

# Set 430/3/3

## SOLUTIONS MATHEMATICS (BASIC)

### SECTION A

This section has 20 Multiple Choice Questions (MCQs) carrying 1 mark each.

$20 \times 1 = 20$

1. The perimeter of a quadrant of a circle of circumference 22 cm is :

- (A) 29 cm
- (B) 22 cm
- (C) 12.5 cm
- (D) 5.5 cm

Ans: (C) 12.5 cm

1

2. A cone and cylinder have same height and same radius. The volume of the cone and the volume of the cylinder are in the ratio :

- (A) 1 : 1
- (B) 1 : 3
- (C) 3 : 1
- (D) 1 : 2

Ans: (B) 1 : 3

1

3. The following table shows the marks scored by 23 students of a class.

Marks	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50
Number of Students	5	3	4	8	3

The lower limit of the modal class is :

- (A) 10
- (B) 20
- (C) 30
- (D) 40

Ans: (C) 30

1

4. For a distribution, if mean = 15 and mode = 12, then its median is :

- (A) 12
- (B) 13
- (C) 14
- (D) 15

Ans: (C) 14

1

<p>5. A pair of dice is thrown simultaneously. Let E denote the event that “The sum of numbers obtained on both dice is at least 9.” The number of outcomes in favour of event E is :</p> <p>(A) 4 (B) 6 (C) 10 (D) 26</p>	
<p><b>Ans:</b> (C) 10</p>	<p>1</p>
<p>6. If <math>p = 2^3 \times 3^2 \times 5</math> and <math>q = 2^2 \times 3^3</math>, then the LCM of p and q is :</p> <p>(A) <math>2^3 \times 3^3</math> (B) <math>2^2 \times 3^2</math> (C) <math>2^2 \times 3^2 \times 5</math> (D) <math>2^3 \times 3^3 \times 5</math></p>	
<p><b>Ans:</b> (D) <math>2^3 \times 3^3 \times 5</math></p>	<p>1</p>
<p>7. <math>3^n</math>, where n is a natural number, cannot end with the digit :</p> <p>(A) 3 (B) 5 (C) 7 (D) 9</p>	
<p><b>Ans:</b> (B) 5</p>	<p>1</p>
<p>8. A prime number has :</p> <p>(A) exactly two prime factors (B) exactly one prime factor (C) at least one prime factor (D) at least two prime factors</p>	
<p><b>Ans:</b> (B) exactly one prime factor</p>	<p>1</p>
<p>9. The system of linear equations given by <math>x = a</math> and <math>y = b</math> is :</p> <p>(A) Consistent with a unique solution. (B) Consistent with infinitely many solutions. (C) Consistent with two solutions. (D) Inconsistent.</p>	
<p><b>Ans:</b> (A) Consistent with a unique solution</p>	<p>1</p>

10. If  $(x + 1)^3 = x^3 + 1$  is expressed as a quadratic equation in the form  $px^2 + qx + r = 0$ , then the value of  $p - q + r$  is :

- (A) 0 (B) 1  
(C) 3 (D) 6

Ans: (A) 0

1

11. If point  $(a, 2b)$  is the mid-point of the line segment joining the points  $(3, 5)$  and  $(-1, -1)$ , then  $(a, b)$  is equal to :

- (A)  $(1, 2)$  (B)  $(2, 2)$   
(C)  $(2, 1)$  (D)  $(1, 1)$

Ans: (D)  $(1, 1)$

1

12. The distance of point  $(-3, 4)$  from y-axis is :

- (A)  $-3$  (B)  $3$   
(C)  $4$  (D)  $5$

Ans: (B) 3

1

13. The value of  $\theta$  for which  $\sin 2\theta = \tan 45^\circ$  is :

- (A)  $22.5^\circ$  (B)  $30^\circ$   
(C)  $45^\circ$  (D)  $90^\circ$

Ans: (C)  $45^\circ$

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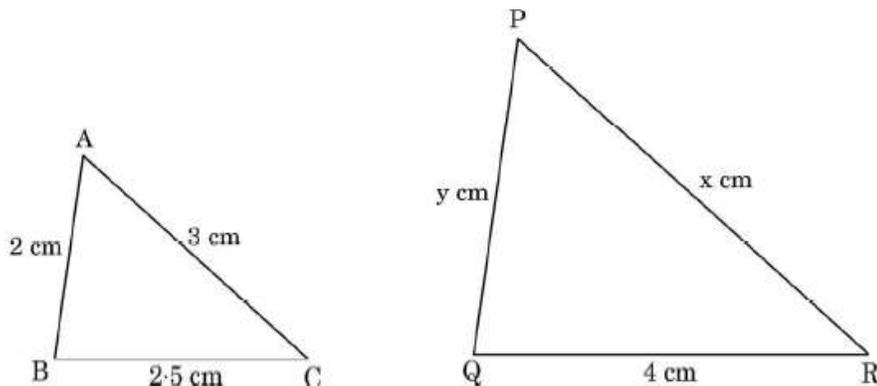
14. Which types of triangles are always similar ?

