MATHEMATICS (PART – I)

BOARD'S QUESTION PAPER (MARCH 2020)

(With Full Solution)

Time : 2 Hours] **[Total Marks : 40**

Note : *(i)* ***All*** *questions are compulsory.*

(ii) Use of calculator is ***not*** *allowed.*

(iii) The numbers to the right of the questions indicate full marks.

(iv) In case of MCQ's [Q. No. ***1(A)****], only the first attempt will be evaluated and will be given credit.*

(v) For every MCQ, the correct alternative (A), (B), (C) or (D) of answers with subquestion number is to be written as an answer.

Q. 1. (A) For every subquestion 4 alternative answers are given. Choose the correct answer and write the letter of the alphabet of it : **4**

(i) In the format of GSTIN, there are ..... alphanumerals.

(A) 15 (B) 10 (C) 16 (D) 9

(ii) From the following equations, which one is the quadratic equation?

(A) $\frac{5}{x}-3=x^2$ (B) $x(x+5)=4$ (C) $n-1=2n$ (D) $\frac{1}{x^2}(x+2)=x$

(iii) For simultaneous equations in variables x and y, if $D_x=49$, $D_y=-63$, $D=7$, then what is the value of x?

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

(iv) If $n(A)=2$, $P(A)=\frac{1}{5}$, then $n(S)=$?

(A) $\frac{2}{5}$ (B) $\frac{5}{2}$ (C) 10 (D) $\frac{1}{3}$

Q. 1. (B) Solve the following subquestions : **4**

(i) Find second and third terms of an A.P. whose first term is -2 and the common difference is -2.

(ii) 'Pawan Medicals' supplies medicines. On some medicines the rate of GST is 12%, then what is the rate of CGST and SGST?

(iii) Find the values of a and b from the quadratic equation $2x^2-5x+7=0$.

(iv) If $15x+17y=21$ and $17x+15y=11$, then find the value of $x+y$.

Q. 2. (A) Complete and write *any two* activities from the following : **4**

(i) Complete the following table to draw the graph of $2x - 6y = 3$.

x	-5	
y		0
(x, y)		

(ii) First term and common difference of an A.P. are 6 and 3 respectively. Find S_{27}.

First term $= a = 6$, common difference $= d = 3$, $S_{27} = ?$

$S_n = \frac{n}{2}\left[\square + (n-1)d\right]$ ... (Formula)

$\therefore S_{27} = \frac{27}{2}\left[12 + (27-1)\square\right]$ ... (Substituting the values)

$= \frac{27}{2} \times \square$

$= 27 \times 45$

$\therefore S_{27} = \square$.

(iii) A card is drawn from a well-shuffled pack of 52 playing cards. Find the probability of the event, that the card drawn is a red card.

Suppose S is the sample space.

$\therefore n(S) = 52$

Event A : Card drawn is a red card.

Total red cards $= \square$ hearts $+ 13$ diamonds.

$\therefore n(A) = \square$

$P(A) = \frac{\square}{n(S)}$ ... (Formula)

$\therefore P(A) = \frac{26}{52}$ $\therefore P(A) = \square$.

Q. 2. (B) Solve *any four* subquestions from the following : **8**

(i) Find the value of the determinant $\begin{vmatrix} \frac{7}{3} & \frac{5}{3} \\ \frac{3}{2} & \frac{1}{2} \end{vmatrix}$.

(ii) Solve the quadratic equation by factorisation method :

$x^2 - 15x + 54 = 0$.

(iii) Decide whether the following sequence is an A.P. or not. If so, find the 20th term of the progression :

$-12, -5, 2, 9, 16, 23, 30, \ldots$.

(iv) A two-digit number is formed with digits 2, 3, 5, 7, 9 without repetition. What is the probability that the number formed is an odd number?

(v) If $L = 10, f_1 = 70, f_0 = 58, f_2 = 42, h = 2$, then find the mode by using formula.

