

Set 430/3/1

SOLUTIONS MATHEMATICS (BASIC)

SECTION A

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

$20 \times 1 = 20$

1. If $p = 2^3 \times 3^2 \times 5$ and $q = 2^2 \times 3^3$, then the LCM of p and q is :

- (A) $2^3 \times 3^3$
- (B) $2^2 \times 3^2$
- (C) $2^2 \times 3^2 \times 5$
- (D) $2^3 \times 3^3 \times 5$

Ans: (D) $2^3 \times 3^3 \times 5$

1

2. 3^n , where n is a natural number, cannot end with the digit :

- (A) 3
- (B) 5
- (C) 7
- (D) 9

Ans: (B) 5

1

3. A prime number has :

- (A) exactly two prime factors
- (B) exactly one prime factor
- (C) at least one prime factor
- (D) at least two prime factors

Ans: (B) exactly one prime factor

1

4. For what value(s) of k does the system of equations $kx + 2y = 3$ and $2x + y = 5$ have a unique solution ?

- (A) $k =$ a real number
- (B) $k \neq 8$
- (C) $k \neq 4$
- (D) $k = 4$

Ans: (C) $k \neq 4$

1

5. If $x = \sqrt{x}$, ($x \neq 0$) is expressed as a quadratic equation in the form $ax^2 + bx + c = 0$, then the value of $a + b + c$ is :

- (A) 0 (B) 1
(C) 2 (D) 3

Ans: (A) 0

1

6. If point (1, 2) is the mid-point of the line segment joining the points (3, 5) and (2a, b), then (a, b) =

- (A) (-1, -1) (B) $\left(-\frac{1}{2}, -\frac{1}{2}\right)$
(C) $\left(-\frac{1}{2}, -1\right)$ (D) $\left(-1, -\frac{1}{2}\right)$

Ans: (C) $\left(-\frac{1}{2}, -1\right)$

1

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

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

Ans: (B) 3

1

8. The value of $\frac{\sec^2 30^\circ + \tan^2 30^\circ}{\sin^2 45^\circ + \cos^2 45^\circ}$ is :

- (A) 1 (B) $\frac{5}{3}$
(C) $\frac{13}{3}$ (D) 7

Ans: (B) $\frac{5}{3}$

1

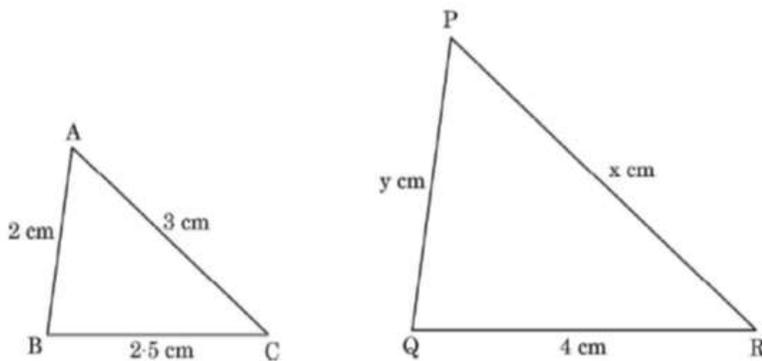
9. Which types of triangles are always similar ?

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

Ans: (D) Equilateral triangles

1

10. What values of x and y will make ΔABC similar to ΔQRP in the figures given below ?

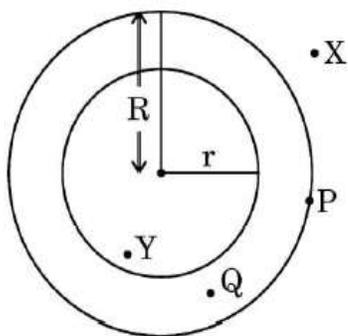


- (A) $x = 6, y = 5$
- (B) $x = 5, y = 6$
- (C) $x = 6, y = 6$
- (D) $x = 12, y = 3.2$