- (A) Right-angled triangles  
(B) Acute-angled triangles  
(C) Isosceles triangles  
(D) Equilateral triangles

Ans: (D) Equilateral triangles

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15. What values of  $x$  and  $y$  will make  $\triangle ABC$  similar to  $\triangle QRP$  in the figures given below ?

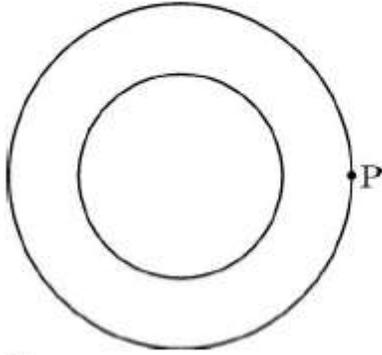


- (A)  $x = 6, y = 5$
- (B)  $x = 5, y = 6$
- (C)  $x = 6, y = 6$
- (D)  $x = 12, y = 3 \cdot 2$

**Ans:** (B)  $x = 5, y = 6$

1

16. How many tangents can be drawn from the point P on the outer circle to the inner circle in the given figure ?

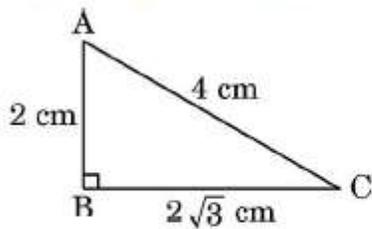


- (A) 0
- (B) 1
- (C) 2
- (D) Infinite

**Ans:** (C) 2

1

17. In the given figure, the angle of elevation of point A from point C is :



- (A)  $30^\circ$
- (B)  $45^\circ$
- (C)  $60^\circ$
- (D) Cannot be determined

**Ans:** (A)  $30^\circ$

1

18. The angle of the sector of a circle whose area is one-eighth of the area of the circle is :

- (A)  $22\frac{1}{2}^\circ$
- (B)  $45^\circ$
- (C)  $60^\circ$
- (D)  $90^\circ$

**Ans:** (B)  $45^\circ$

1

Questions number 19 and 20 are Assertion and Reason based questions. Two statements are given, one labelled as Assertion (A) and the other is labelled as Reason (R). Select the correct answer to these questions from the codes (A), (B), (C) and (D) as given below.

- (A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
- (B) Both Assertion (A) and Reason (R) are true, but Reason (R) is *not* the correct explanation of Assertion (A).
- (C) Assertion (A) is true, but Reason (R) is false.
- (D) Assertion (A) is false, but Reason (R) is true.

19. Assertion (A) : For an angle  $\theta$ ,  $\sec \theta = 1 \Rightarrow \tan \theta = 0$ .

Reason (R) :  $\sec^2 \theta + \tan^2 \theta = 1$ .

Ans: (C) Assertion (A) is true, but Reason (R) is false

1

20. Assertion (A) : Every quadratic equation has two real roots.

Reason (R) : A quadratic polynomial can have at most two zeroes.

Ans: (D) Assertion (A) is false, but Reason (R) is True.

1

### SECTION B

This section has 5 Very Short Answer (VSA) type questions carrying 2 marks each.

$5 \times 2 = 10$

21. From a circular sheet of radius 10 cm, a quadrant is cut. Find the perimeter of the remaining sheet.

**Solution:** Perimeter of the remaining sheet

$$= 2\pi r - \frac{1}{4} \times 2\pi r + 2r = \frac{3}{2} \pi r + 2r$$

$$= \frac{3}{2} \times \frac{22}{7} \times 10 + 20$$

$$= \frac{470}{7} \text{ cm or } 67.14 \text{ cm}$$

1

1

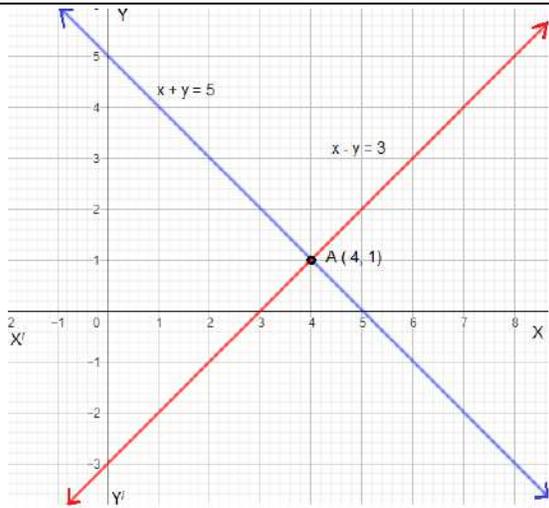
22. Solve the following system of linear equations graphically :

