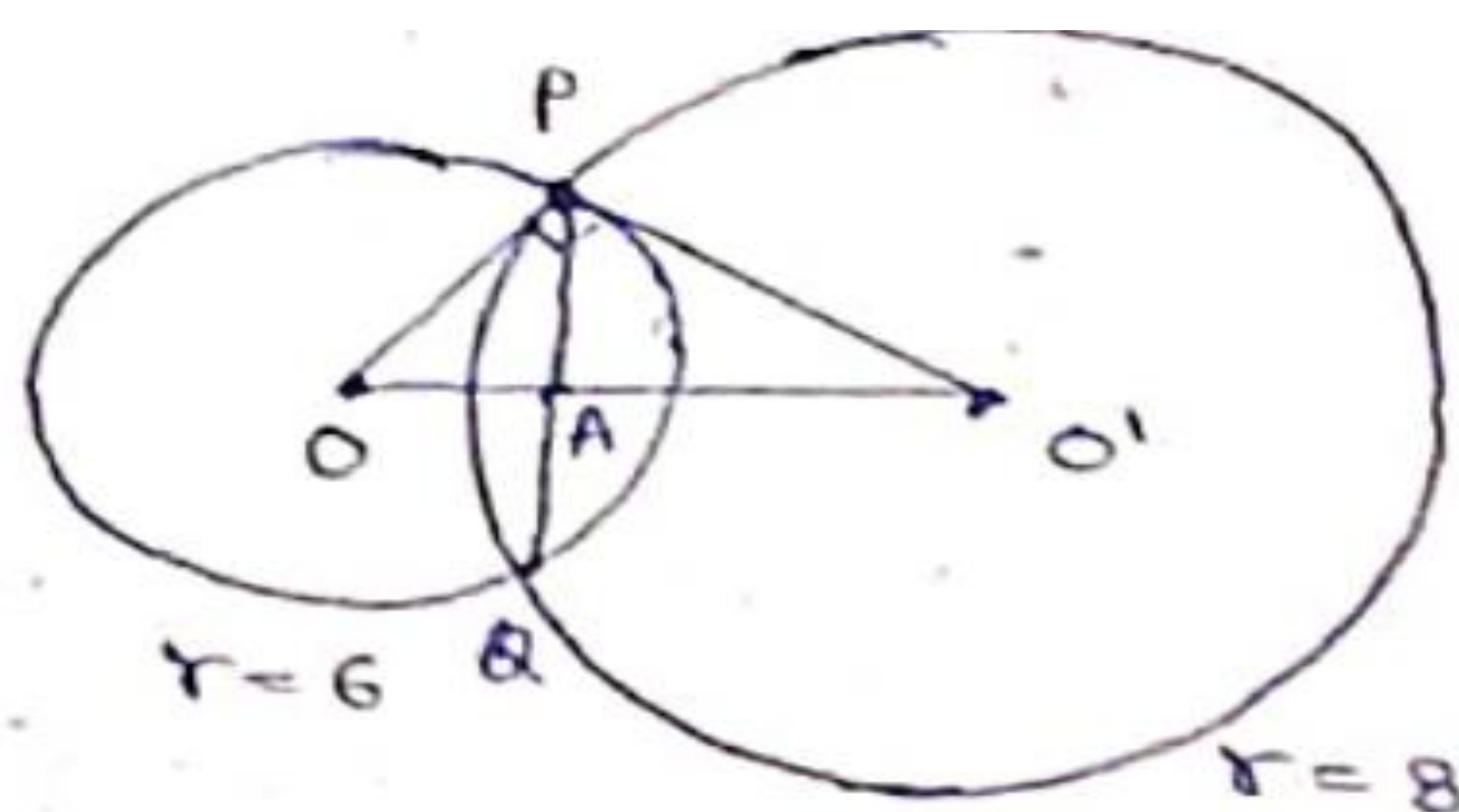


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## SOLUTIONS : 10<sup>th</sup> CBSE MATHS 2023 STANDARD SET 1 CODE 30/5/1

