# MATHEMATICS (PART–I)

## SOLUTION : PRACTICE QUESTION PAPER 1

**Q. 1. (A)** (i) (A)

(ii) (B)

(iii) (A)

(iv) (D).

**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) Substitute $y = 3$ in the given equation.

(ii) $d = (x+3) - (x-1) = (3x+1) - (x+3)$

Solving simple equations, find the value of $x$. Hence, find the value of $d$.

(iii) There are 8 cards bearing numbers multiple of 5 from cards 1 to 40.

(iv) Use the formula : $\alpha + \beta = \frac{-b}{a}$.

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

FV = ₹ 100, MV = ₹ 150, Dividend = 10%

Shweta purchased 5 shares of FV ₹ 100.

Dividend = 10% = ₹ 10 per share of FV ₹ 100.

$\therefore$ dividend on 5 shares = ₹ $10 \times 5$ = ₹ 50

**Ans.** Shweta gets dividend **₹ 50**.

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**(ii) Solution :**

$4y = 12 - 3x$

$\therefore\ 4y + 3x - 12 = 0$

i.e. $3x + 4y - 12 = 0$

**Ans.** The general form is $\boldsymbol{3x + 4y - 12 = 0}$.

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**(iii) Solution :**

Let $\alpha = -3$ and $\beta = -5$

$\alpha + \beta = -3 + (-5) = -8;\quad \alpha\beta = (-3) \times (-5) = 15$

The required quadratic equation is

$x^2 - (\alpha + \beta)\,x + \alpha\beta = 0$

i.e. $x^2 - (-8)\,x + 15 = 0$ i.e. $x^2 + 8x + 15 = 0$

**Ans.** The quadratic equation is $\boldsymbol{x^2 + 8x + 15 = 0}$.

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**(iv) Solution :**

$S = \{1, 2, 3, 4, 5, 6\}$

Event $A = \{1, 3, 5\}$

**Ans.** Event $A = \mathbf{\{1, 3, 5\}}$.

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

| $x$ | 4 | **−1** | 0 |
|---|---|---|---|
| $y$ | **0** | −5 | **−4** |
| $(x, y)$ | (4, 0) | **(−1, −5)** | (0, −4) |

$[x - y = 4$

$\therefore\ 4 - y = 4$ ... (Substituting $x = 4$)

$\therefore\ -y = 4 - 4 \quad \therefore\ -y = 0 \quad$ i.e. $y = 0$

$x - y = 4$

$\therefore\ x - (-5) = 4$ ... (Substituting $y = -5$)

$\therefore\ x + 5 = 4 \quad \therefore\ x = 4 - 5 \quad$ i.e. $x = -1$

$x - y = 4$

$\therefore\ 0 - y = 4$ ... (Substituting $x = 0$)

$\therefore\ -y = 4$ $\quad \therefore\ y = -4$.]

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**(ii) Activity :**

Here, $a = 1$, $d = \boxed{\mathbf{2}}$, $t_n = 149$

$t_n = a + \boxed{\mathbf{(n-1)\,d}}$ ... (Formula)

$\therefore\ 149 = \boxed{\mathbf{1 + (n-1) \times 2}}$ ... (Substituting the values)

$\therefore\ 149 = 2n - \boxed{\mathbf{1}}$ $\quad \therefore\ n = 75$.

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**(iii) Activity :**

If two coins are tossed simultaneously.

$S = \left\{HH, \boxed{\mathbf{HT}}, \boxed{\mathbf{TH}}, TT\right\}$

(i) Event $A$ : at least getting one head.

$\therefore\ A = \left\{HH, \boxed{\mathbf{HT}}, TH\right\}$

(ii) Event $B$ : to get no head.

$\therefore\ B = \left\{\boxed{\mathbf{TT}}\right\}$.