Q. 3. (A) Complete and write *any one* activity from the following : **3**

(i)

Age group (in years)	**Number of Persons**	**Measure of central angle**
$20 - 25$	80	$\frac{\square}{200} \times 360° = \square$
$25 - 30$	60	$\frac{60}{200} \times 360° = \square$
$30 - 35$	35	$\frac{35}{200} \times \square = 63°$
$35 - 40$	25	$\frac{25}{200} \times 360° = \square$
Total	200	$\square$

(ii) Shri Shantilal purchased 150 shares of FV ₹ 100, for MV of ₹ 120. Company paid divided at 7%, then to find the rate of return on his investment, complete the following activity :

Activity : FV = ₹ 100; Number of shares = 150; Market value = ₹ 120

(1) Sum invested = MV × Number of Shares

$= \square \times \square$

Sum invested = ₹18,000

(2) Dividend per share = FV × Rate of divided

$= \square \times \frac{\square}{100} =$ ₹ 7

$\therefore$ total dividend received $= 150 \times 7 = \square$

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

$= \frac{1050}{18000} \times 100 = \square$

Q. 3. (B) Attempt *any two* subquestions from the following : **6**

(i) A balloon vendor has 2 red, 3 blue and 4 green balloons. He wants to choose one of them at random to give it to Pranali. What is the probability of the event that Pranali gets,

(1) a red balloon (2) a blue balloon.

(ii) The denominator of a fraction is 4 more than twice its numerator. Denominator becomes 12 times the numerator, if both the numerator and the denominator are reduced by 6. Find the fraction.

(iii) A milk centre sold milk to 50 customers. The table below gives the number of customers and the milk they purchased. Find the mean of the milk sold using direct method :

Milk Sold (litres)	**Number of Customers**
1 – 2	17
2 – 3	13
3 – 4	10
4 – 5	7
5 – 6	3

(iv) In an A.P., the sum of three consecutive terms is 27 and their product is 504. Find the terms.

(Assume that three consecutive terms in an A.P. are $a-d$, a, $a+d$.)

Q. 4. Attempt *any two* subquestions from the following : **8**

(i) Represent the following data by histogram :

Price of Sugar (per kg in ₹)	**Number of Weeks**
18 – 20	4
20 – 22	8
22 – 24	22
24 – 26	12
26 – 28	6
28 – 30	8

(ii) One person borrows ₹ 4,000 and agrees to repay with a total interest of ₹ 500 in 10 instalments. Each instalment being less than the preceding instalment by ₹ 10. What should be the first and the last instalments?

(iii) The sum of the areas of two squares is 400 sq m. If the difference between their perimeters is 16 m, find the sides of two squares.

Q. 5. Attempt *any one* subquestion from the following : **3**

(i) Convert the following equations into simultaneous equations and solve :

$$\sqrt{\frac{x}{y}} = 4,\ \frac{1}{x} + \frac{1}{y} = \frac{1}{xy}$$

(ii) A dealer sells a toy for ₹ 24 and gains as much per cent as the cost price of the toy. Find the cost price of the toy.

SOLUTION : BOARD'S QUESTION PAPER (MARCH 2020)

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

(ii) (B)

(iii) (A)

(iv) (C)

Hints : Only for guidance. Students are not expected to write this.

(ii) In (A) and (D), the variable is with degree 3.

In (C), the variable is with degree 1.

(iii) $x = \frac{D_x}{D}$

(iv) $P(A) = \frac{n(A)}{n(S)}$

Q. 1. (B) **(i)** First term $(t_1) = a = -2$, common difference $= d = -2$.

$t_2 = a + d = -2 + (-2) = -4$

$t_3 = t_2 + d = -4 + (-2) = -6$

(ii) The rate of GST is 12%.

The rate of CGST $= \frac{\text{The rate of GST}}{2} = \frac{12\%}{2} = 6\%$

The rate of SGST = The rate of CGST = 6%.

(iii) Comparing $2x^2 - 5x + 7 = 0$ with $ax^2 + bx + c = 0$

$a = 2$,

$b = -5$

(iv) $15x + 17y = 21$ ... (1)

$17x + 15y = 11$ ... (2)

$32x + 32y = 32$ ... [Adding equations (1) and (2)]

$\therefore x + y = 1$ ... (Dividing both the sides by 32)

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

x	-5	$\boxed{\frac{3}{2}}$
y	$\boxed{-\frac{13}{6}}$	0
(x, y)	$\boxed{\left(-5, -\frac{13}{6}\right)}$	$\boxed{\left(\frac{3}{2}, 0\right)}$

(ii) First term $= a = 6$, common difference $= d = 3$, $S_{27} = ?$

$S_n = \frac{n}{2}\left[\boxed{\mathbf{2a}} + (n-1)\ d\right]$ ... (Formula)

$\therefore S_{27} = \frac{27}{2}\left[12 + (27-1)\ \boxed{\mathbf{3}}\right]$ ... (Substituting the values)

$= \frac{27}{2} \times \boxed{\mathbf{90}}$

$= 27 \times 45$

$\therefore S_{27} = \boxed{\mathbf{1215}}$

(iii) Suppose S is the sample space.