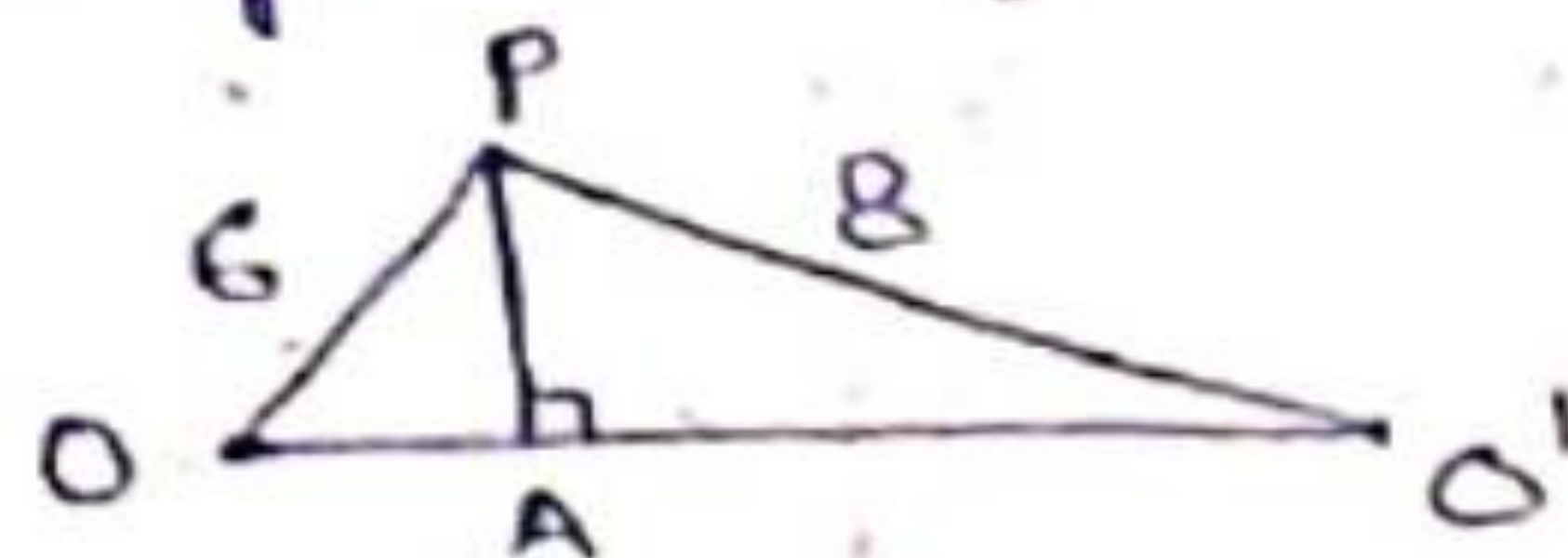
33

1(b) OR



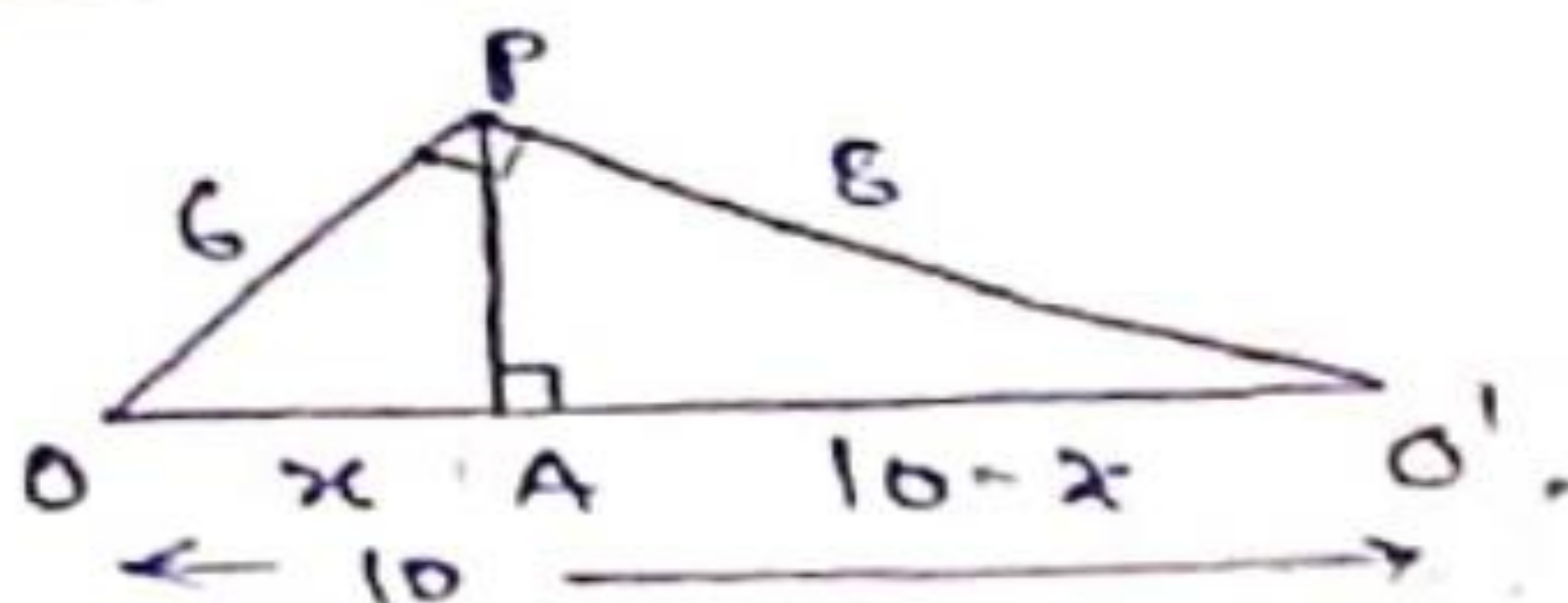
$$PQ = ? \quad O'P \text{ is tangent} \Rightarrow OP \perp O'P$$

Now the figure belongs to right  $\Delta$



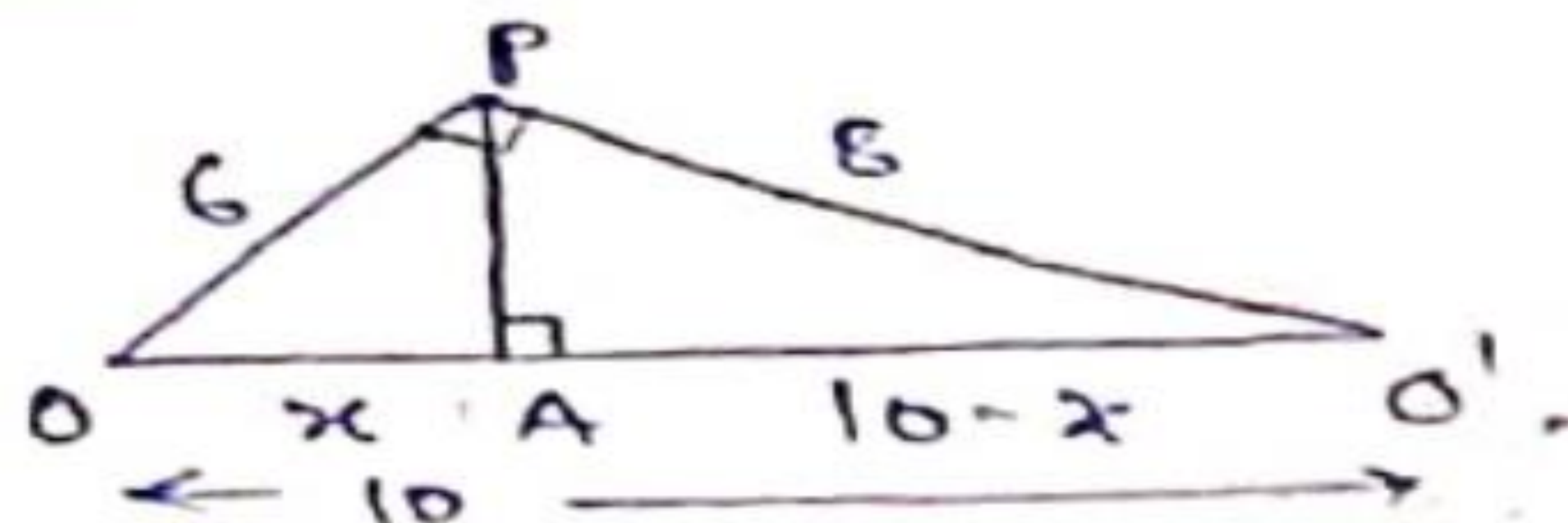
only  $\perp$  bisector of PQ can pass through O & O'

$$\Rightarrow \underline{PA \perp OO'} \quad \text{So}$$



only  $\perp$  bisector of PQ can pass through O & O'

$$\Rightarrow \underline{PA \perp OO'} \quad \text{So}$$



$$OO' = 10 \quad (\text{PGT in } \Delta OPO') \Rightarrow OA = x, \quad AO' = 10 - x$$

$$\text{So } \underline{PA = AQ}$$

Now

$$\Delta PAO' \sim \Delta OPO' \quad (\text{AA criteria})$$

$$\Rightarrow \frac{PA}{OP} = \frac{PO'}{OO'} \Rightarrow \frac{PA}{6} = \frac{8}{10} \Rightarrow PA = \frac{4 \times 8}{10} = 4.8$$

$$\Rightarrow \boxed{PQ = 2 \times 4.8 = 9.6 \text{ cm}}$$

Tip: you could use trigonometry here instead of similarity.



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## SOLUTIONS : 10<sup>th</sup> CBSE MATHS 2023 STANDARD SET 1 CODE 30/5/1

34

- (a) A train travels at a certain average speed for a distance of 54 km and then travels a distance of 63 km at an average speed of 6 km/h more than the first speed. If it takes 3 hours to complete the journey, what was its first average speed?

36 km/hr

OR

- (b) Two pipes together can fill a tank in  $\frac{15}{8}$  hours. The pipe with larger diameter takes 2 hours less than the pipe with smaller diameter to fill the tank separately. Find the time in which each pipe can fill the tank separately.

3 hrs, 5 hrs

34

(a) let first average speed =  $x$  km/hr

time in first case =  $\frac{54}{x}$  hrs.  
(Part)

2<sup>nd</sup> Part: distance = 63, speed =  $x + 6$

$$\text{time} = \frac{63}{x+6}$$

$$\text{total time} = 3$$

$$\Rightarrow \frac{54}{x} + \frac{63}{x+6} = 3$$

$$\Rightarrow \frac{18}{x} + \frac{21}{x+6} = 1 \Rightarrow 18x + 108 + 21x = x(x+6)$$

$$\Rightarrow x^2 + 6x - 39x - 108 = 0$$

$$\Rightarrow x^2 - 33x - 108 = 0$$

$$(x-36)(x+3) = 0$$

$$\Rightarrow \boxed{x = 36 \text{ km/hr}}$$

first average speed = 36 km/hr



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## SOLUTIONS : 10<sup>th</sup> CBSE MATHS 2023 STANDARD SET 1 CODE 30/5/1

OR

34

(b). Let time taken by pipe (larger dia) to fill tank =  $x$  hrs  
 (smaller dia) =  $x+2$

In 1 hr, pipe (smaller dia), fills the tank =  $\frac{1}{x+2}$  tank  
 , Pipe (larger dia), =  $\frac{1}{x}$  tank

They are on for  $\frac{15}{8}$  hrs.