$$x + y = 5 \text{ and } x - y = 3$$

**Solution:**

Correct graph of equations

1½



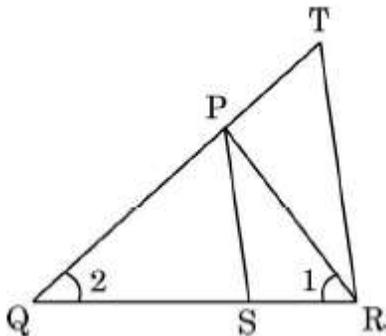
Solution:  $x = 4, y = 1$  or  $(4, 1)$

$\frac{1}{2}$

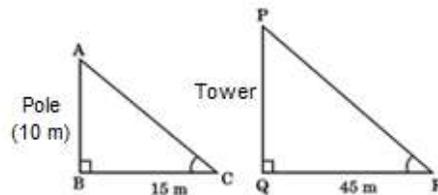
23. (a) A vertical pole of height 10 m casts a shadow of 15 m on the ground and at the same time, a tower casts a shadow of 45 m on the ground. Find the height of the tower.

OR

- (b) In the given figure,  $\frac{QR}{QS} = \frac{QT}{PR}$  and  $\angle 1 = \angle 2$ . Prove that  $\Delta PQS \sim \Delta TQR$ .



Solution: (a)



$$\begin{aligned} \therefore \Delta ABC &\sim \Delta PQR \\ \therefore \frac{10}{PQ} &= \frac{15}{45} \Rightarrow PQ = 30 \end{aligned}$$

Height of the tower = 30 m

OR

- (b) In  $\Delta PQR$   $\angle 1 = \angle 2 \Rightarrow PQ = PR$

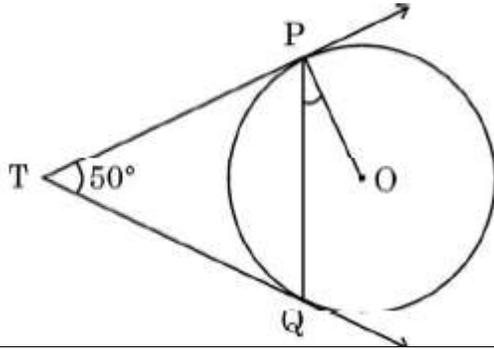
$\frac{1}{2}$

$1\frac{1}{2}$

$\frac{1}{2}$

$\therefore$ In $\Delta PQS$ and $\Delta TQR$ $\therefore \frac{QR}{QS} = \frac{QT}{PR} \Rightarrow \frac{QR}{QS} = \frac{QT}{QP}$ also $\angle Q = \angle Q$ (Common) $\therefore \Delta PQS \sim \Delta TQR$ (by SAS similarity criterion)	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$
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24. In the given figure, TP and TQ are two tangents. If  $\angle PTQ = 50^\circ$ , then find the measure of  $\angle OPQ$ .



<b>Solution:</b> TP = TQ (Tangents drawn from an exterior point to a circle are equal) Since angles opposite to equal sides of a triangle are equal $\therefore \angle TPQ = \angle TQP$ In $\Delta TPQ$ , $50^\circ + 2 \angle TPQ = 180^\circ$ $\Rightarrow \angle TPQ = 65^\circ$ $\angle OPQ = 90^\circ - 65^\circ = 25^\circ$	$\frac{1}{2}$ 1 $\frac{1}{2}$
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25. (a) If  $\sin 3A = 1$ , then find the value of  $\cos 2A - \tan^2 45^\circ$ .

**OR**

(b) If  $(\sec A + \tan A)(1 - \sin A) = k \cos A$ , then find the value of k.