$\therefore n(S) = 52$

Event A : Card drawn is a red card.

Total red cards $= \boxed{\mathbf{13}}$ hearts $+ 13$ diamonds

$\therefore n(A) = \boxed{\mathbf{26}}$

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

$\therefore P(A) = \frac{26}{52}$ $\therefore P(A) = \boxed{\mathbf{\frac{1}{2}}}$

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

$$\begin{vmatrix} \frac{7}{3} & \frac{5}{3} \\ \frac{3}{2} & \frac{1}{2} \end{vmatrix} = \frac{7}{3} \times \frac{1}{2} - \frac{5}{3} \times \frac{3}{2}$$

$$= \frac{7}{6} - \frac{15}{6}$$

$$= \frac{7-15}{6}$$

$$= \frac{-8}{6} = \frac{-4}{3}$$

Ans. The value of the determinant is $\mathbf{\frac{-4}{3}}$.

(ii) Solution :

$x^2 - 15x + 54 = 0$

$\therefore x^2 - 6x - 9x + 54 = 0$

$\therefore x\ (x-6) - 9\ (x-6) = 0$

$\therefore (x-6)\ (x-9) = 0$

$\therefore x - 6 = 0$ or $x - 9 = 0$

$\therefore x = 6$ or $x = 9$

Ans. 6 and **9** are the roots of the given quadratic equation.

(iii) Solution :

Here, $a = t_1 = -12$, $t_2 = -5$, $t_3 = 2$, $t_4 = 9$, $t_5 = 16$, ...

$t_2 - t_1 = -5 - (-12) = -5 + 12 = 7$

$t_3 - t_2 = 2 - (-5) = 2 + 5 = 7$

$t_4 - t_3 = 9 - 2 = 7$

The common difference $= d = 7$ which is constant.

$\therefore$ the given sequence is an A.P.

$t_n = a + (n-1)\ d$ ... (Formula)

$\therefore t_{20} = -12 + (20-1) \times 7$ ... (Substituting the values)

$= -12 + 133$

$= 121$

Ans. The given sequence **is an A.P.** The 20th term of the A.P. is **121**.

(iv) Solution :

The sample space is

$S = \{23, 25, 27, 29, 32, 35, 37, 39, 52, 53, 57, 59, 72, 73, 75, 79, 92, 93, 95, 97\}$

$\therefore n(S) = 20$.

Let A be the event that two-digit odd numbers are formed.

Then A $= \{23, 25, 27, 29, 35, 37, 39, 53, 57, 59, 73, 75, 79, 93, 95, 97\}$

$\therefore n(A) = 16$

$$P(A) = \frac{n(A)}{n(S)}$$

$$\therefore P(A) = \frac{16}{20} \qquad \therefore P(A) = \frac{4}{5}$$

Ans. The probability is $\mathbf{\frac{4}{5}}$.

(v) Solution :

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

$$= 10 + \left[\frac{70 - 58}{2(70) - 58 - 42}\right] \times 2$$

$$= 10 + \frac{12}{140 - 100} \times 2$$

$$= 10 + \frac{12}{40} \times 2$$

$$= 10 + 0.6$$

$$= 10.6$$

Ans. The mode is **10.6**.