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

$4x + 3y = 11$ ... (1)

$3x + 4y = 10$ ... (2)

Multiplying equation (1) by 4,

$16x + 12y = 44$ … (3)

Multiplying equation (2) by 3,

$9x + 12y = 30$ … (4)

Subtracting equation (4) from equation (3),

$$\begin{array}{rcl} 16x + 12y = 44 & & \dots (3) \\ 9x + 12y = 30 & & \dots (4) \\ - \quad - \quad - & & \\ \hline 7x \qquad = 14 & & \end{array}$$

$\therefore\ x = 2$ … (Dividing both the sides by 7)

Substituting $x = 2$ in equation (1),

$4(2) + 3y = 11$ $\quad \therefore\ 8 + 3y = 11$ $\quad \therefore\ 3y = 11 - 8$

$\therefore\ 3y = 3$

$\therefore\ y = 1$ … (Dividing both the sides by 3)

**Ans.** $(x, y) =$ **(2, 1)** is the solution.

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**(ii) Solution :**

Comparing the equation $2x^2 - 7x - 2 = 0$ with $ax^2 + bx + c = 0$,

$a = 2,\ b = -7,\ c = -2$

$\Delta = b^2 - 4ac = (-7)^2 - 4\ (2)\ (-2)$

$= 49 + 16 = 65$

Here, $\Delta > 0$

**Ans.** The roots are **real and unequal**.

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**(iii) Solution :**

FV = ₹ 100; MV = ₹ 120

For getting 1 share of FV ₹ 100, the investment is ₹ 120.

Dividend = 15% = ₹ 15 per share of ₹ 100.

$$\text{Rate of return} = \frac{\text{Dividend income}}{\text{Sum invested}} \times 100$$

$$= \frac{15}{120} \times 100 = 12.5$$

**Ans.** The rate of return for Amol is **12.5%**.

[**Note :** To find the rate of return, the numbers of share purchased is immaterial.]

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**(iv) Solution :**

Here, $a = t_1 = 5,\ t_{10} = 95 = t_n,\ S_{10} = ?$

$S_n = \frac{n}{2}\ [t_1 + t_n]$ … (Formula)

$\therefore S_{10} = \frac{10}{2}[5+95]$ ... (Substituting the values)

$= 5 \times 100$

$\therefore S_{10} = 500$

**Ans.** $S_{10} = \mathbf{500}$.

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**(v) Solution :**

Here, $L = 60$, $h = 20$, $f_1 = 100$, $f_0 = 70$, $f_2 = 80$

$$\text{Mode} = L + \left[\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right] \times h$$

$$= 60 + \left[\frac{100 - 70}{2 \times 100 - 70 - 80}\right] \times 20$$

$$= 60 + \frac{30}{200 - 150} \times 20$$

$$= 60 + \frac{30}{50} \times 20$$

$$= 60 + 12 = 72$$

**Ans.** Mode is **72**.

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

Here, $a = 1$, $b = -10$, $c = -24$

$b^2 - 4ac = \boxed{\mathbf{(-10)^2}} - 4 \times 1 \times (-24) = \boxed{\mathbf{100}} + 96 = \boxed{\mathbf{196}}$

$$x = \frac{-b \pm \boxed{\sqrt{b^2 - 4ac}}}{2a} = \frac{-(-10) \pm \sqrt{\boxed{196}}}{2 \times 1} = \frac{10 \pm \boxed{14}}{2}$$

$\therefore x = 12$ or $x = -2$.

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**(ii) Activity :**

The cumulative frequency which is just greater than 125 is $\boxed{\mathbf{153}}$.

$\therefore$ the corresponding class $\boxed{\mathbf{150-200}}$ is the median class.

$L = 150$, $f = 90$, $cf = \boxed{\mathbf{63}}$, $h = 50$

$$\text{Median} = L + \left[\frac{\boxed{\frac{N}{2} - cf}}{f}\right] \times h$$

$$= 150 + \left[\frac{\boxed{125 - 63}}{90}\right] \times 50$$

$$= 150 + \frac{\boxed{62}}{90} \times 50 \approx 184.4$$

The median data is 184.4 mangoes.