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

1

11. In the given figure, from which point can the tangent **not** be drawn to the circle with radius r ?

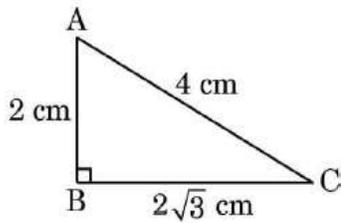


- (A) X
- (B) P
- (C) Q
- (D) Y

Ans: (D) Y

1

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



- (A) 30° (B) 45°
 (C) 60° (D) Cannot be determined

Ans: (A) 30° 1

13. 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°
 (C) 60° (D) 90°

Ans: (B) 45° 1

14. 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

15. 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

16. 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

<p>17. For a distribution, if mean = 15 and mode = 12, then its median is :</p> <p>(A) 12 (B) 13 (C) 14 (D) 15</p>	
<p>Ans: (C) 14</p>	<p>1</p>
<p>18. 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>Ans: (C) 10</p>	<p>1</p>
<p><i>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.</i></p> <p>(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 <i>not</i> 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.</p> <p>19. <i>Assertion (A) :</i> For $\sin \theta = 1$, $\cos \theta$ must be 0. <i>Reason (R) :</i> $\sin^2 \theta - \cos^2 \theta = 1$.</p>	
<p>Ans: (C) Assertion (A) is true, but Reason (R) is false</p>	<p>1</p>
<p>20. <i>Assertion (A) :</i> Every quadratic equation has two real roots. <i>Reason (R) :</i> A quadratic polynomial can have at most two zeroes.</p>	
<p>Ans: (D) Assertion (A) is false, but Reason (R) is True.</p>	<p>1</p>

SECTION B

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

$5 \times 2 = 10$

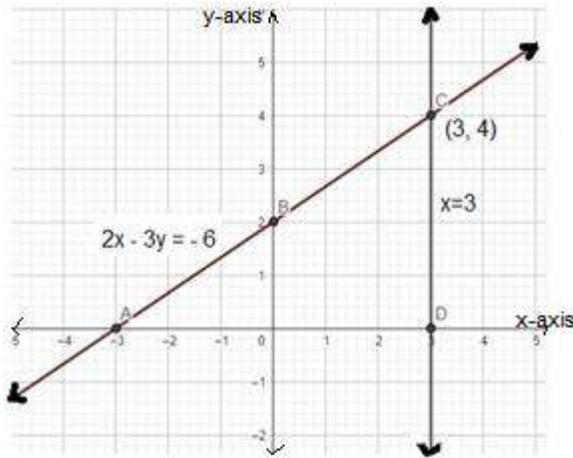
21. Solve the following system of equations graphically :

$$2x - 3y = -6 \text{ and } x = 3$$

Solution:

Correct graph of equations

$1\frac{1}{2}$



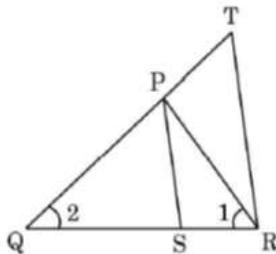
$x = 3, y = 4$ or $(3, 4)$

$\frac{1}{2}$

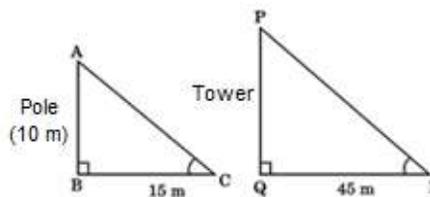
22. (a) A vertical pole of height 10 m casts a shadow of 15 m on the ground and at the same time, a tower casts a shadow of 45 m on the ground. Find the height of the tower.

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)



$$\therefore \Delta ABC \sim \Delta PQR$$

$$\therefore \frac{10}{PQ} = \frac{15}{45} \Rightarrow PQ = 30$$

Height of the tower = 30 m

OR

(b) In ΔPQR $\angle 1 = \angle 2 \Rightarrow PQ = PR$

\therefore In ΔPQS and ΔTQR

$$\frac{QR}{QS} = \frac{QT}{PR} \Rightarrow \frac{QR}{QS} = \frac{QT}{QP}$$

also $\angle Q = \angle Q$ (Common)

$\therefore \Delta PQS \sim \Delta TQR$ (by SAS similarity criterion)