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

Age group (in Years)	Number of persons	Measure of the central angle
20 – 25	80	$\frac{\boxed{80}}{200} \times 360° = \boxed{144°}$
25 – 30	60	$\frac{60}{200} \times 360° = \boxed{108°}$
30 – 35	35	$\frac{35}{200} \times \boxed{360°} = 63°$
35 – 40	25	$\frac{25}{200} \times 360° = \boxed{45°}$
Total	200	$\boxed{360°}$

(ii) Activity : FV = ₹ 100, Number of shares = 150; Market value = ₹ 120

(1) Sum invested = MV × Number of shares

$= \boxed{₹\ 120} \times \boxed{150}$

Sum invested = ₹ 18,000

(2) Dividend per share = FV × Rate of dividend

$= \boxed{₹\ 100} \times \frac{\boxed{7}}{100} = ₹\ 7$

$\therefore$ total dividend received $= 150 \times 7 = \boxed{₹\ 1050}$

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

$= \frac{1050}{18000} \times 100 = \boxed{5.83\%}$

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

Here, there are 2 red balloons R_1, R_2; 3 blue balloons B_1, B_2, B_3; 4 green balloons G_1, G_2, G_3, G_4.

$\therefore$ the sample space

$S = \{R_1, R_2, B_1, B_2, B_3, G_1, G_2, G_3, G_4\}$

$\therefore n(S) = 9$

(1) Let A be the event that Pranali gets a red balloon.

Then $A = \{R_1, R_2\}$

$\therefore n(A) = 2$

$P(A) = \frac{n(A)}{n(S)}$

$\therefore P(A) = \frac{2}{9}$

$\therefore$ the probability that Pranali gets a red balloon is $\frac{2}{9}$.

(2) Let B be the event that Pranali gets a blue balloon.

Then $B = \{B_1, B_2, B_3\}$

$\therefore n(B) = 3$

$P(B) = \frac{n(B)}{n(S)}$

$\therefore P(B) = \frac{3}{9} = \frac{1}{3}$

$\therefore$ the probability that Pranali gets a blue balloon is $\frac{1}{3}$.

Ans. (1) $\mathbf{\frac{2}{9}}$ (2) $\mathbf{\frac{1}{3}}$.

(ii) Solution :

Let the numerator of the fraction be x and its denominator y.

Twice the numerator $= 2x$

From the first condition,

$y = 2x + 4$

$\therefore 2x + 4 = y$

$\therefore 2x - y = -4$ ... (1)

If 6 is subtracted both from the numerator and the denominator, then the numerator becomes $(x - 6)$ and the denominator becomes y $(y - 6)$.

From the second condition,

$y - 6 = 12\ (x - 6)$

$\therefore y - 6 = 12x - 72$

$\therefore 12x - 72 = y - 6$

$\therefore 12x - y = -6 + 72$

$\therefore 12x - y = 66$ ... (2)

Subtracting equation (1) from equation (2),

$12x - y = 66$ ... (2)

$2x - y = -4$ ... (1)

$-\quad +\quad +$

$10x = 70$

$\therefore x = 7$

Substituting $x = 7$ in equation (1),

$2\ (7) - y = -4$

$\therefore\ -y = -4 - 14$

$\therefore\ -y = -18$

$\therefore\ y = 18$

The numerator is 7 and the denominator 18.

Ans. The fraction is $\frac{\mathbf{7}}{\mathbf{18}}$.

(iii) Solution :

Class Milk sold (Litres)	Class mark x_i	Frequency (Number of customers) f_i	Class marks × frequency $x_i f_i$
1–2	1.5	17	25.5
2–3	2.5	13	32.5
3–4	3.5	10	35.0
4–5	4.5	7	31.5
5–6	5.5	3	16.5
Total		$\Sigma f_i = 50$	$\Sigma x_i f_i = 141$

Here, $\Sigma x_i f_i = 141$, $\Sigma f_i = 50$

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

$$= \frac{141}{50} = 2.82$$

Ans. The mean of milk sold is **2.82 litres**.

(iv) Solution :

Let the three consecutive terms in an A.P. be $a - d$, a and $a + d$.

From the first condition,

$(a - d) + a + (a + d) = 27$

$\therefore\ a - d + a + a + d = 27 \quad \therefore\ 3a = 27$

$\therefore\ a = 9$

From the second condition,

$(a - d) \times a \times (a + d) = 504$

$\therefore\ (9 - d) \times 9 \times (9 + d) = 504$ ... (Substituting a = 9)