<b>Solution:</b> (a) $3A = 90^\circ \Rightarrow A = 30^\circ$ $\cos 2A - \tan^2 45^\circ = \cos 60^\circ - \tan^2 45^\circ$ $= \frac{1}{2} - 1 = \frac{-1}{2}$	$\frac{1}{2}$ $1\frac{1}{2}$
<b>OR</b> (b) $\left( \frac{1}{\cos A} + \frac{\sin A}{\cos A} \right) (1 - \sin A) = k \cos A$ $1 - \sin^2 A = k \cos^2 A$ $\cos^2 A = k \cos^2 A$ $k = 1$	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$

## SECTION C

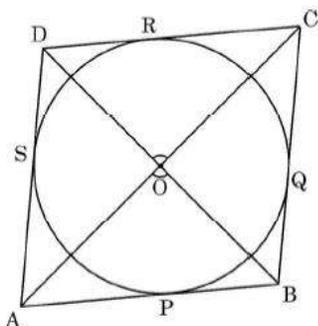
*This section has 6 Short Answer (SA) type questions carrying 3 marks each. 6×3=18*

26. A box contains 6 blue, 4 white and 8 red marbles. A marble is drawn at random from this box. Find the probability that the marble so drawn is :

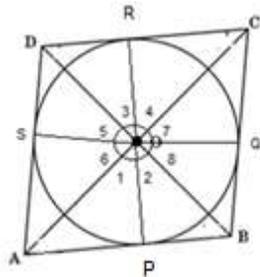
- (i) white
- (ii) white or red
- (iii) not red

<b>Solution:</b>	(i) $P(\text{white marble}) = \frac{4}{18}$ or $\frac{2}{9}$	1
	(ii) $P(\text{white or red marble}) = \frac{12}{18}$ or $\frac{2}{3}$	1
	(iii) $P(\text{not a red marble}) = \frac{10}{18}$ or $\frac{5}{9}$	1

27. In the given figure, a circle is inscribed in a quadrilateral ABCD which touches the sides AB, BC, CD and DA at P, Q, R and S respectively. Prove that  $\angle AOB + \angle COD = 180^\circ$ .



**Solution:**



Proof of  $\triangle OAP \cong \triangle OAS$  (by any congruency criterion)  
 $\Rightarrow \angle 1 = \angle 6$  (cpct)

Similarly  $\angle 3 = \angle 5$ ,  $\angle 4 = \angle 7$  and  $\angle 2 = \angle 8$

Also  $\angle 1 + \angle 2 + \angle 3 + \angle 4 + \angle 5 + \angle 6 + \angle 7 + \angle 8 = 360^\circ$

$\therefore \angle 1 + \angle 2 + \angle 3 + \angle 4 = 180^\circ$

$\angle AOB + \angle COD = 180^\circ$

1

1

$\frac{1}{2}$

$\frac{1}{2}$

28. (a) Prove that  $\sqrt{2}$  is an irrational number.

OR

(b) Find which among the following numbers a, b and c is/are composite numbers.

$$a = 7 \times 11 \times 13 + 13$$

$$b = 6 \times 5 \times 4 + 4$$

$$c = 7 \times 13 + 6$$

**Solution:** (a) Let  $\sqrt{2}$  be a rational number such that  $\sqrt{2} = \frac{p}{q}$

(p and q are co-prime numbers,  $q \neq 0$ )

$$\sqrt{2} q = p \Rightarrow 2q^2 = p^2$$

2 divides  $p^2 \Rightarrow 2$  divides p as well

$$p = 2m \text{ (for some integer m)}$$

$$2q^2 = 4m^2 \Rightarrow q^2 = 2m^2$$

2 divides  $q^2 \Rightarrow 2$  divides q as well

p and q have a common factor 2 which is a contradiction as p and q are co-prime.

$\therefore$  our assumption is wrong

Hence,  $\sqrt{2}$  is an irrational number

OR

(b) a and b are **only** composite numbers

$\frac{1}{2}$

1

1

$\frac{1}{2}$

3

29. Find the zeroes of the polynomial  $25a^2 - 10a + 1$  and verify the relationship between the zeroes and coefficients of the given polynomial.

**Solution:**  $25a^2 - 10a + 1 = (5a - 1)(5a - 1)$

Zeroes are  $\frac{1}{5}$  and  $\frac{1}{5}$

$$\text{Sum of zeroes} = \frac{1}{5} + \frac{1}{5} = \frac{2}{5} = \frac{-(-10)}{25} = \frac{-\text{Coefficient of } a}{\text{Coefficient of } a^2}$$

$$\text{Product of zeroes} = \frac{1}{5} \times \frac{1}{5} = \frac{1}{25} = \frac{\text{Constant term}}{\text{Coefficient of } a^2}$$

1

1

1

30. (a) A fraction becomes  $\frac{1}{3}$ , when 1 is subtracted from the numerator and it becomes  $\frac{1}{4}$ , when 8 is added to its denominator. Find the fraction.

**OR**

(b) Find the value of k for which the following pair of linear equations will have infinitely many solutions :

$$kx + 3y - (k - 3) = 0 \text{ and } 12x + ky - k = 0$$

Hence, find any two solutions of the given pair of equations.