$\frac{1}{2}$

$1\frac{1}{2}$

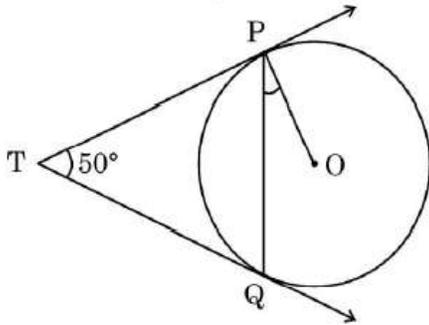
$\frac{1}{2}$

$\frac{1}{2}$

$\frac{1}{2}$

$\frac{1}{2}$

23. In the given figure, TP and TQ are two tangents. If $\angle PTQ = 50^\circ$, then find the measure of $\angle OPQ$.



Solution: $TP = TQ$ (Lengths of tangents drawn from an external point to a circle are equal)

Since angles opposite to equal sides of a triangle are equal

$$\therefore \angle TPQ = \angle TQP$$

$$\text{In } \Delta TPQ, \quad 50^\circ + 2 \angle TPQ = 180^\circ$$

$$\Rightarrow \angle TPQ = 65^\circ$$

$$\angle OPQ = 90^\circ - 65^\circ = 25^\circ$$

$\frac{1}{2}$

1

$\frac{1}{2}$

24. (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.

Solution: (a) $3A = 90^\circ \Rightarrow A = 30^\circ$

$$\cos 2A - \tan^2 45^\circ = \cos 60^\circ - \tan^2 45^\circ$$

$$= \frac{1}{2} - 1 = \frac{-1}{2}$$

OR

(b) $\left(\frac{1}{\cos A} + \frac{\sin A}{\cos A} \right) (1 - \sin A) = k \cos A$

$$1 - \sin^2 A = k \cos^2 A$$

$\frac{1}{2}$

$1\frac{1}{2}$

$\frac{1}{2}$

$\frac{1}{2}$

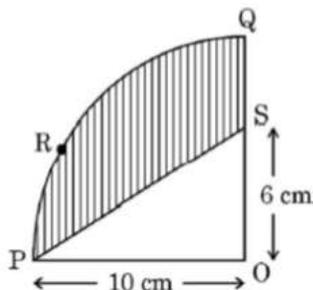
$$\cos^2 A = k \cos^2 A$$

$$k = 1$$

1/2

1/2

25. In the given figure, OPRQ is a quadrant of a circle with centre O and radius 10 cm. If OP = 10 cm and OS = 6 cm, find the area of the shaded region. (Use $\pi = 3.14$)



Solution: Area of the shaded region = Area of quadrant – Area of ΔPOS

$$= \frac{1}{4} \times 3.14 \times 10 \times 10 - \frac{1}{2} \times 10 \times 6$$

$$= 48.5 \text{ sq. cm} \quad \text{or} \quad \frac{97}{2} \text{ sq. cm}$$

1

1

SECTION C

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

26. (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, $q \neq 0$)