$\therefore\ (9 - d)(9 + d) = \frac{504}{9} = 56$

$\therefore\ 81 - d^2 = 56 \quad \therefore\ 81 - 56 = d^2$

$\therefore\ d^2 = 25 \quad \therefore\ d = \pm 5$

When $d = 5$, the three consecutive terms are

$a - d = 9 - 5 = 4,\ a = 9,\ a + d = 9 + 5 = 14$

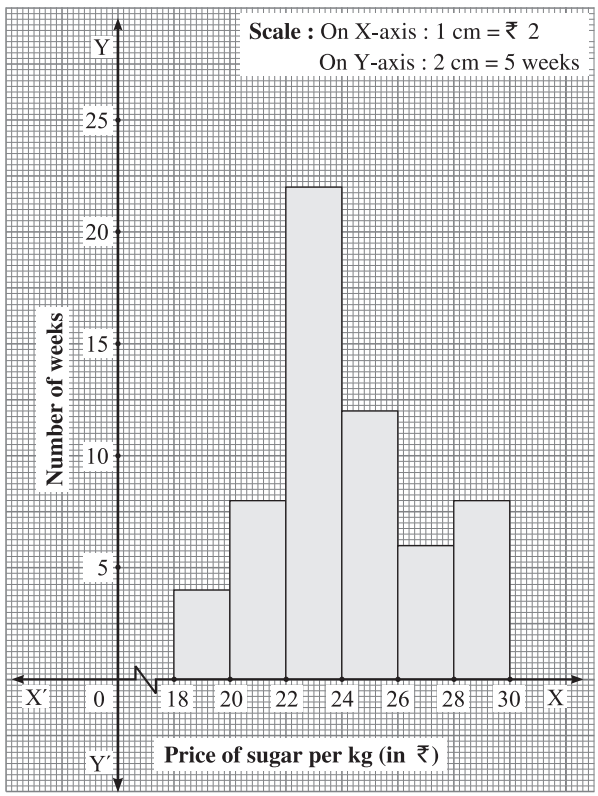
When $d = -5$, the three consecutive terms are

$a - d = 9 - (-5) = 9 + 5 = 14,\ a = 9$

$a + d = 9 + (-5) = 9 - 5 = 4.$

Ans. The three consecutive terms are **4, 9, 14** or **14, 9, 4**.

Q. 4. (i) Ans.



(ii) Solution :

The person repays ₹ 4000 + ₹ 500 = ₹ 4500

Number of instalments = 10

$\therefore$ n = 10 and $S_n = S_{10} = 4500$

Each instalment is ₹ 10 less than the preceding one.

$\therefore$ d = -10

This is an A.P.

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

$\therefore S_{10} = 4500 = \frac{10}{2}\,[2a + (10-1) \times (-10)]$ ... (Substituting the values)

$\therefore 4500 = 5\,[2a + 9 \times (-10)]$

$\therefore 900 = 2a - 90$ ... (Dividing both the sides by 5)

$\therefore 2a - 90 = 900$

$\therefore 2a = 900 + 90$

$\therefore 2a = 990$

$\therefore a = \dfrac{990}{2}$

$\therefore a = 495$

$t_n =$ Last instalment

$t_n = a + (n-1)\ d$ ... (Formula)

$\therefore t_{10} = 495 + (10-1) \times (-10)$ ... (Substituting the values)

$= 495 + 9 \times (-10)$

$= 495 - 90$

$\therefore t_n = 405$

Ans. The first instalment is ₹ **495** and the last instalment is ₹ **405**.

(iii) Solution :

Let the side of the smaller square be x m.

Then its perimeter is $4x$ m.

From the given condition, the perimeter of the other square is $(4x + 16)$ m.

$\therefore$ the side of the other square

$= \dfrac{\text{Perimeter}}{4} = \dfrac{(4x+16)}{4}\ (x+4)$ m

The sum of their areas is 400 m^2.

$\therefore x^2 + (x+4)^2 = 400$

$\therefore x^2 + x^2 + 8x + 16 = 400$

$\therefore 2x^2 + 8x + 16 - 400 = 0$

$\therefore 2x^2 + 8x - 384 = 0$

$\therefore x^2 + 4x - 192 = 0$ ... (Dividing by 2)

$\therefore x^2 + 16x - 12x - 192 = 0$

$\therefore x\ (x+16) - 12\ (x+16) = 0$

$\therefore (x+16)\ (x-12) = 0$

$\therefore x + 16 = 0$ or $x - 12 = 0$

$\therefore x = -16$ or $x = 12$

But the length of the side cannot be negative.

$\therefore x = -16$ is unacceptable.