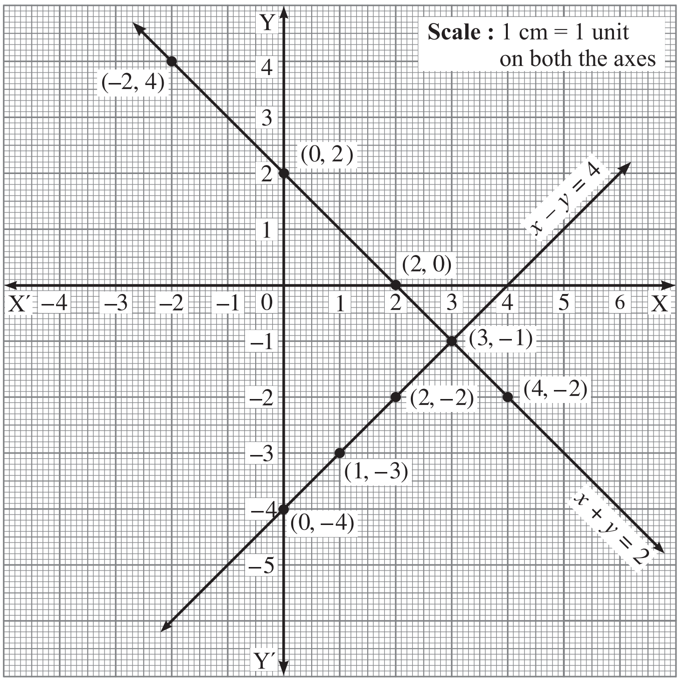
**Q. 3. (B) (i) Solution :**

$x + y = 2 \quad \therefore y = 2 - x$

| $x$ | $-2$ | 0 | 2 | 4 |
|---|---|---|---|---|
| $y$ | 4 | 2 | 0 | $-2$ |
| $(x, y)$ | $(-2, 4)$ | (0, 2) | (2, 0) | $(4, -2)$ |

$x - y = 4 \quad \therefore -y = 4 - x \quad \therefore y = x - 4$

| $x$ | 0 | 1 | 2 | 3 |
|---|---|---|---|---|
| $y$ | $-4$ | $-3$ | $-2$ | $-1$ |
| $(x, y)$ | $(0, -4)$ | $(1, -3)$ | $(2, -2)$ | $(3, -1)$ |




The coordinates of the point of intersection are $(3, -1)$.

**Ans.** The solution of the given simultaneous equations is $x = \mathbf{3}$ and $y = \mathbf{-1}$.

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**(ii) Solution :** Let the cost price of the toy be ₹ $x$.

Gain is as much per cent as the cost price of the toy.

$\therefore$ gain $= x\%$ of $x = \dfrac{x}{100} \times x =$ ₹ $\dfrac{x^2}{100}$

Cost price + gain = selling price

$\therefore x + \dfrac{x^2}{100} = 24$

Multiplying both the sides by 100,

$100x + x^2 = 2400$

$\therefore x^2 + 100x - 2400 = 0$

$\therefore\ x^2 + 120x - 20x - 2400 = 0$

$\therefore\ x(x + 120) - 20(x + 120) = 0$

$\therefore\ (x + 120)(x - 20) = 0$

$\therefore\ x + 120 = 0$ or $x - 20 = 0$

$\therefore\ x = -120$ or $x = 20$

$-2400$ → $+120$, $-20$

But the price cannot be negative.

$\therefore\ x = -120$ is unacceptable. $\therefore\ x = 20$

**Ans.** The cost price of the toy is ₹ **20**.

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**(iii) Solution :** Discount 5% of ₹ 1000 $= \frac{5}{100} \times 1000 =$ ₹ 50

$\therefore$ taxable value = ₹ (1000 − 50) = ₹ 950

Rate of GST = 5%

$\therefore$ GST $= \frac{5}{100} \times 950 =$ ₹ 47.50

Purchase price for the customer

= Taxable value + GST = ₹ (950 + 47.50) = ₹ 997.50

**Ans.** The purchase price of the dress for the customer is ₹ **997.50.**

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**(iv) Solution :**

| Time (hours) | Class mark ($x_i$) | Frequency (Number of students) ($f_i$) | $x_i f_i$ |
|---|---|---|---|
| 0 – 2 | 1 | 10 | 10 |
| 2 – 4 | 3 | 16 | 48 |
| 4 – 6 | 5 | 20 | 100 |
| 6 – 8 | 7 | 4 | 28 |
| Total | | $\Sigma f_i = 50$ | $\Sigma x_i f_i = 186$ |