$$\frac{15}{8} \left( \frac{1}{x+2} + \frac{1}{x} \right) = 1$$

$$\Rightarrow \frac{1}{x} + \frac{1}{x+2} = \frac{8}{15}$$

$$\Rightarrow \frac{x+2+x}{x(x+2)} = \frac{8}{15} \Rightarrow 30x+30 = 8x^2+16x$$

$$\Rightarrow 8x^2-14x-30=0 \Rightarrow 4x^2-7x-15=0$$

$$4x^2-19x+5x-15=0$$

$$\Rightarrow 4x(x-3)+5(x-3)=0$$

$\therefore$  Time taken by smaller pipe = 5 hrs  
 larger pipe = 3 hrs

35. A horse is tied to a peg at one corner of a square shaped grass field of side

Qet-3  
33

15 m by means of a 5 m long rope. Find the area of that part of the field

in which the horse can graze. Also, find the increase in grazing area if

length of rope is increased to 10 m. (Use  $\pi = 3.14$ )

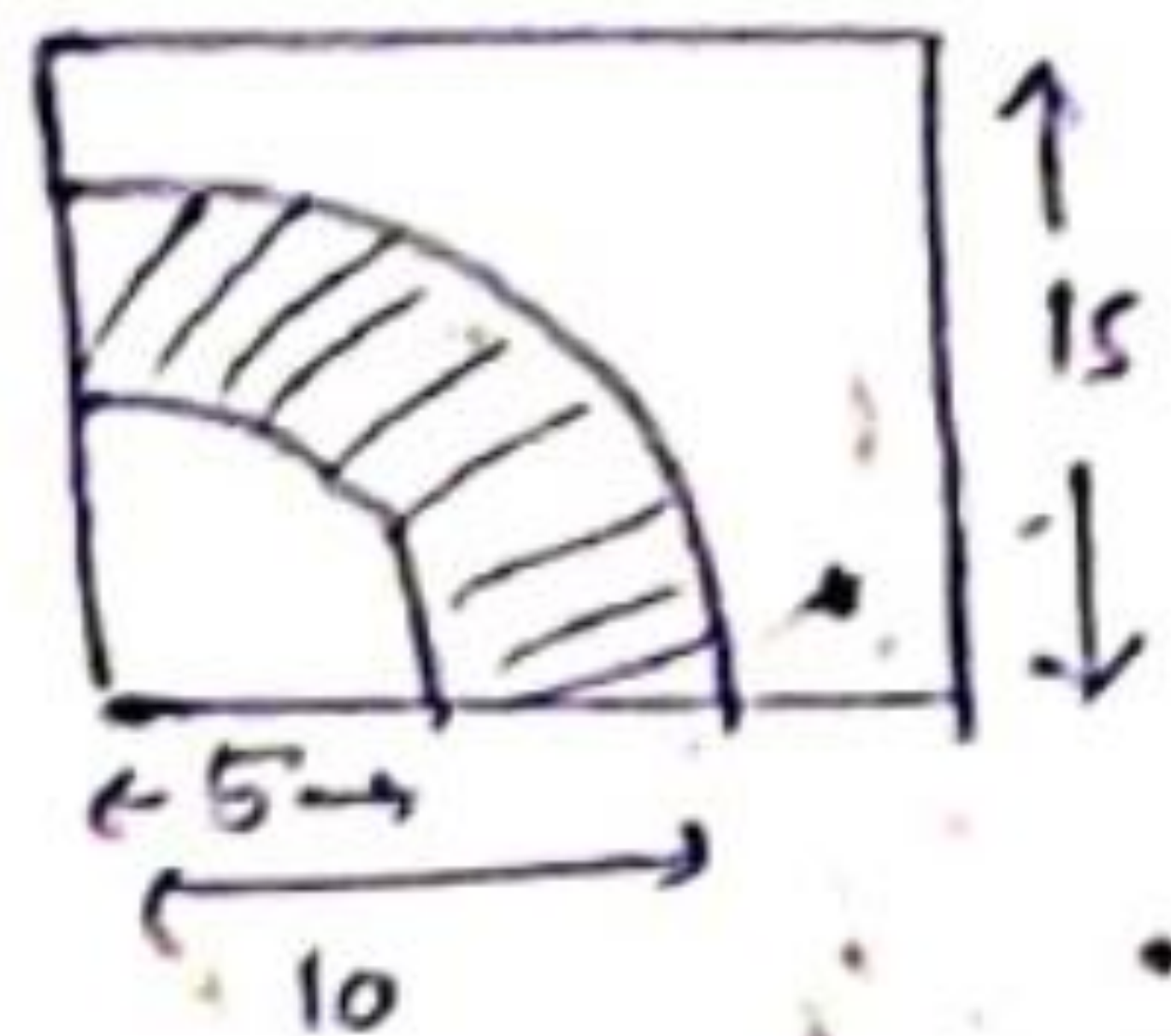
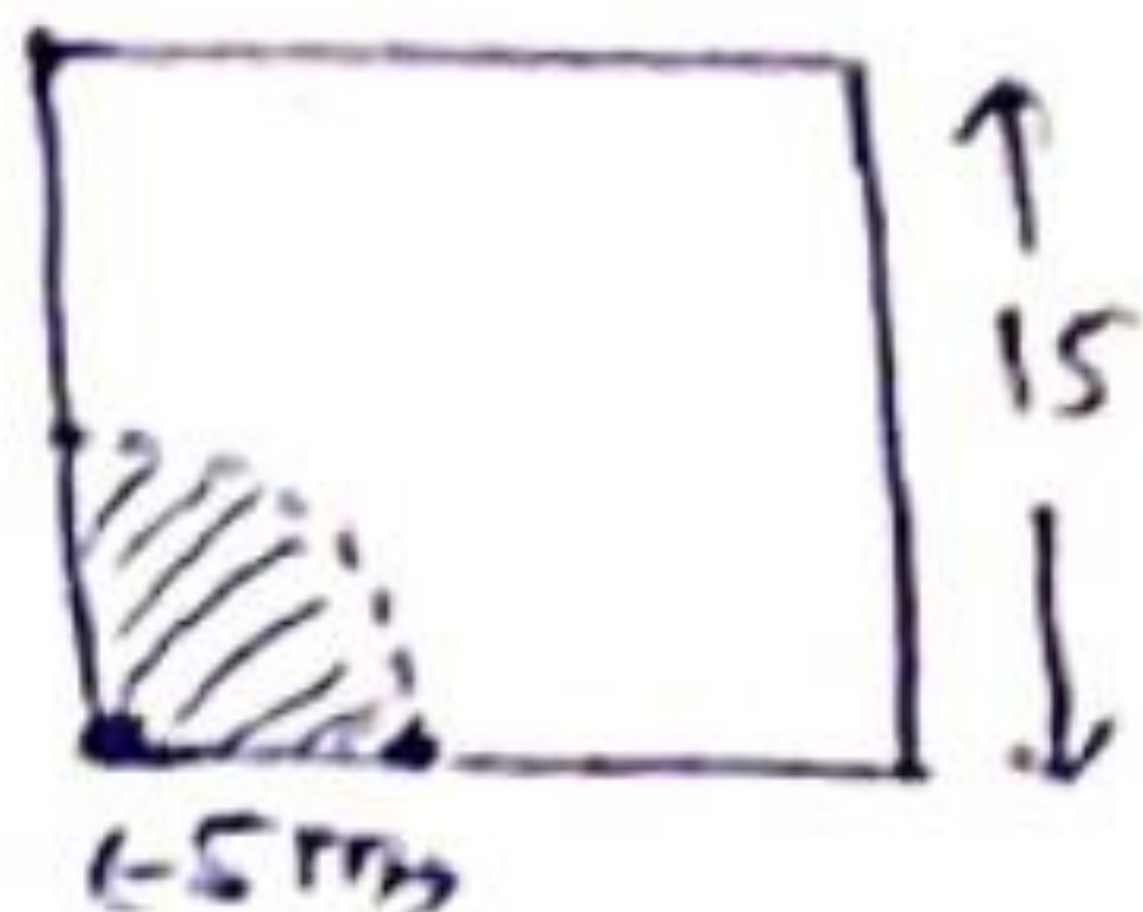
19.6 m<sup>2</sup>, 58.87 m<sup>2</sup>