**Solution:** (a) Let the fraction be  $\frac{x}{y}$

$$\frac{x-1}{y} = \frac{1}{3} \Rightarrow 3x - y = 3 \dots\dots\dots(i)$$

$$\frac{x}{y+8} = \frac{1}{4} \Rightarrow 4x - y = 8 \dots\dots\dots(ii)$$

On solving the equations (i) and (ii), we get  $x = 5, y = 12$

Required fraction is  $\frac{5}{12}$

**OR**

(b) For infinitely many solutions:  $\frac{k}{12} = \frac{3}{k} = \frac{k-3}{k}$

$$k^2 = 36 \text{ and } k^2 - 6k = 0$$

$$(k = \pm 6) \text{ and } (k = 6 \text{ or } 0)$$

$$\therefore k = 6$$

For  $k = 6$ , equations are  $6x + 3y = 3$  and  $12x + 6y = 6$

any two correct solutions

$\frac{1}{2}$

$\frac{1}{2}$

$\frac{1}{2}$

1

$\frac{1}{2}$

1

1

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

31. Prove the following trigonometric identity :

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

**Solution:** LHS =  $\frac{\tan \theta}{1 + \frac{1}{\tan \theta}} + \frac{1}{1 + \tan \theta}$

$$= \frac{\tan^2 \theta}{1 + \tan \theta} + \frac{1}{\tan \theta(1 + \tan \theta)}$$

$\frac{1}{2}$

$\frac{1}{2}$

$$= \frac{1 + \tan^3 \theta}{\tan \theta (1 + \tan \theta)}$$

$$= \frac{(1 + \tan \theta)(1 + \tan^2 \theta - \tan \theta)}{\tan \theta (1 + \tan \theta)}$$

$$= \cot \theta + \tan \theta - 1 = \text{RHS}$$

1/2

1

1/2

### SECTION D

This section has 4 Long Answer (LA) type questions carrying 5 marks each.  $4 \times 5 = 20$

32. The following table shows the daily expenditure of 25 households of a locality.

Daily Expenditure (in ₹)	Number of Households
500 – 750	4
750 – 1000	$2x + 1$
1000 – 1250	12
1250 – 1500	$x$
1500 – 1750	2

Find the value of  $x$ . Hence find the mean daily expenditure.

**Solution:**  $4 + 2x + 1 + 12 + x + 2 = 25 \Rightarrow x = 2$

C. I.	$x_i$	$f_i$	$u_i$	$f_i u_i$
500 – 750	625	4	-2	-8
750 – 1000	875	5	-1	-5
1000 – 1250	<b>1125 = a</b>	12	0	0
1250 – 1500	1375	2	1	2
1500 – 1750	1625	2	2	4
		25		-7

$$\bar{x} = 1125 + \frac{-7}{25} \times 250$$

$$\bar{x} = 1055$$

$$\therefore \text{mean daily expenditure} = ₹1055$$

1

Correct Table:  
2 marks

1 1/2

1/2

33. (a) Find two consecutive odd integers, sum of whose squares is 290.

**OR**

(b) A charity trust decides to build a rectangular hall having an area of  $300 \text{ m}^2$ . The length of the hall is one metre more than twice its width. Find the length and breadth of the hall.

**Solution:**

(a) Let the two consecutive odd integers be  $x$  and  $x + 2$

$$x^2 + (x + 2)^2 = 290$$

$$2x^2 + 4x - 286 = 0 \text{ or } x^2 + 2x - 143 = 0$$

$$(x - 11)(x + 13) = 0$$

$$x = 11$$

Required odd integers are 11 and 13

**OR**

(b) Let width be  $x$  m and length be  $(2x + 1)$  m

$$\text{A.T.Q. } (2x + 1)x = 300$$

$$2x^2 + x - 300 = 0$$

$$(x - 12)(2x + 25) = 0$$

$$x = 12$$

$$\left( \text{Rejecting } x = \frac{-25}{2} \right)$$

length = 25 m and width = 12 m

$\frac{1}{2}$

$1\frac{1}{2}$

$1\frac{1}{2}$

1

$\frac{1}{2}$

$\frac{1}{2}$

$1\frac{1}{2}$

$1\frac{1}{2}$

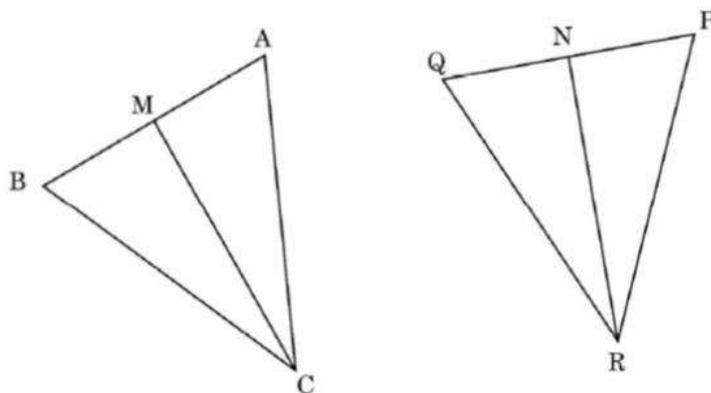
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$\frac{1}{2}$

34. (a) State and Prove "Basic Proportionality Theorem".

