MATHEMATICS (PART–I)

SOLUTION : PRACTICE QUESTION PAPER 2

Q. 1. (A) (i) (C)

(ii) (C)

(iii) (A)

(iv) (B).

Q. 1. (A) Explanation to the answers to MCQs in this question has been given below for students' guidance. Please note that, **Students are not expected to write the explanation in the examination.**

Explanations :

(i) $D = \begin{vmatrix} a_1 & b_1 \\ a_2 & b_2 \end{vmatrix}$

(ii) Roots are equal. $\therefore\ \Delta = b^2 - 4ac = 0.$

(iii) $S_n = \frac{n}{2}(t_1 + t_n).$

(iv) $n(A) = \{2\}$ … (1 and 2) $P(A) = \frac{n(A)}{n(S)}.$

Q. 1. (B) (i) Solution :

Substituting $y = 5$ in the equation $4x + 3y = 23$.

$4x + 3\ (5) = 23$

$\therefore\ 4x + 15 = 23$

$\therefore\ 4x = 23 - 15$ $\therefore\ 4x = 8$ $\therefore\ x = 2$

Ans. The value of x is **2**.

(ii) Solution :

$3x^2 - 6x - 5 = 0.$

Here, $b = -6$ and $a = 3$.

$\alpha + \beta = \frac{-b}{a} = \frac{-(-6)}{3} = \frac{6}{3} = 2.$

Ans. The value of $\alpha + \beta$ is **2**.

(iii) Solution :

FV = ₹ 50. MV is at a discount of 10%.

10% of ₹ 50 = ₹ $50 \times \frac{10}{100}$ = ₹ 5

MV = FV − discount = ₹ (50 − 5) $\therefore$ MV = ₹ 45

Ans. MV of the share is ₹ **45**.

(iv) Solution :

Here, $n(S) = 6$

Event $A = \{2, 4, 6\}$ $\therefore\ n(A) = 3.$

$P(A) = \frac{n(A)}{n(S)} = \frac{3}{6}$ $\therefore\ P(A) = \frac{1}{2}$

Ans. The probability is $\mathbf{\frac{1}{2}}$.

Q. 2. (A) (i) Activity :

Adding equations (1) and (2),

$5x + 3y = 9$ … (1)

$2x - 3y = 12$ … (2)

$\boxed{\mathbf{7x}} = 21$ $\therefore\ x = \boxed{\mathbf{3}}$

Substituting the value of x in equation (1),

$\boxed{\mathbf{5 \times 3}} + 3y = 9$ $\therefore\ 3y = \boxed{\mathbf{-6}}$ $\therefore\ y = -2.$

(ii) Activity :

Let the nth term of this A.P. be 560.

$t_n = \boxed{\boldsymbol{a + (n-1)\ d}}$ … (Formula)

$\therefore\ 560 = 2 + (n-1) \times 9$ … (Substituting the values)

$\therefore\ 560 = 2 + \boxed{\mathbf{9}\boldsymbol{n}\mathbf{ - 9}}$

$\therefore\ 9n = \boxed{\mathbf{567}}$ $\therefore\ n = \boxed{\mathbf{63}}.$

(iii) Activity :

The sample space $S = \left\{\boxed{\mathbf{1, 2, 3, 4, 5, 6}}\right\}$ $\therefore\ n(S) = 6$

Event A : To get an odd number on the upper face.

$\therefore\ A = \left\{\boxed{\mathbf{1, 3, 5}}\right\}$ $\therefore\ n(A) = 3$

$P(A) = \frac{\boxed{\boldsymbol{n(A)}}}{n(S)}$ … (Formula)

$\therefore\ P(A) = \frac{1}{\boxed{\mathbf{2}}}.$

Q. 2. (B) (i) Solution :

$3x + ky = 3$

Substituting $x = 5$ and $y = 3$,

$3 \times 5 + k \times 3 = 3$

$\therefore\ 15 + 3k = 3$

$\therefore\ 3k = 3 - 15$

$\therefore\ 3k = -12$

$\therefore\ k = \frac{-12}{3}$

$\therefore\ k = -4$

Ans. The value of k is $\mathbf{-4}$.