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SOLUTIONS : 10<sup>th</sup> CBSE MATHS 2023 STANDARD SET 1 CODE 30/5/1

35



(i) Area which can be grazed by horse with 5 m rope

$$= \frac{1}{4} \times \pi (5)^2 = \frac{25\pi}{4} \text{ m}^2$$

(ii)

$$= \frac{25}{4} \times 3.14 = \frac{314}{16} \text{ m}^2$$

$$\approx \underline{19.6 \text{ m}^2}$$

(ii) Increase in area when rope is changed from 5 m to 10 m length

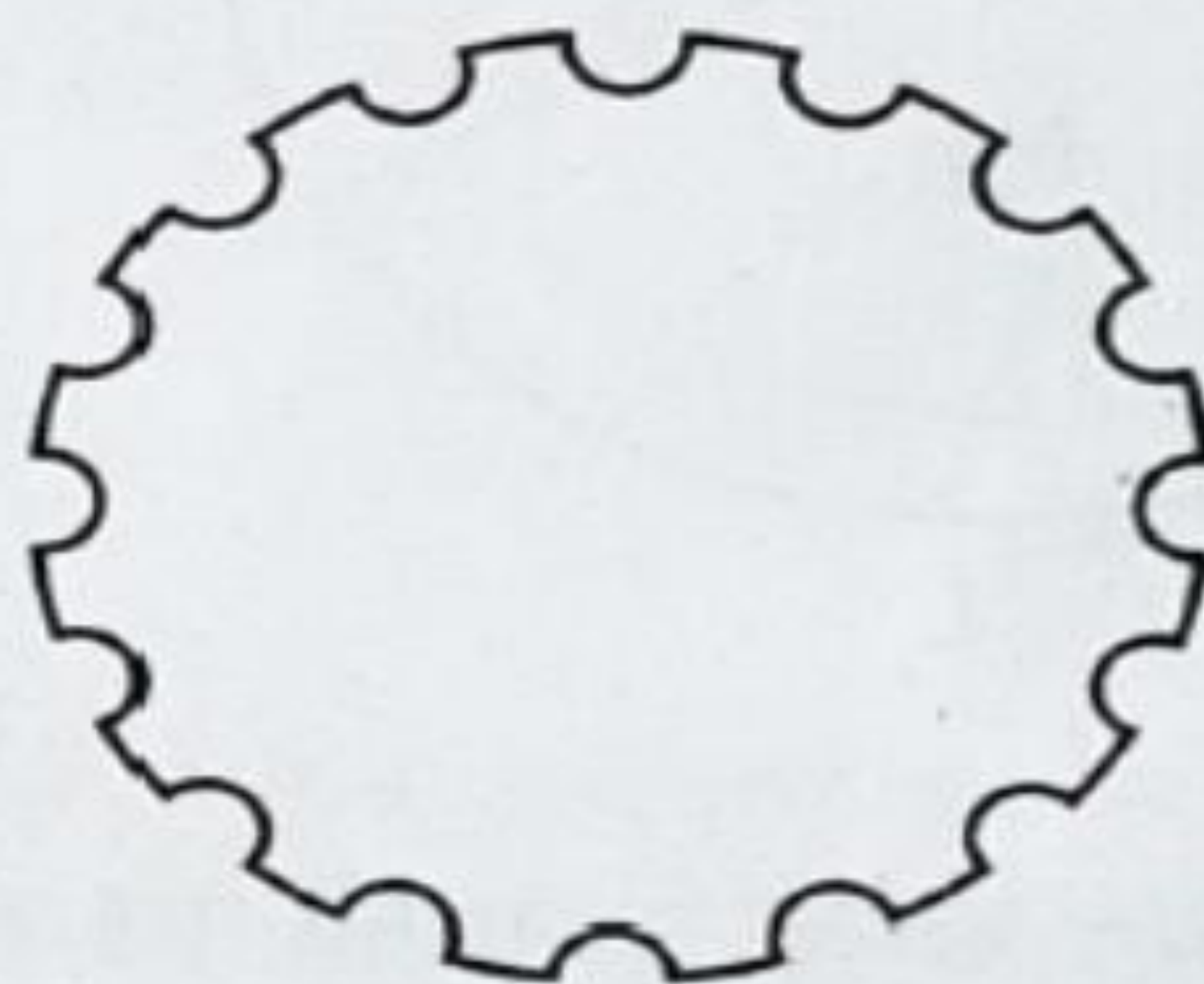
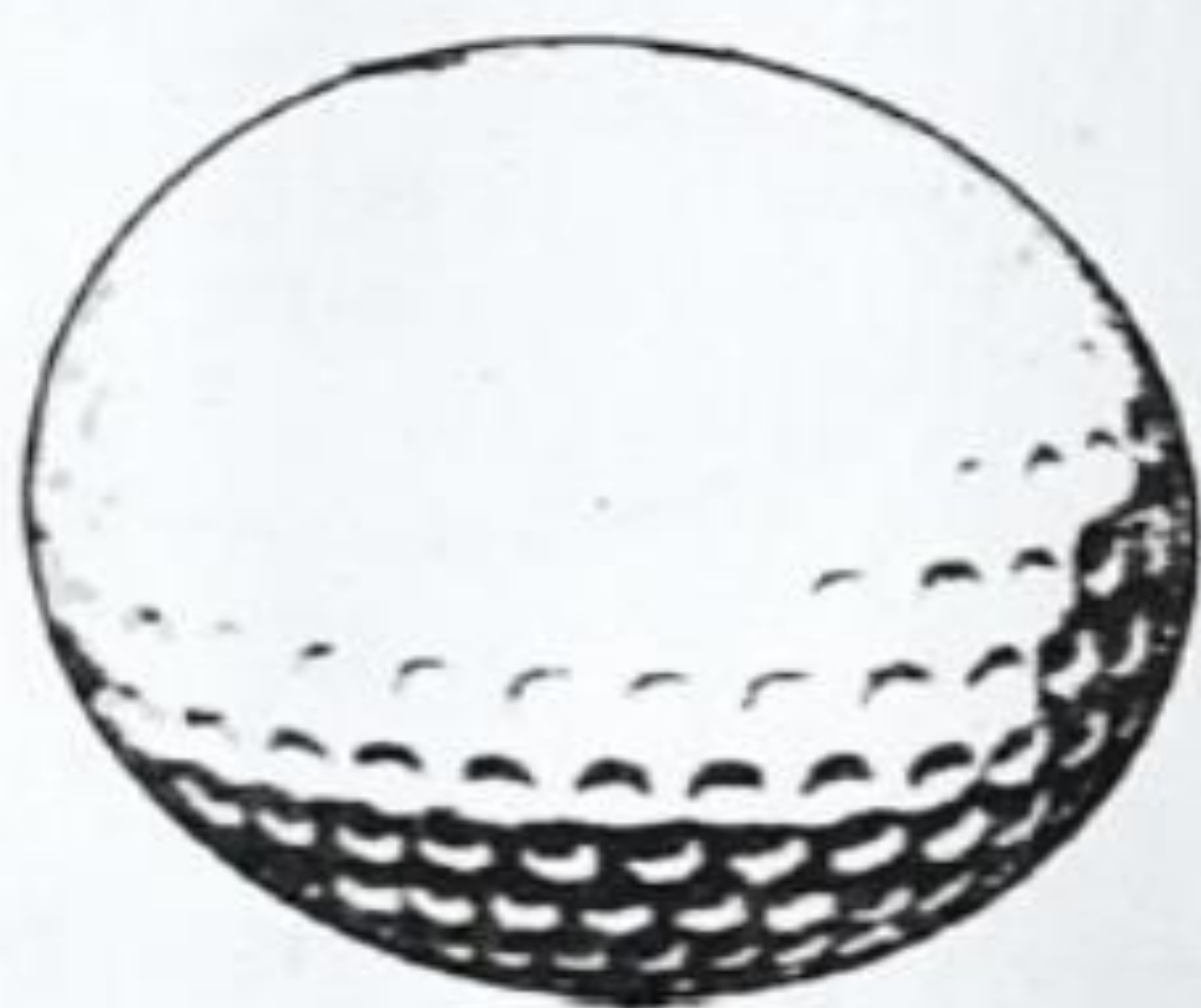
$$= \frac{1}{4} \pi (10)^2 - \frac{1}{4} \pi (5)^2$$