**OR**

(b) In the given figure, CM and RN are respectively, the medians of  $\Delta ABC$  and  $\Delta PQR$ . If  $\Delta ABC \sim \Delta PQR$ , prove that :



(i)  $\Delta AMC \sim \Delta PNR$

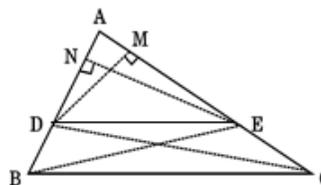
(ii)  $\angle BCM = \angle QRN$

(iii)  $\Delta BMC \sim \Delta QNR$

**Solution:** (a) Statement: If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, the other two sides are divided in the same ratio.

Given: In  $\Delta ABC$ ,  $DE \parallel BC$

To Prove:  $\frac{AD}{DB} = \frac{AE}{EC}$



Construction: Draw  $DM \perp AC$ ,  $EN \perp AB$ , join  $BE$  and  $CD$

Proof :  $\frac{ar(\Delta ADE)}{ar(\Delta DBE)} = \frac{\frac{1}{2} \times AD \times EN}{\frac{1}{2} \times DB \times EN} = \frac{AD}{DB} \dots\dots\dots(i)$

$\frac{ar(\Delta ADE)}{ar(\Delta ECD)} = \frac{\frac{1}{2} \times AE \times DM}{\frac{1}{2} \times EC \times DM} = \frac{AE}{EC} \dots\dots\dots(ii)$

as  $\Delta DBE$  and  $\Delta ECD$  lie on the same base  $DE$  and between same parallels  $BC$  and  $DE$

$\therefore ar(\Delta DBE) = ar(\Delta ECD)$  or  $\frac{ar(\Delta ADE)}{ar(\Delta DBE)} = \frac{ar(\Delta ADE)}{ar(\Delta ECD)} \dots\dots\dots(iii)$

From (i), (ii) and (iii), we get  $\frac{AD}{DB} = \frac{AE}{EC}$

**OR**

(b) (i)  $\Delta ABC \sim \Delta PQR \Rightarrow \frac{AB}{PQ} = \frac{AC}{PR}$

$\Rightarrow \frac{AC}{PR} = \frac{\frac{1}{2} AB}{\frac{1}{2} PQ} \Rightarrow \frac{AC}{PR} = \frac{AM}{PN}$

Also  $\angle A = \angle P$

$\therefore \Delta AMC \sim \Delta PNR$  (by SAS similarity criterion)

(ii)  $\Delta AMC \sim \Delta PNR$  (from part (i))

$\therefore \angle ACM = \angle PRN$

Also  $\angle ACB = \angle PRQ$  ( as  $\Delta ABC \sim \Delta PQR$ )

Correct Statement:  
1 mark

Given + To prove + Construction + Figure:  
1 mark

1

1

1/2

1/2

1/2

1/2

1/2

1/2

1/2

$$\therefore \angle ACB - \angle ACM = \angle PRQ - \angle PRN$$

$$\Rightarrow \angle BCM = \angle QRN$$

$$(iii) \triangle ABC \sim \triangle PQR \Rightarrow \frac{AB}{PQ} = \frac{BC}{QR}$$

$$\Rightarrow \frac{BC}{QR} = \frac{\frac{1}{2}AB}{\frac{1}{2}PQ} \Rightarrow \frac{BC}{QR} = \frac{BM}{QN}$$

$$\text{Also } \angle B = \angle Q$$

$\therefore \triangle BMC \sim \triangle QNR$  (by SAS similarity criterion)

$\frac{1}{2}$

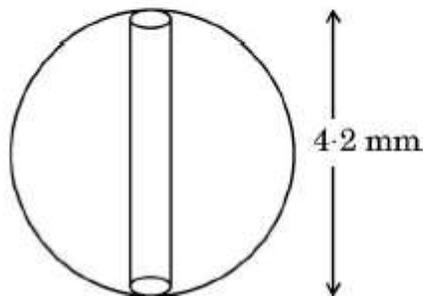
$\frac{1}{2}$

$\frac{1}{2}$

$\frac{1}{2}$

$\frac{1}{2}$

- 35.** A necklace is made up of wooden beads. Each bead is in the form of a sphere of diameter 4.2 mm. A cylinder is hollowed out from each bead. If the radius of the cylinder is 1 mm, find the volume of wood left in each bead.