(ii) Solution :

$x^2 + 8x + 15 = 0$

$\therefore\ x^2 + 5x + 3x + 15 = 0$

$\therefore\ x(x + 5) + 3(x + 5) = 0$

$\therefore\ (x + 5)(x + 3) = 0$

$\therefore\ x + 5 = 0$ or $x + 3 = 0$

$\therefore\ x = -5$ or $x = -3$

Ans. $\mathbf{-5}$, $\mathbf{-3}$ are the roots of the given quadratic equation.

(iii) Solution :

Here, $a = 12$, $d = 16 - 12 = 4$, $t_{11} = ?$

$t_n = a + (n - 1)\ d$ … (Formula)

$\therefore\ t_{11} = 12 + (11 - 1) \times 4$ … (Substituting the values)

$= 12 + 10 \times 4$

$= 12 + 40$

$\therefore\ t_{11} = 52$

Ans. The 11th term of the A.P. is **52**.

(iv) Solution :

Taxable value of a tin of lustre paint = ₹ 3000

Quantity 2 $\therefore$ taxable amount = ₹ 3000 × 2 = ₹ 6000.

The rate of GST is 18%

$\therefore$ GST charged = 18% of ₹ 6000

$= \frac{18}{100} \times 6000 =$ ₹ 1080

Ans. The GST charged is **₹ 1080**.

(v) Solution :

$\text{Class mark} = \frac{\text{lower limit} + \text{upper limit}}{2}$

$= \frac{35 + 39}{2} = \frac{74}{2} = 37.$

The next consecutive class is 39–43.

Ans. 37; **39–43**.

Q. 3. (A) (i) Activity :

Substitute $x = \frac{3}{2}$ in the given quadratic equation.

$\therefore k \boxed{\left(\frac{\mathbf{3}}{\mathbf{2}}\right)^{\mathbf{2}}} - \frac{3}{2} - 12 = 0 \qquad \therefore \boxed{\frac{\mathbf{9k}}{\mathbf{4}}} - \frac{3}{2} - 12 = 0$

$\therefore 9k - 6 - \boxed{\mathbf{48}} = 0$ ... (Multiplying by 4)

$\therefore 9k = \boxed{\mathbf{54}} \qquad \therefore k = \boxed{\frac{\mathbf{54}}{\mathbf{9}}} \qquad \therefore k = \boxed{\mathbf{6}}$.

(ii) Activity :

Here, the modal class is $\boxed{\mathbf{15-20}}$.

$$\text{Mode} = L + \left[\boxed{\frac{f_1 - f_0}{2f_1 - f_0 - f_2}}\right] \times h \qquad \text{… (Formula)}$$

$$= 15 + \left[\boxed{\frac{\mathbf{50 - 30}}{\mathbf{2 \times 50 - 30 - 38}}}\right] \times 5 \qquad \text{… (Substituting the values)}$$

$$= 15 + \boxed{\frac{\mathbf{20}}{\mathbf{100 - 68}}} \times 5$$

$$= 15 + \frac{20}{32} \times 5$$

$$= 15 + \boxed{\frac{\mathbf{25}}{\mathbf{8}}}$$

$$= \boxed{\mathbf{18.125}}.$$

Q. 3. (B) (i) Solution :

Two angles are complementary.

Suppose measure of one angle is $x°$ and other angle is $y°$. $(x > y)$

From the given condition, we get

$x = y + 50$

$\therefore x - y = 50$ ... (1)

Sum of two complementary angles is 90°.

$\therefore x + y = 90$ ... (2)

Adding equations (1) and (2), we get

$x - y = 50$ ... (1)

$x + y = 90$ ... (2)

$2x = 140$

$\therefore x = \frac{140}{2} = 70$

Substituting $x = 70$ in equation (2), we get

$70 + y = 90$

$\therefore\ y = 90 - 70 = 20$

Ans. Measures of complementary angles are **70°** and **20°** respectively.

(ii) Solution :

Let the natural number be x.

Its reciprocal is $\frac{1}{x}$.

From the given condition,

$x + \frac{1}{x} = \frac{65}{8}$

$\therefore\ 8x^2 + 8 = 65x$ … (Multiplying both the sides by $8x$)

$\therefore\ 8x^2 - 65x + 8 = 0$

$\therefore\ 8x^2 - 64x - x + 8 = 0$

$\therefore\ 8x(x - 8) - 1(x - 8) = 0$

$\therefore\ (x - 8)\ (8x - 1) = 0$

$\therefore\ x - 8 = 0$ or $8x - 1 = 0$

$\therefore\ x = 8$ or $x = \frac{1}{8}$

But $\frac{1}{8}$ is not a natural number.