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

$$2 \text{ divides } p^2 \Rightarrow 2 \text{ divides } p \text{ as well}$$

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

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

$$2 \text{ divides } q^2 \Rightarrow 2 \text{ divides } q \text{ as well}$$

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

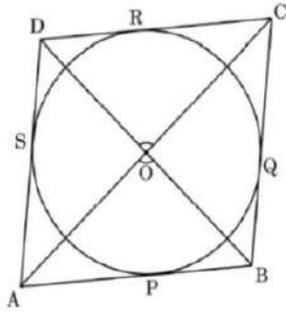
1/2

1

1

<p>∴ our assumption is wrong Hence, $\sqrt{2}$ is an irrational number</p> <p style="text-align: center;">OR</p> <p>(b) a and b are only composite numbers.</p>	<p>$\frac{1}{2}$</p> <p>3</p>
<p>27. Find the zeroes of the polynomial $9s^2 - 6s + 1$ and verify the relationship between the zeroes and the coefficients of the given polynomial.</p>	
<p>Solution: $9s^2 - 6s + 1 = (3s - 1)(3s - 1)$</p> <p>Zeroes are $\frac{1}{3}$ and $\frac{1}{3}$</p> <p>Sum of zeroes = $\frac{1}{3} + \frac{1}{3} = \frac{2}{3} = \frac{-(-6)}{9} = \frac{-\text{Coefficient of } s}{\text{Coefficient of } s^2}$</p> <p>Product of zeroes = $\frac{1}{3} \times \frac{1}{3} = \frac{1}{9} = \frac{\text{Constant term}}{\text{Coefficient of } s^2}$</p>	<p>1</p> <p>1</p> <p>1</p>
<p>28. (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.</p> <p style="text-align: center;">OR</p> <p>(b) Find the value of k for which the following pair of linear equations will have infinitely many solutions :</p> <p style="text-align: center;">$kx + 3y - (k - 3) = 0$ and $12x + ky - k = 0$</p> <p>Hence, find any two solutions of the given pair of equations.</p>	
<p>Solution: (a) Let the fraction be $\frac{x}{y}$</p> <p>A.T.Q.</p> <p>$\frac{x-1}{y} = \frac{1}{3} \Rightarrow 3x - y = 3 \dots\dots\dots(i)$</p> <p>and $\frac{x}{y+8} = \frac{1}{4} \Rightarrow 4x - y = 8 \dots\dots\dots(ii)$</p> <p>On solving the equations (i) and (ii), we get $x = 5, y = 12$</p> <p>Required fraction is $\frac{5}{12}$</p> <p style="text-align: center;">OR</p>	<p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>1</p> <p>$\frac{1}{2}$</p>

<p>(b) For infinitely many solutions: $\frac{k}{12} = \frac{3}{k} = \frac{k-3}{k}$</p> <p>$k^2 = 36$ and $k^2 - 6k = 0$ $(k = \pm 6)$ and $(k = 6 \text{ or } 0)$ $\therefore k = 6$</p> <p>For $k = 6$, equations are $6x + 3y = 3$ and $12x + 6y = 6$ any two correct solutions</p>	<p>1</p> <p>1</p> <p>$\frac{1}{2} + \frac{1}{2}$</p>
<p>29. Prove that :</p> $\frac{1 + \operatorname{cosec} A}{\operatorname{cosec} A} = \frac{\cos^2 A}{1 - \sin A}$	
<p>Solution:</p> $\begin{aligned} \text{LHS} &= \frac{1 + \frac{1}{\sin A}}{\frac{1}{\sin A}} \\ &= 1 + \sin A \\ &= \frac{(1 + \sin A)(1 - \sin A)}{(1 - \sin A)} \\ &= \frac{1 - \sin^2 A}{1 - \sin A} = \frac{\cos^2 A}{1 - \sin A} = \text{RHS} \end{aligned}$	<p>$\frac{1}{2}$</p> <p>1</p> <p>$\frac{1}{2}$</p> <p>1</p>
<p>30. 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 :</p> <p>(i) white (ii) white or red (iii) not red</p>	
<p>Solution: (i) $P(\text{white marble}) = \frac{4}{18}$ or $\frac{2}{9}$</p> <p>(ii) $P(\text{white or red marble}) = \frac{12}{18}$ or $\frac{2}{3}$</p> <p>(iii) $P(\text{not a red marble}) = \frac{10}{18}$ or $\frac{5}{9}$</p>	<p>1</p> <p>1</p> <p>1</p>
<p>31. 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 $\angle AOB + \angle COD = 180^\circ$.</p>	



Solution:

Proving $\triangle OAP \cong \triangle OAS$ (by any congruency criterion)

$$\Rightarrow \angle 1 = \angle 6 \text{ (cpct)}$$

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

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

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

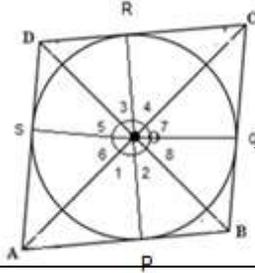
$$\angle AOB + \angle COD = 180^\circ$$

1

1

$\frac{1}{2}$

$\frac{1}{2}$



SECTION D

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

32. (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 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 $x + 2$