**Solution:**

Radius of a spherical bead =  $R = 2.1$  mm

radius of cylinder =  $r = 1$  mm

height of cylinder =  $h = 4.2$  mm

Volume of wood left in a bead

$$= \text{Volume of sphere} - \text{Volume of cylinder}$$

$$= \frac{4}{3}\pi R^3 - \pi r^2 h$$

$$= \frac{4}{3} \times \frac{22}{7} \times 2.1 \times 2.1 \times 2.1 - \frac{22}{7} \times 1 \times 1 \times 4.2$$

$$= 25.608 \text{ cu. mm}$$

2 + 2

1

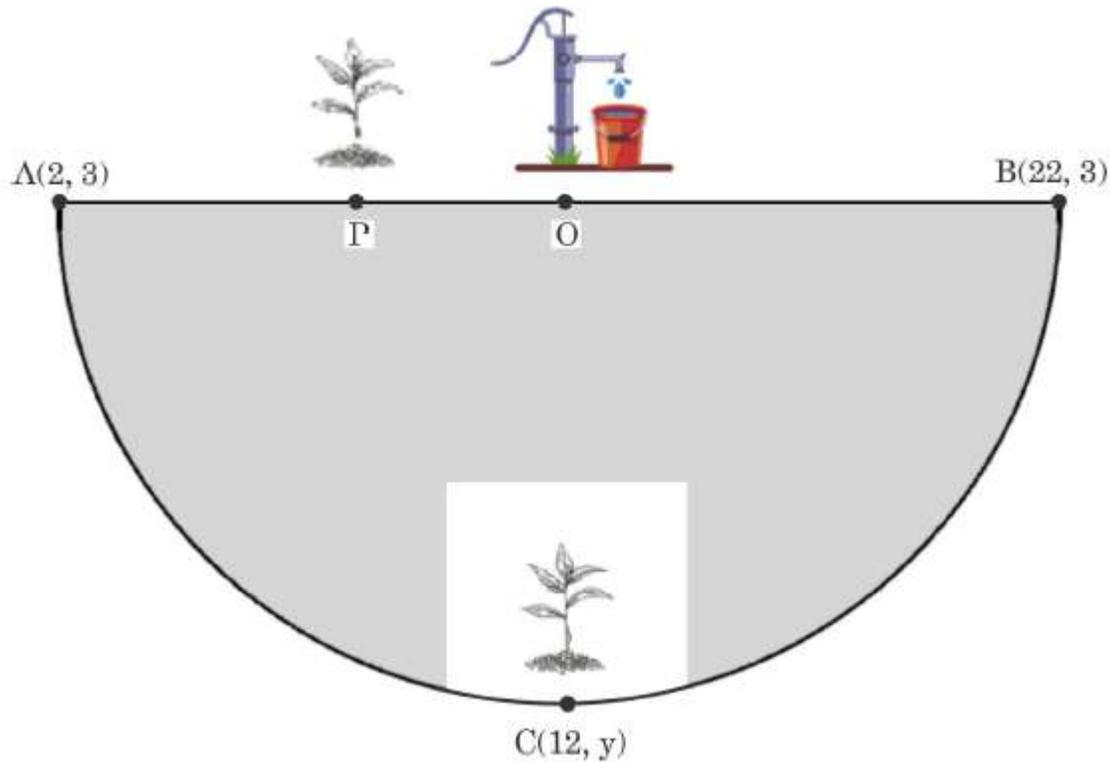
### SECTION E

*This section has 3 case study based questions carrying 4 marks each.*

*3×4=12*

#### Case Study - 1

36. There is a semicircular park in Aman's society. He wishes to plant saplings along the boundary of the park. There is a borewell at the centre O of the park along the diameter AB as shown in the figure below.