$$= \frac{\pi}{4} (100 - 25) = \frac{75\pi}{4} \text{ m}^2$$

$$= \frac{75}{4} \times 3.14 = \underline{58.87 \text{ m}^2}$$

### Case Study - 1

36. A golf ball is spherical with about 300 – 500 dimples that help increase its velocity while in play. Golf balls are traditionally white but available in colours also. In the given figure, a golf ball has diameter 4.2 cm and the surface has 315 dimples (hemi-spherical) of radius 2 mm.





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## SOLUTIONS : 10<sup>th</sup> CBSE MATHS 2023 STANDARD SET 1 CODE 30/5/1

Based on the above, answer the following questions :

(i) Find the surface area of one such dimple.  $0.08\pi \text{ cm}^2$  1

(ii) Find the volume of the material dug out to make one dimple. 1

$$\frac{0.016}{3} \text{ cm}^3$$

(iii) (a) Find the total surface area exposed to the surroundings. 2

$$30.24\pi \text{ cm}^2$$

OR

(iii) (b) Find the volume of the golf ball.  $11.256 \text{ cm}^3$  2

Case Study-2

36



large sphere  
 $R = 2.1 \text{ cm}$

hemisphere (dimple)

$$r = 2 \text{ mm} \\ = 0.2 \text{ cm}$$

no of dimples = 315

$$\begin{aligned} \text{(i) S.A of one such dimple} &= 2\pi r^2 \\ &= 2 \times \pi \times (0.2)^2 \\ &= 2\pi \times 0.04 \\ &= \underline{0.08\pi \text{ cm}^2} \end{aligned}$$

$$\begin{aligned} \text{(ii) material dug out to make one dimple} &= \text{Vol of one hemisphere} \\ &= \frac{2}{3} \pi r^3 \\ &= \frac{2}{3} \pi (0.2)^3 \\ &= \frac{2}{3} \pi \times 0.008 = \underline{\frac{0.016\pi}{3} \text{ cm}^3} \end{aligned}$$



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SOLUTIONS : 10<sup>th</sup> CBSE MATHS 2023 STANDARD SET 1 CODE 30/5/1

(iii) a Total surface area exposed to surrounding

$$= \text{TSA of Sphere} - 315\pi r^2 + 315(2\pi r^2)$$

$$= 4\pi R^2 + 315\pi r^2$$

$$= \pi [4(2.1)^2 + 315 \times (0.2)^2]$$

$$= \pi [17.64 + 12.6]$$

$$= 30.24\pi \text{ cm}^2$$

~~(iii) b~~

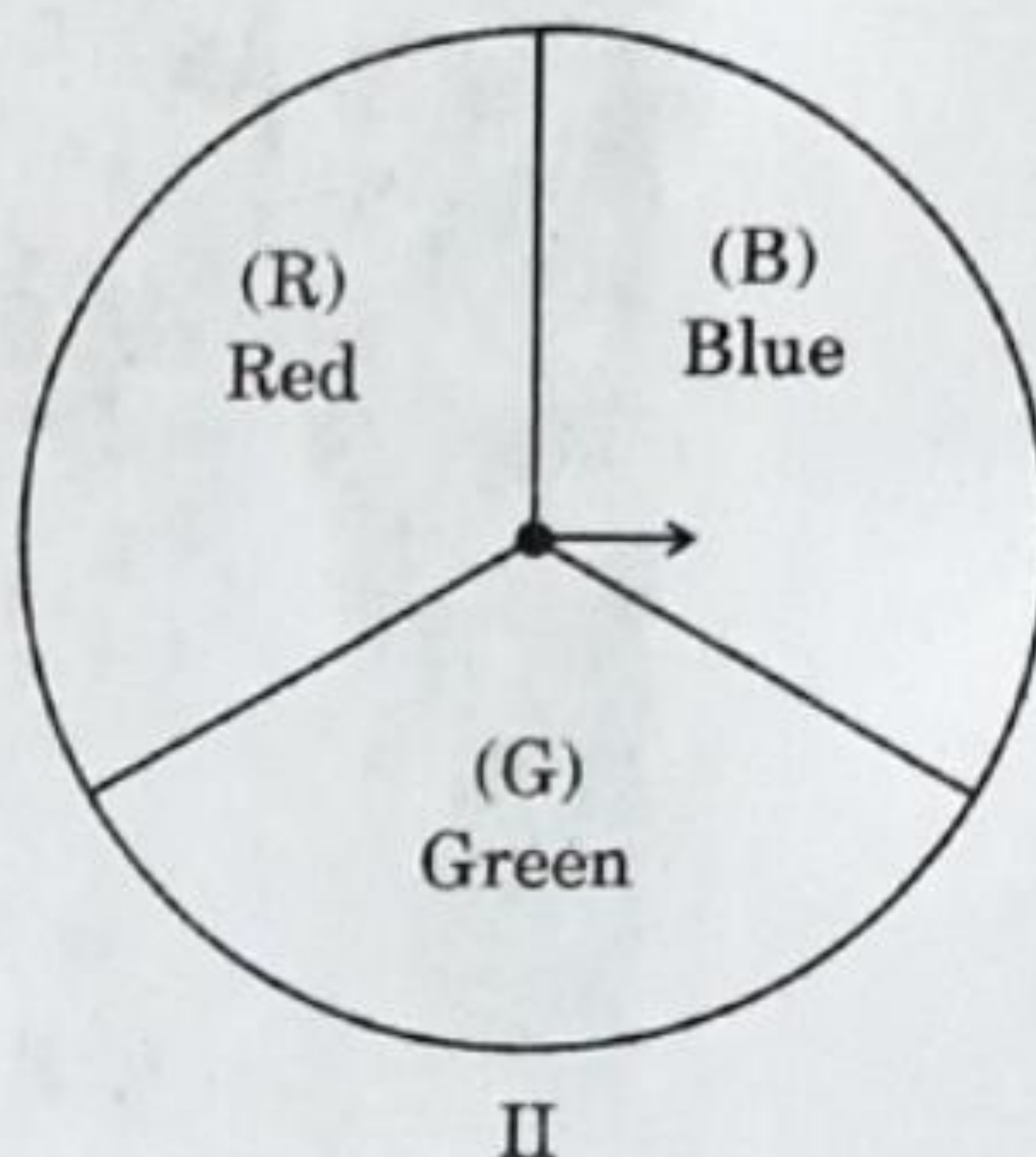
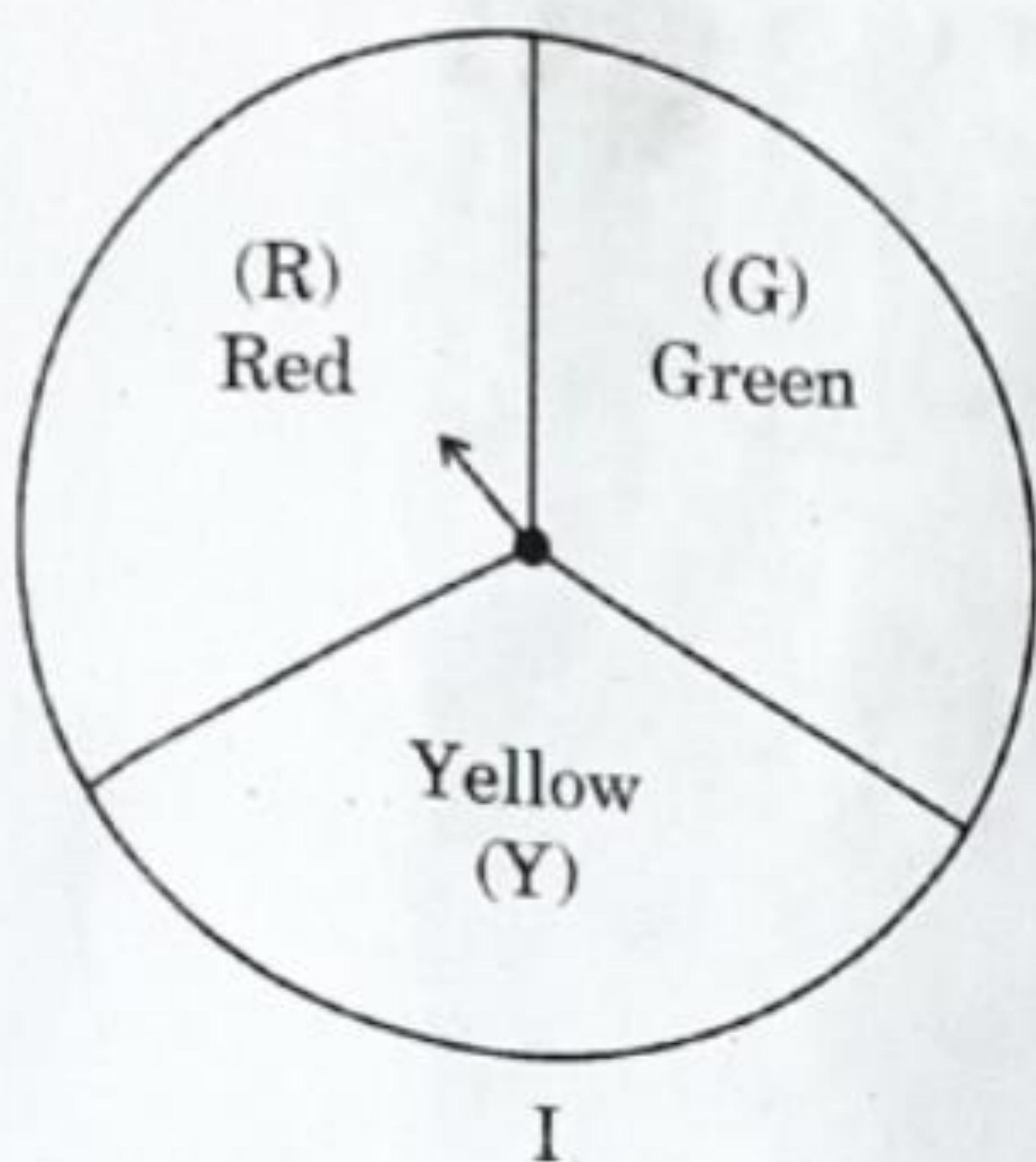
(iii) b Vol of golf ball =  $\frac{4}{3} \cdot \pi \cdot R^3 - \frac{105}{315} \times \frac{4}{3} \pi r^3$