$\therefore x = 12$

$x + 4 = 12 + 4 = 16$

Ans. The length of the sides of the squares are **12 m** and **16 m** respectively.

Q. 5. (i) Solution :

$$\sqrt{\frac{x}{y}} = 4$$

$\therefore \frac{x}{y} = 16$ ... (Squaring both the sides)

$\therefore x = 16y$ ... (1)

$$\frac{1}{x} + \frac{1}{y} = \frac{1}{xy}$$

$\therefore y + x = 1$ ... (Multiplying both the sides by xy) ... (2)

Substituting the value of x from equation (1) in equation (2),

$y + 16y = 1$

$\therefore 17y = 1$ $\therefore y = \frac{1}{17}$

Substituting $y = \frac{1}{17}$ in equation (1)

$x = 16 \times \frac{1}{17}$ $\therefore x = \frac{16}{17}$

Ans. $x = \mathbf{\frac{16}{17}}$ and $y = \mathbf{\frac{1}{17}}$ is the solution of the given simultaneous equations

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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 $x = \frac{x}{100} \times x =$ ₹ $\frac{x^2}{100}$

Cost price + gain = selling price

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

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

$+120$ $\quad$ -20

But the price cannot be negative

$\therefore x = -120$ is unacceptable

$\therefore x = 20$

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

MATHEMATICS (PART – I)

BOARD'S QUESTION PAPER (NOVEMBER 2020)

(With Full Solution)

Time : 2 Hours] **[Total Marks : 40**

Note : *(i)* ***All*** *questions are compulsory.*

(ii) Use of calculator is ***not*** *allowed.*

(iii) The numbers to the right of the questions indicate full marks.

(iv) In case of MCQ's [Q. No. ***1(A)****], only the first attempt will be evaluated and will be given credit.*

(v) For every MCQ, the correct alternative (A), (B), (C) or (D) of answers with subquestion number is to be written as an answer.

Q. 1 (A) Four alternative answers are given for every subquestion. Choose the correct alternative and write its alphabet with subquestion number : **4**

(i) To draw the graph of $4x + 5y = 19$, what will be the value of y when $x = 1$?

(A) 4 (B) 3 (C) 2 (D) -3

(ii) What is the sum of the first 10 natural numbers?

(A) 55 (B) 20 (C) 65 (D) 11

(iii) From the following equations, which one is the quadratic equation?

(A) $\frac{5}{x} - 3 = x^2$ (B) $x(x+5) = 2$ (C) $n - 1 = 2n$ (D) $\frac{1}{x^2}(x+2) = x$

(iv) If the format of GSTIN there are ..... alphanumerals.

(A) 9 (B) 10 (C) 16 (D) 15

Q. 1. (B) Solve the following subquestions : **4**

(i) For simultaneous equations in variables x and y, if $D_x = 25$, $D_y = 40$, $D = 5$, then what is the value of x?

(ii) Find the first term and common difference for the following A.P. :

127, 135, 143, 151, ...,

(iii) A die is rolled. Write the sample space S and the number of sample point $n(S)$.

(iv) If $\Sigma f_i d_i = 108$ and $\Sigma f_i = 100$, then find $\bar{d}$.

Q. 2. (A) Complete the following activities and rewrite it : (*Any two)* **4**

(i) **Activity :**

$$\begin{vmatrix} 3 & 2 \\ 4 & 5 \end{vmatrix} = 3 \times \square - \square \times 4$$

$$= \square - 8$$

$$= \square$$

(ii) One of the roots of quadratic equation $5m^2 + 2m + k = 0$ is $-\frac{7}{5}$. Complete the following activity to find the value of k.

Activity :

$-\frac{7}{5}$ is a root of quadratic equation $5m^2 + 2m + k = 0$

Put $m = \square$ in the equation

$\therefore\ 5 \times \left(-\frac{7}{5}\right)^2 + 2 \times \square + k = 0$

$\therefore\ \square + \left(-\frac{14}{5}\right) + k = 0$

$\therefore\ k = \square$

(iii) Complete the activity to prepare a table showing the coordinates which are necessary to draw a frequency polygon :

Class	18–19	19–20	20–21	☐
Class Mark	18.5	19.5	☐	21.5
Frequency	4	☐	15	19
Coordinates of points	(☐)	(19.5, 13)	(20.5, 15)	(21.5, 19)

Q. 2. (B) Solve the following subquestions : (*Any four)* **8**

(i) The sum of two numbers is 7 and their difference is 5. Find the numbers.