Based on the above information, answer the following questions :

- (i) Find the coordinates of point O. 1
- (ii) Find the radius of the semicircular park. 1
- (iii) (a) One sapling is kept at point C(12, y). Find the coordinates of C. 2
- OR**
- (b) One sapling is kept at point P along AB so that  $PA = \frac{1}{3} PB$ .  
Find the coordinates of P. 2

**Solution:**

- |   |               |
|---|---------------|
| (i) Coordinates of O are (12, 3)  | 1             |
| (ii) Radius = 10  | 1             |
| (iii) (a) $OC = \text{radius} = 10$   | $\frac{1}{2}$ |
| $y = 13, y = -7$  | 1             |
| Coordinates of the point 'C' are (12, 13) or (12, -7)   | $\frac{1}{2}$ |
| <b>OR</b>   |               |
| (iii) (b) P divides AB in the ratio 1 : 3   | $\frac{1}{2}$ |
| Coordinates of P are $\left( \frac{1 \times 22 + 3 \times 2}{4}, \frac{1 \times 3 + 3 \times 3}{4} \right)$ | 1             |
| i.e. (7, 3)   | $\frac{1}{2}$ |

## Case Study – 2

37. In a society, a yoga instructor was hired to train the people of the society to live a healthy lifestyle. Yoga sessions were held daily from 5 p.m. to 7 p.m. in the society park. On day one, 5 people joined the yoga session, on day two, 3 more people joined, on day three, another 3 people joined and in this manner every next day, 3 more people kept on joining.



Based on the given information, answer the following questions :

- |   |   |
|---|---|
| (i) On which day did 59 people join the yoga session ?  | 1 |
| (ii) How many people joined the yoga session on the 31 <sup>st</sup> day ?  | 1 |
| (iii) (a) The yoga instructor was paid ₹100 for each person attending the yoga session. On which day would he earn ₹5,000 ? | 2 |
| <b>OR</b>   |   |
| (b) What was the total amount earned by the yoga instructor in 16 days ?  | 2 |

### Solution:

- |   |   |
|---|---|
| (i) $5 + (n - 1) 3 = 59$<br>$n = 19$                  | 1 |
| (ii) $a_{31} = 95$                                    | 1 |
| (iii) (a) Number of persons = $\frac{5000}{100} = 50$ | 1 |
| $5 + (n - 1) 3 = 50$<br>$n = 16$                      | 1 |

OR

(iii) (b)  $S_{16} = \frac{16}{2} [10 + 15(3)]$

$= 440$

Total amount earned in 16 days =  $440 \times 100$

$= ₹ 44000$

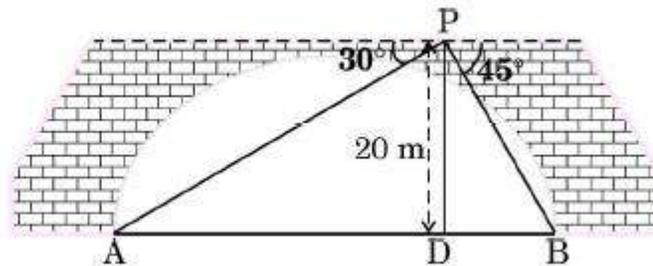
1

$\frac{1}{2}$

$\frac{1}{2}$

### Case Study - 3

38. Two motorboats A and B are waiting at the opposite banks of a river in order to reach the opposite side. From a point P on the bridge, 20 m above the river, the angles of depression of the boats are  $30^\circ$  and  $45^\circ$  respectively, as shown in the figure given below. Both the boats leave at the same time at the speed of 10 m/s and 5 m/s, respectively



Based on the above information, answer the following questions :

- (i) Find the distance travelled by boat A to reach point D in the river, vertically below the point P. (Use  $\sqrt{3} = 1.73$ ) 1
- (ii) What is the width of the river? 1
- (iii) (a) Which boat will reach point D first, and how much earlier, than the other boat? 2

OR

- (b) What is the distance between the two boats after 3 seconds? 2

<b>Solution:</b>	(i) $\frac{20}{AD} = \tan 30^\circ$	$\frac{1}{2}$
	$AD = 20\sqrt{3} = 34.6 \text{ m}$	$\frac{1}{2}$
	(ii) $\frac{20}{DB} = \tan 45^\circ \Rightarrow DB = 20 \text{ m}$	$\frac{1}{2}$
	Width of river = $34.6 + 20 = 54.6 \text{ m}$	$\frac{1}{2}$
	(iii) (a) Time taken by boat A = $\frac{34.6}{10} = 3.46 \text{ seconds}$	1

$$\text{Time taken by boat B} = \frac{20}{5} = 4 \text{ seconds}$$

Boat A will reach earlier by 0.54 seconds

$\frac{1}{2}$

**OR**

(iii) (b) Distance covered by boat A in 3 seconds =  $3 \times 10 = 30$  m

Distance covered by boat B in 3 seconds =  $3 \times 5 = 15$  m

Distance between them after 3 seconds =  $54.6 - (30+15)$   
 $= 9.6$  m

$\frac{1}{2}$

$\frac{1}{2}$

1