$$= \pi \left[ \frac{4}{3} (2.1)^3 - 210 (0.2)^3 \right]$$

$$= \pi [12.936 - 1.68] = 11.256\pi \text{ cm}^3$$

### Case Study - 2

37. A middle school decided to run the following spinner game as a fund-raiser on Christmas Carnival.



**Making Purple :** Spin each spinner once. Blue and red make purple. So, if one spinner shows Red (R) and another Blue (B), then you 'win'. One such outcome is written as 'RB'.



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## SOLUTIONS : 10<sup>th</sup> CBSE MATHS 2023 STANDARD SET 1 CODE 30/5/1

Based on the above, answer the following questions :

(i) List all possible outcomes of the game.  $RR, RB, RG, GR, GB, GG, YR, YB, YG$  1

(ii) Find the probability of 'Making Purple'.  $\frac{1}{9}$  1

(iii) (a) For each win, a participant gets ₹ 10, but if he/she loses, he/she has to pay ₹ 5 to the school.

If 99 participants played, calculate how much fund could the school have collected.  $Rs. 330$  2

OR

(iii) (b) If the same amount of ₹ 5 has been decided for winning or losing the game, then how much fund had been collected by school ? (Number of participants = 99)  $Rs. 385$  2

37

(i)

List of all the outcomes

$RR, RB, RG, GR, GB, GG, YR, YB, YG$  (9 outcomes)

$$(ii) P(\text{making purple}) = \frac{n(\text{Fav. outcomes})}{n(\text{Total})} = \frac{1}{9} \quad \underline{\text{Ans.}}$$

Fav. outcomes = RB

(iii) 99 participants play the game

so no of possible winners =  $\frac{1}{9} \times 99 = 11$

losers =  $\frac{8}{9} \times 99 = 88$

amount (possible) which, school could collect

$$= 88 \times 5 - 11 \times 10$$

$$= 440 - 110$$

$$= \underline{330 \text{ Rs.}}$$



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## SOLUTIONS : 10<sup>th</sup> CBSE MATHS 2023 STANDARD SET 1 CODE 30/5/1

\* This question ~~has~~ is ~~not~~ not appropriate, amount must be written as possible amount.

(11) b      5 for win, 5 for lose

So possible amount collected  
(which could be collected)

$$= 5 \times \text{no of losers} - 5 \times \text{no of winners}$$

$$= 5 \times 88 - 5 \times 11$$

$$= 440 - 55$$

$$= \underline{385}$$

38. In a pool at an aquarium, a dolphin jumps out of the water travelling at 20 cm per second. Its height above water level after  $t$  seconds is given by  $h = 20t - 16t^2$ .



Based on the above, answer the following questions :

- (i) Find zeroes of polynomial  $p(t) = 20t - 16t^2$ .