Here, $\Sigma x_i f_i = 186$, $\Sigma f_i = 50$

$$\text{Mean} = \overline{X} = \frac{\Sigma x_i f_i}{\Sigma f_i} = \frac{186}{50} = 3.72$$

**Ans.** The mean time spent by the students for studies is **3.72 hours**.

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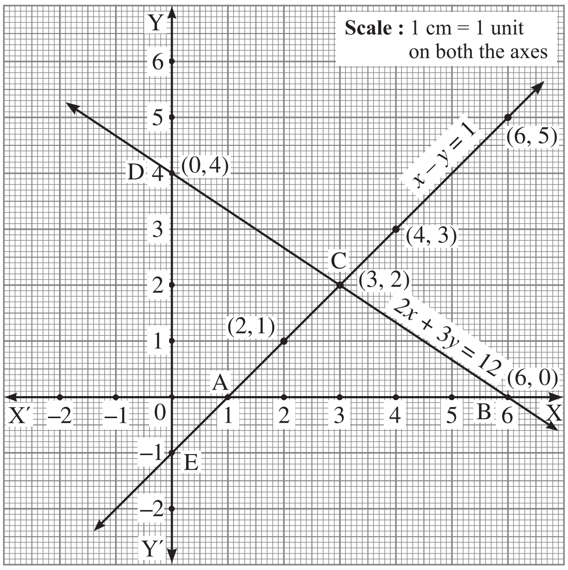
**Q. 4. (i) Solution :**

$x - y = 1$ $\therefore\ y = x - 1$

| $x$ | 2 | 4 | 6 |
|---|---|---|---|
| $y$ | 1 | 3 | 5 |
| $(x, y)$ | (2, 1) | (4, 3) | (6, 5) |

$2x + 3y = 12 \qquad \therefore\ y = \dfrac{12 - 2x}{3}$

| $x$ | 0 | 3 | 6 |
|---|---|---|---|
| $y$ | 4 | 2 | 0 |
| $(x, y)$ | (0, 4) | (3, 2) | (6, 0) |




From the graph (1) $\triangle$ABC is formed by the two lines and the X-axis.

(2) $\triangle$CDE is formed by the two lines and the Y-axis.

For $\triangle$ABC, AB = 5 units and the perpendicular drawn from point C on the X-axis is 2 units.

$\therefore\ A(\triangle ABC) = \dfrac{1}{2} \times 5 \times 2 = 5$ sq units.

For $\triangle$CDE, DE = 5 units and the perpendicular drawn from point C on the Y-axis is 3 units.

$\therefore\ A(\triangle CDE) = \dfrac{1}{2} \times 5 \times 3 = 7.5$ sq units.

**Ans.** The area of triangles are **5** sq units and **7.5** sq units respectively.

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**(ii)** $n(S) = 16,\ n(R) = x.$

Probability of getting a red ball

$P_1(R) = \dfrac{n(R)}{n(S)} = \dfrac{x}{16}$ … (1)

8 more red balls are put in the bag.

$\therefore\ n(S) = 24,\ n(\text{R}) = (x + 8)$

Probability of getting a red ball

$P_2(R) = \dfrac{n(R)}{n(S)} = \dfrac{x + 8}{24}$ … (2)

From the given condition,

$P_2(R) = 2\dfrac{4}{9}\, P_1(R)$

$\therefore \frac{x+8}{24} = \frac{22}{9} \times \frac{x}{16}$

Multiplying both the sides by 144,

$6(x+8) = 22x$

$\therefore 6x + 48 = 22x \qquad \therefore 48 = 22x - 6x$

$\therefore 16x = 48 \qquad \therefore x = 3$

**Ans.** Initially there were **3 red** balls in the bag.

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**(iii) Solution :**

$15 + a + 30 + b + 15 + 10 = 100$

$\therefore a + b + 70 = 100 \qquad \therefore a + b = 100 - 70 \qquad \therefore a + b = 30 \quad \dots (1)$