(ii) Solve the quadratic equation by factorisation method :

$x^2 + x - 20 = 0$.

(iii) Find the 19th term of the following A.P. :

7, 13, 19, 25, ...

(iv) For the following experiments, write the sample space S and the number of sample points $n(S)$:

Two-digit numbers are formed using digits 2, 3 and 5 without repeating a digit.

(v) The following table shows causes of noise pollution. Find the measure of the central angles for each, to draw a pie diagram :

Construction	Traffic	Aircraft take offs	Industry
10%	50%	15%	25%

Q. 3. (A) Complete the following activity and rewrite it : (*Any one*) **3**

(i) In an A.P., the first term is -5 and last term is 45. If sum of n terms in the A.P. is 120, then complete the activity to find n.

Activity :

$t_1 = -5$, $t_n =$ ☐, $S_n =$ ☐

$S_n = \frac{n}{2}[t_1 +$ ☐$]$

☐ $= \frac{n}{2}[-5 + 45]$

$240 = n \times$ ☐

$\therefore n =$ ☐

(ii) A card is drawn from a well-shuffled pack of 52 playing cards. Complete the activity to find the probability of the event that the card drawn is a red card.

Activity :

S is the sample space

$n(S) = 52$

Event A : Card drawn is a red card.

Total number of red cards = ☐ hearts + ☐ diamonds

$\therefore n(A) =$ ☐

$P(A) = \frac{\square}{n(S)}$

$\therefore P(A) = \frac{\square}{52}$

$\therefore P(A) =$ ☐

Q. 3. (B) Solve the following subquestions : (*Any two*) **6**

(i) Solve the following simultaneous equations graphically :

$x + y = 5$; $x - y = 1$.

(ii) Solve quadratic equation using formula method :

$5m^2 + 13m + 8 = 0$.

(iii) A retailer sold 2 tins of lustre paint and taxable value of each tin is ₹ 2,800. If the rate of GST is 28%, then find the amount of CGST and SGST charged in the tax invoice.

(iv) Time allotted for the preparation of an examination by some students is shown in the table. Draw a histogram to show this information :

Time (minutes)	Number of Students
60 – 80	14
80 – 100	20
100 – 120	24
120 – 140	22

Q. 4. Solve the following subquestions : (*Any two)* **8**

(i) If one root of the quadratic equation $ax^2 + bx + c = 0$ is half of the other root, show that, $b^2 = \frac{9ac}{2}$.

(ii) Bhujangrao invested ₹ 2,50,590 in shares of F.V. ₹ 10 when M.V. is ₹ 250. Rate of brokerage is 0.2% and GST is 18%, then find :

(a) the number of shares purchased,

(b) the amount of brokerage paid, and

(c) GST paid for the trading.

(iii) The following table shows frequency distribution of number of trees planted by students in the school :

Number of Trees Planted	Number of Students
0 – 10	30
10 – 20	70
20 – 30	100
30 – 40	70
40 – 50	40

Find the mode of trees planted.

Q. 5. Solve the following subquestions : (*Any one)* **3**

(i) Six faces of a die are as shown below :

A	B	C	D	E	O

If the die is rolled once, find the probability of event *M* that 'English vowel appears on the upper face'.

(ii) Construct any one linear equation in two variables. Obtain another equation by interchanging only coefficients of variables. Find the value of the variables.

SOLUTION : BOARD'S QUESTION PAPER (NOVEMBER 2020)

Q. 1. (A) (i) (B)

(ii) (A)

(iii) (B)

(iv) (D)

Hints : Only for guidance. Students are not expected to write this.

(i) Substitute $x = 1$ in the given equation.

(ii) $S_n = \frac{n\,(n+1)}{2}$.

(iii) (C) is a linear equation. (A) and (D) are cubic equations.

Q. 1. (B) **(i)** $D_x = 25,\ D_y = 40,\ D = 5.$

$$x = \frac{D_x}{D} \qquad \therefore\ x = \frac{25}{5} \qquad \therefore\ x = 5$$

The value of x is **5**.