A.T.Q. $x^2 + (x + 2)^2 = 290$

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

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

$$x = 11$$

Required odd integers are 11 and 13

OR

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

A.T.Q. $(2x + 1)x = 300$

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

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

$$x = 12$$

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

length = 25 m and breadth = 12 m

$\frac{1}{2}$

$1\frac{1}{2}$

$1\frac{1}{2}$

1

$\frac{1}{2}$

$\frac{1}{2}$

$1\frac{1}{2}$

$1\frac{1}{2}$

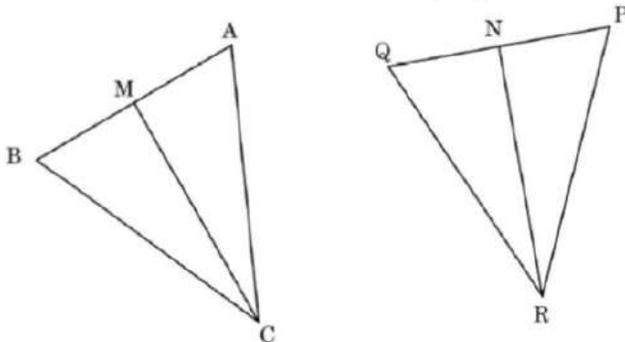
1

$\frac{1}{2}$

33. (a) State and Prove “Basic Proportionality Theorem”.

OR

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



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

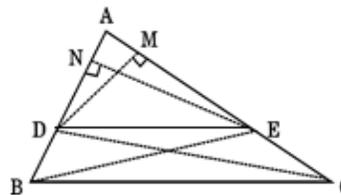
(ii) $\angle BCM = \angle QRN$

(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 ΔABC , $DE \parallel BC$

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



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

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

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

as ΔDBE and ΔECD lie on the same base DE and between same parallels BC and DE

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

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

Correct Statement:
1 mark

Given, To prove,
Construction &
Figure:
1 mark

1

1

1/2

1/2

OR

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

$\frac{1}{2}$

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

$\frac{1}{2}$

Also $\angle A = \angle P$

$\frac{1}{2}$

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

$\frac{1}{2}$

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

$\therefore \angle ACM = \angle PRN$

$\frac{1}{2}$

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

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

$\frac{1}{2}$

$\Rightarrow \angle BCM = \angle QRN$

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

$\frac{1}{2}$

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

$\frac{1}{2}$

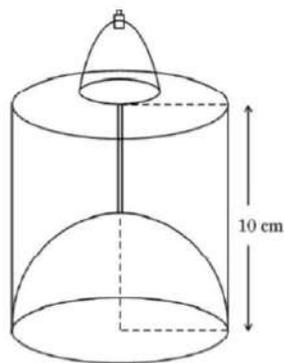
Also $\angle B = \angle Q$

$\frac{1}{2}$

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

$\frac{1}{2}$

34. A perfume bottle is in the form of a cylinder but the bottom of the bottle has a hemispherical raised portion to reduce the capacity of the bottle. The inner diameter of the bottle is 5 cm and the height of the bottle is 10 cm. Find the capacity of the perfume bottle in mL. (Use $\pi = 3.14$ and $1 \text{ cm}^3 = 1 \text{ mL}$)



Solution: Radius of cylinder = radius of hemisphere = $r = \frac{5}{2}$ cm

$\frac{1}{2}$

Height of cylinder = $h = 10$ cm

Volume of the bottle = Volume of cylinder – Volume of hemisphere

$$\begin{aligned}
&= \pi r^2 h - \frac{2}{3} \pi r^3 \\
&= 3.14 \times \frac{5}{2} \times \frac{5}{2} \times 10 - \frac{2}{3} \times 3.14 \times \frac{5}{2} \times \frac{5}{2} \times \frac{5}{2} \\
&= \frac{3925}{24} \text{ cu. cm or } 163.5 \text{ cu. cm}
\end{aligned}$$

Capacity of the perfume bottle = 163.5 mL

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

1

$\frac{1}{2}$

35. The weights of 30 students of a class are given in the following distribution table :

Weight (in kg)	Number of students
40 – 45	2
45 – 50	5
50 – 55	8
55 – 60	6
60 – 65	6
65 – 70	3

Find the median weight of the students.