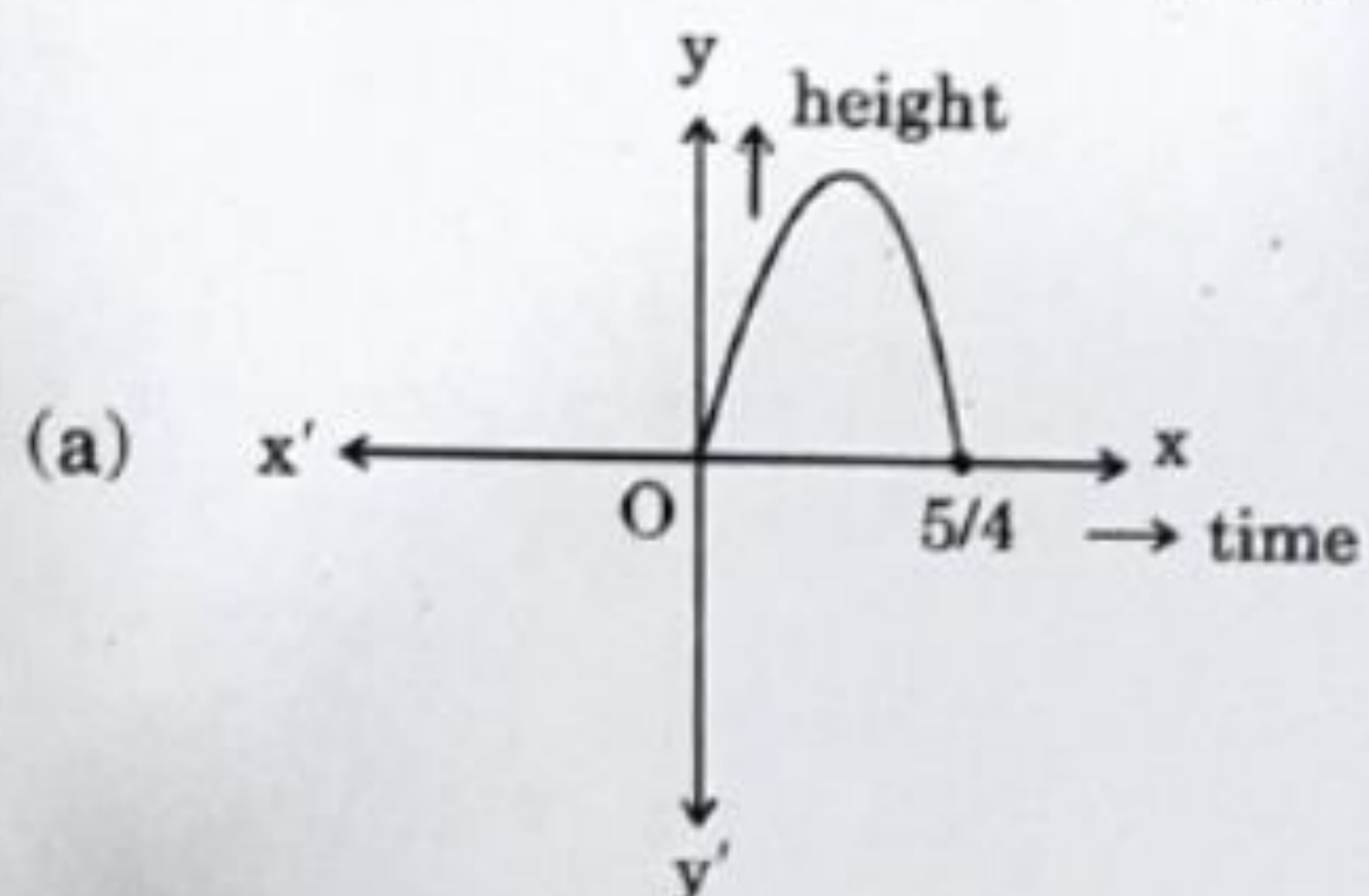
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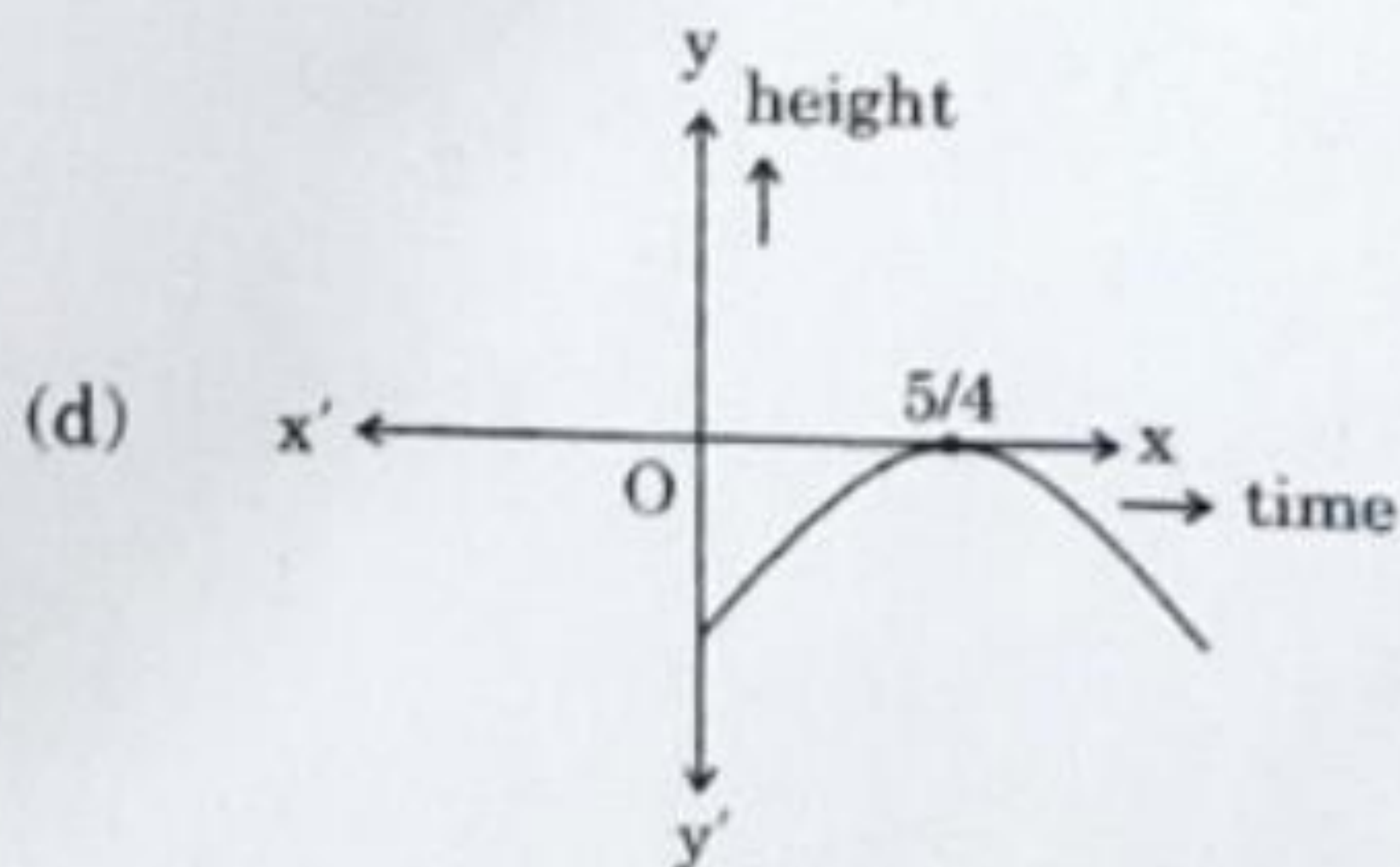
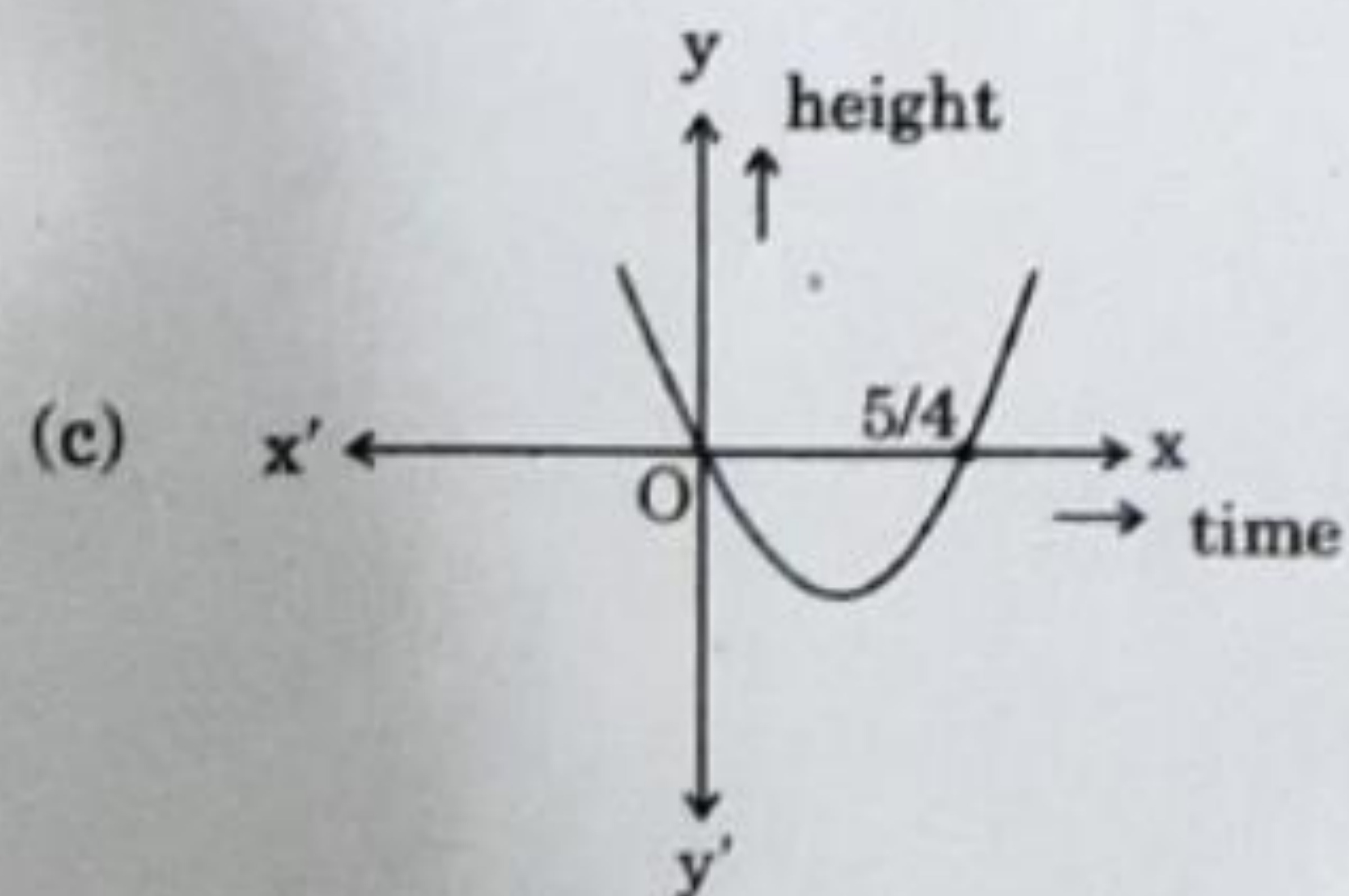
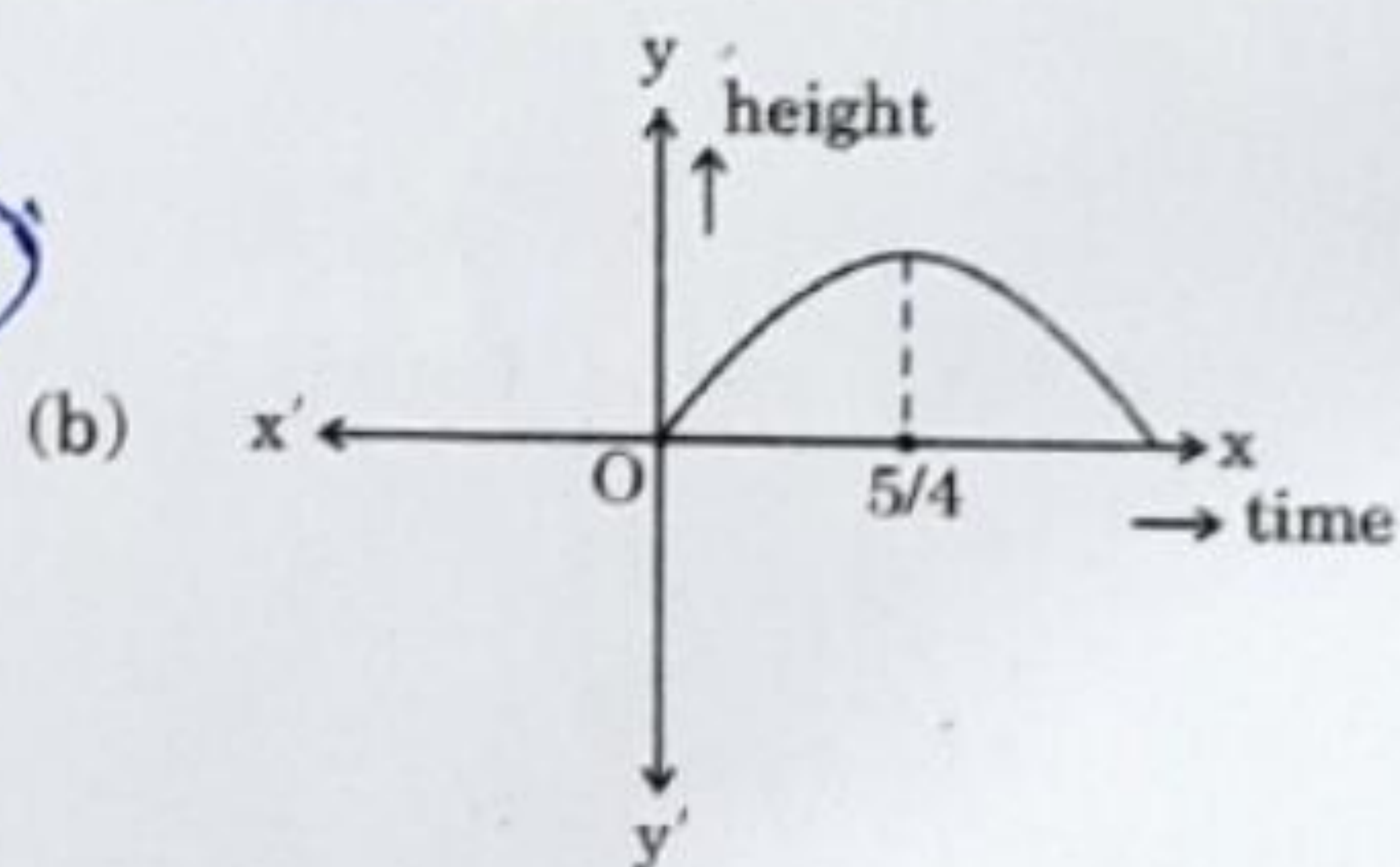
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SOLUTIONS : 10<sup>th</sup> CBSE MATHS 2023 STANDARD SET 1 CODE 30/5/1