Now, $a = 2b$ Substituting the value of $a$ in equation (1),

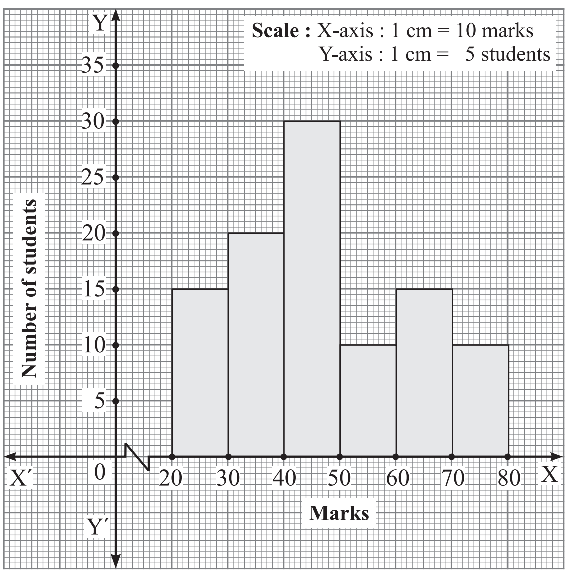
$2b + b = 30 \qquad \therefore 3b = 30 \qquad \therefore b = 10$

$a = 2b = 2 \times 10 = 20 \qquad \therefore a = 20$

The value of $a$ is 20 and that of $b$ is 10.

Tabulation for histogram :

| **Marks** | 20–30 | 30–40 | 40–50 | 50–60 | 60–70 | 70–80 | Total |
|---|---|---|---|---|---|---|---|
| **Number of students** | 15 | **20** | 30 | **10** | 15 | 10 | 100 |

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**Q. 5. (i) Solution :**

(1) Let Payal's age be $x$ years.

(2) From the first condition, Sonal's age is $(x + 12)$ years.

(3) The reciprocal of Payal's age is $\frac{1}{x}$ years and that of Sonal's age is $\frac{1}{x+12}$ years.

(4) The sum of the reciprocal of their ages is $\frac{1}{8}$.

$\therefore \frac{1}{x}+\frac{1}{x+12}=\frac{1}{8}$

$\therefore \frac{x+12+x}{x(x+12)}=\frac{1}{8}$

$\therefore \frac{2x+12}{x^2+12x}=\frac{1}{8}$

$\therefore 8(2x+12)=x^2+12x$ … (Cross multiplying)

$\therefore 16x+96=x^2+12x$

$\therefore x^2+12x-16x-96=0$

$\therefore x^2-4x-96=0$

$\therefore x^2-12x+8x-96=0$

$\therefore x(x-12)+8(x-12)=0$

$\therefore (x-12)(x+8)=0$ $\therefore x-12=0$ or $x+8=0$

$\therefore x=12$ or $x=-8$ But the age cannot be negative.

$\therefore x=-8$ is unacceptable. $\therefore x=12$ and $x+12=12+12=24$.

**Ans.** Payal's age is **12 years**. Sonal's age is **24 years**.

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**(ii) Solution :**

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

Here, $t_9=75$ and $t_{21}=183$, $t_{15}=?$

$t_n=a+(n-1)d$ … (Formula)

$\therefore t_9=75=a+(9-1)d$ … (Substituting the values)

$\therefore 75=a+8d$ … (1)

Similarly, $t_{21}=183=a+(21-1)d$

$\therefore 183=a+20d$ … (2)

Adding equations (1) and (2),

$a+8d=75$ … (1)

$a+20d=183$ … (2)

$2a+28d=258$

$\therefore a+14d=129$ … (Dividing both the sides by 2) … (3)

Now, $t_{15}=a+(15-1)d$

$\therefore t_{15}=a+14d$

$\therefore t_{15}=129$ … [From (3)]

**Ans.** The 15th term of the A.P. is **129**.