Solution:

C. I.	F	Cf
40 – 45	2	2
45 – 50	5	7
50 – 55	8	15
55 – 60	6	21
60 – 65	6	27
65 – 70	3	30
	30	

Median class : 50 – 55

$$\begin{aligned}
\text{Median} &= l + \frac{\frac{N}{2} - cf}{f} \times h \\
&= 50 + \frac{15 - 7}{8} \times 5 \\
&= 55
\end{aligned}$$

\therefore Median weight = 55 kg

Correct Table:

2

2

1

SECTION E

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

3×4=12

Case Study - 1

36. 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 31st 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
- OR**
- (b) What was the total amount earned by the yoga instructor in 16 days ? 2

Solution:

(i) $5 + (n - 1) 3 = 59$
 $n = 19$

(ii) $a_{31} = 95$

(iii) (a) Number of persons = $\frac{5000}{100} = 50$
 $5 + (n - 1) 3 = 50$
 $n = 16$

1

1

1

1

OR

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

$= 440$

Total amount earned in 16 days = 440×100
 $= ₹ 44000$

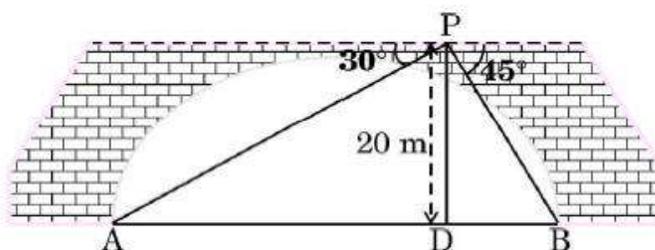
1

$\frac{1}{2}$

$\frac{1}{2}$

Case Study - 2

37. 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° and 45° 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

Solution:

(i) $\frac{20}{AD} = \tan 30^\circ$

$AD = 20\sqrt{3} = 34.6 \text{ m}$

$\frac{1}{2}$

$\frac{1}{2}$

(ii) $\frac{20}{DB} = \tan 45^\circ \Rightarrow DB = 20 \text{ m}$

Width of river = $34.6 + 20 = 54.6 \text{ m}$

(iii) (a) Time taken by boat A = $\frac{34 \cdot 6}{10} = 3.46 \text{ seconds}$

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

Boat A will reach earlier by 0.54 seconds

OR

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

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

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

1/2

1/2

1

1/2

1/2

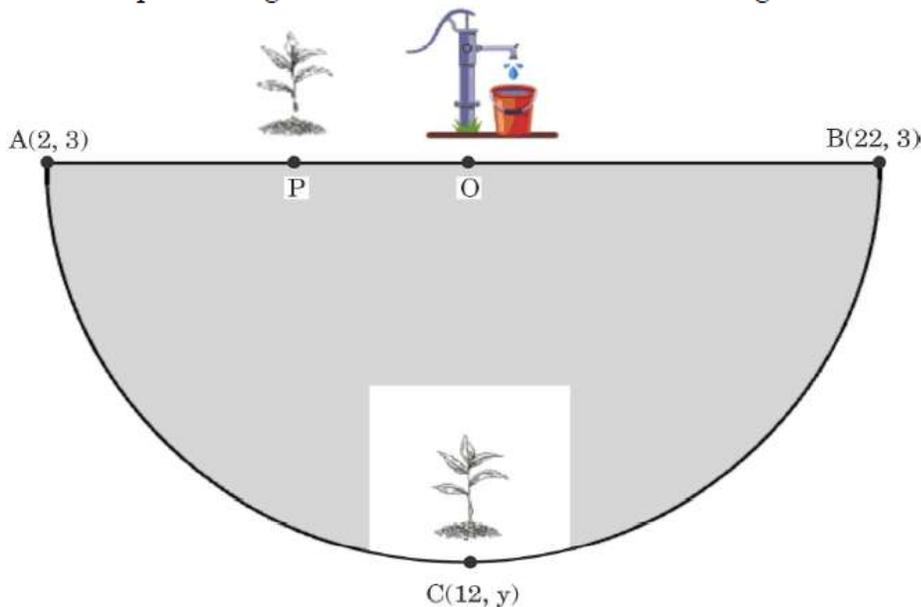
1/2

1/2

1

Case Study - 3

38. 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 = radius = 10
y = 13, y = -7
Coordinates of the point 'C' are (12, 13) or (12, -7) | ½
1
½ |
| OR | |
| (iii) (b) P divides AB in the ratio 1 : 3
Coordinates of P are $\left(\frac{1 \times 22 + 3 \times 2}{4}, \frac{1 \times 3 + 3 \times 3}{4}\right)$
i.e. (7, 3) | ½
1
½ |