(ii) Which of the following types of graph represents  $p(t)$  ? 1



**A**



(iii) (a) What would be the value of  $h$  at  $t = \frac{3}{2}$  ? Interpret the result. 2

-6cm, 6cm below water level

OR

(iii) (b) How much distance has the dolphin covered before hitting the water level again ? 2

25 cm



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## SOLUTIONS : 10<sup>th</sup> CBSE MATHS 2023 STANDARD SET 1 CODE 30/5/1

Case

38

$$h = 20t - 16t^2, \quad \begin{array}{l} t = \text{time in sec} \\ h = \text{height above water level} \end{array}$$

(i) zeroes of polynomial

$$20t - 16t^2 = 0 \Rightarrow t = 0 \text{ or } \frac{20}{16}$$

$0, \frac{5}{4}$  Ans.

(ii) (A), because,  $y = 0$  at  $t = 0$  &  $\frac{5}{4}$  from above

and height  $y$  first increases then decreases.

$$(iii) \text{ at } t = \frac{3}{2} \text{ sec, } h = 20 \times \frac{3}{2} - 16 \times \frac{9}{4} = 30 - 36 = -6 \text{ m}$$

$\Rightarrow$  Dolphin is 6m below the water level

38

(iii) b:

Speed of dolphin = 20 cm/sec

time of flight (above water level) =  $\frac{5}{4}$  sec.

$$\text{So distance} = 20 \times \frac{5}{4} = \underline{25 \text{ cm}}$$