$\therefore\ x = \frac{1}{8}$ is unacceptable.

$\therefore\ x = 8$

Ans. The natural number is **8**.

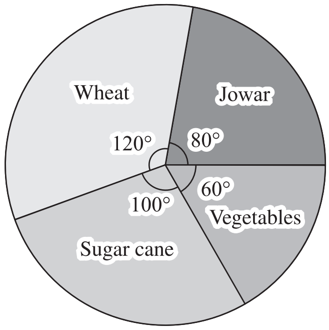
(iii) Solution :

The total area is $40 + 60 + 50 + 30 = 180$

The area is converted into component parts of 360° in the following table :

Crop	Area	Measure of the central angle
Jowar	40	$\frac{40}{180} \times 360° = 80°$
Wheat	60	$\frac{60}{180} \times 360° = 120°$
Sugar cane	50	$\frac{50}{180} \times 360° = 100°$
Vegetables	30	$\frac{30}{180} \times 360° = 60°$
Total	180	360°

On the basis of the table, the pie diagram is drawn.



(iv) Solution :

Discount 10% of ₹ 50000.

$\therefore$ discount $=$ ₹ $50000 \times \frac{10}{100} =$ ₹ 5000

$\therefore$ the taxable value of the laptop $=$ ₹ $(50000 - 5000) =$ ₹ 45,000

Rate of GST $= 18\%$ $\quad\therefore$ rate of CGST $= 9\%$

CGST at 9% of ₹ 45,000 $=$ ₹ $45000 \times \frac{9}{100} =$ ₹ 4050

SGST $=$ CGST $=$ ₹ 4050

$\therefore$ amount paid $=$ ₹ $(45000 + 4050 + 4050) =$ ₹ 53,100

Ans. Shekhar paid **₹ 53,100** for the laptop.

Q. 4. (i) Solution :

The condition for simultaneous equations having infinitely many solution is

$$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2} \qquad \text{... (1)}$$

For $x + 2y = 1$; $\quad a_1 = 1,\ b_1 = 2,\ c_1 = 1$

For $(a - b)x + (a + b)y = a + b - 2$;

$a_2 = a - b,\ b_2 = a + b,\ c_2 = a + b - 2$

Substituting these values in (1),

$$\frac{1}{a-b} = \frac{2}{a+b} = \frac{1}{a+b-2}$$

Now, $\frac{1}{a-b} = \frac{1}{a+b-2}$

$\therefore a + b - 2 = a - b$ $\qquad$ … (Cross multiplying)

$\therefore b - 2 = -b$

$\therefore b + b = 2$

$\therefore 2b = 2$

$\therefore b = \frac{2}{2}$

$\therefore b = 1.$

Substituting $b=1$ in $\frac{1}{a-b}=\frac{2}{a+b}$.

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

$\therefore\ a+1=2(a-1)$ ... (Cross multiplying)

$\therefore\ a+1=2a-2$

$\therefore\ a-2a=-2-1$

$\therefore\ -a=-3$

$\therefore\ a=\frac{-3}{-1}$

$\therefore\ a=3$

Ans. The values of a and b are **3** and **1** respectively.

(ii) Solution :

The completed table is given below :

+	1	2	2	3	3	6
1	2	3	3	4	4	7
2	3	4	4	5	5	8
2	**3**	**4**	**4**	**5**	**5**	**8**
3	**4**	**5**	**5**	**6**	**6**	**9**
3	**4**	**5**	**5**	**6**	**6**	**9**
6	**7**	**8**	**8**	**9**	**9**	**12**

Here, $n(S)=36$.

(i) Let A be the event that the total score is even.

Then, $A=\{2, 4, 4, 4, 4, 8, 4, 4, 8, 4, 6, 6, 4, 6, 6, 8, 8, 12\}$

$\therefore\ n(A)=18$.

$P(A)=\frac{n(A)}{n(S)}$ $\therefore\ P(A)=\frac{18}{36}=\frac{1}{2}$

(ii) Let B be the event that the total score is 6.

Then $B=\{6, 6, 6, 6\}$ $\therefore\ n(B)=4$

$P(B)=\frac{n(B)}{n(S)}$ $\therefore\ P(B)=\frac{4}{36}=\frac{1}{9}$.

(iii) Let C be the event that the total score is at least 6.

Then, $C=\{7, 8, 8, 6, 6, 9, 6, 6, 9, 7, 8, 8, 9, 9, 12\}$

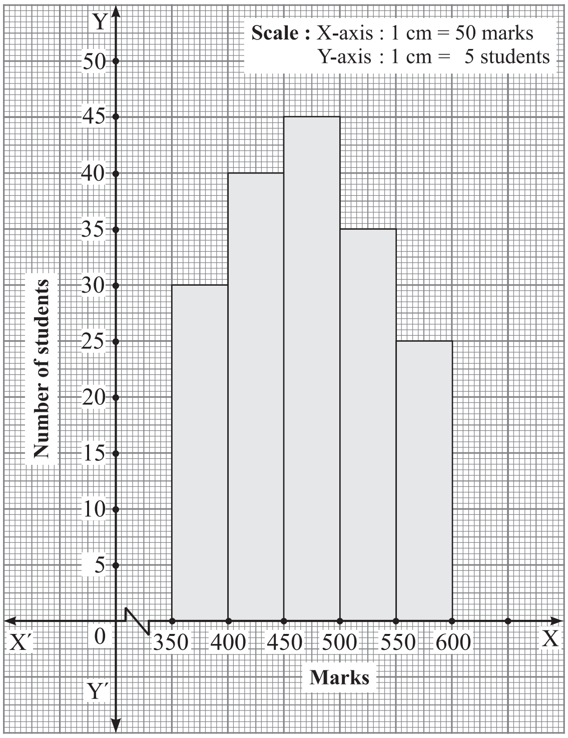
$\therefore\ n(C)=15$

$P(C)=\frac{n(C)}{n(S)}$ $\therefore\ P(C)=\frac{15}{36}=\frac{5}{12}$.

Ans. (i) $\mathbf{\frac{1}{2}}$ (ii) $\mathbf{\frac{1}{9}}$ (iii) $\mathbf{\frac{5}{12}}$.

(iii) Solution :

Class mark of class	Class	Frequency (Number of students)
375	350 – 400	30
425	400 – 450	40
475	450 – 500	45
525	500 – 550	35
575	550 – 600	25



Q. 5. (i) Word problem :

The product of two consecutive natural numbers is 600. Find the smaller number.

Solution :

Let the two consecutive natural numbers be x and $x+1$. $(x < x+1)$

From the given condition,

$x \times (x+1) = 600$

$\therefore\ x^2 + x - 600 = 0$

$\therefore\ x^2 - 24x + 25x - 600 = 0$

$\therefore\ x(x-24) + 25(x-24) = 0$

$\therefore\ (x-24)\ (x+25) = 0 \qquad \therefore\ x - 24 = 0 \qquad \therefore\ x + 25 = 0$

$\therefore\ x = 24 \quad$ or $\quad x = -25$

But -25 is not a natural number.

$\therefore$ $x = -25$ is unacceptable. $\therefore$ $x = 24$ and $x + 1 = 24 + 1 = 25$

$\therefore$ the two consecutive natural numbers are 24 and 25.

Ans. The smaller number is **24**.

(ii) Solution :

Let the first term of the A.P. be a and the common difference d.

$t_{23} = 82$ and $t_{38} = 128$ … (Given)

$t_n = a + (n - 1)\ d$ … (Formula)

$\therefore\ t_{23} = a + (23 - 1)\ d$

$\therefore\ 82 = a + 22d$ … (1)

and $t_{38} = a + (38 - 1)\ d$

$\therefore\ 128 = a + 37d$ … (2)

Adding equations (1) and (2),

$a + 22d = 82$ … (1)

$a + 37d = 128$ … (2)

$2a + 59d = 210$ … (3)

$S_n = \frac{n}{2}[2a + (n - 1)\ d]$ … (Formula)

$\therefore\ S_{60} = \frac{60}{2}[2a + (60 - 1)\ d]$

$= 30\,(2a + 59d)$

$= 30 \times 210$ … [From (3)]

$\therefore\ S_{60} = 6300$

Ans. The sum of the first 60 terms is **6300**.