(ii) A.P. : 127, 135, 143, 151, ... ,

First term $= a = t_1 = 127$

Common difference $(d) = 135 - 127 = 8$

The first term is **127** and the common difference is **8**.

(iii) A die is rolled.

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

The number of sample points $n(S) = \mathbf{6}$.

(iv) $\overline{d} = \frac{\Sigma f_i d_i}{\Sigma f_i}$

$= \frac{108}{100}$

$\therefore\ \overline{d} = \mathbf{1.08}$

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

$$\begin{vmatrix} 3 & 2 \\ 4 & 5 \end{vmatrix} = 3 \times \boxed{5} - \boxed{2} \times 4$$

$$= \boxed{15} - 8$$

$$= \boxed{7}$$

(ii) Activity :

$-\frac{7}{5}$ is a root of the quadratic equation $5m^2 + 2m + k = 0$.

Put $m = \boxed{-\frac{7}{5}}$ in the equation,

$5 \times \left(-\frac{7}{5}\right)^2 + 2 \times \boxed{-\frac{7}{5}} + k = 0$

$\therefore \boxed{\frac{49}{5}} + \frac{-14}{5} + k = 0$

$\therefore k = \boxed{-7}$

(iii) Activity :

Class	18–19	19–20	20–21	**21–22**
Class Mark	18.5	19.5	**20.5**	21.5
Frequency	4	**13**	15	19
Coordinates of points	(**18.5, 4**)	(19.5, 13)	(20.5, 15)	(21.5, 19)

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

Let the greater number be x and the smaller one is y.

The sum of two numbers is 7.

$\therefore x + y = 7$ ... (1)

The difference of two numbers is 5.

$\therefore x - y = 5$ ... (2)

Adding equations (1) and (2),

$x + y = 7$ ... (1)

$x - y = 5$ ... (2)

$2x = 12$ $\therefore x = \frac{12}{2}$ $\therefore x = 6$

Substituting $x = 6$ in equation (1),

$6 + y = 7$ $\therefore y = 7 - 6$ $\therefore y = 1$

Ans. The numbers are **6** and **1**.

(ii) Solution :

$x^2 + x - 20 = 0$

$\therefore x^2 + 5x - 4x - 20 = 0$

$\therefore x(x + 5) - 4(x + 5) = 0$

$\therefore (x+5)(x-4)=0$

$\therefore x+5=0$ or $x-4=0$

$\therefore x=-5$ or $x=4$

Ans. $-5, 4$ are the roots of the given equation.

(iii) Solution :

A.P. : 7, 13, 19, 25, ...,

Here, $a=t_1=7$, $t_2=13$, $t_3=19$, ...

$d=t_2-t_1=13-7=6$

We have to find 19th term i.e. t_{19}.

$t_n=a+(n-1)\,d$ ... (Formula)

$\therefore t_{19}=7+(19-1)\times 6$ ... (Substituting the values)

$=7+18\times 6$

$=7+108$

$\therefore t_{19}=115$

Ans. The 19th term of the given A.P. is **115.**

(iv) Ans. The sample space

$S=\{23, 25, 32, 35, 52, 53\}$

$\therefore n(S)=6.$

(v) Solution :

Causes of noise pollution	% of causes	Measure of the central angle
Construction	10	$\frac{10\%}{100\%}\times 360°=36°$
Traffic	50	$\frac{50\%}{100\%}\times 360°=180°$
Aircraft	15	$\frac{15\%}{100\%}\times 360°=54°$
Industry	25	$\frac{25\%}{100\%}\times 360°=90°$
Total	100	360°

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

$t_1=-5$, $t_n=\boxed{45}$, $S_n=\boxed{120}$

$S_n=\frac{n}{2}[t_1+\boxed{t_n}]$

$\therefore \boxed{120}=\frac{n}{2}[-5+45]$

$\therefore\ 240 = n \times \boxed{40}$

$\therefore\ n = \boxed{6}$.

(ii) Activity :

S is the sample space.

$n(S) = 52$

Event A : Card drawn is a red card

Total number of red cards $= \boxed{13}$ hearts $+ \boxed{13}$ diamonds

$\therefore\ n(A) = \boxed{26}$

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

$$\therefore\ P(A) = \frac{\boxed{26}}{52} \qquad \therefore\ P(A) = \boxed{\frac{1}{2}}$$

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

$x + y = 5$

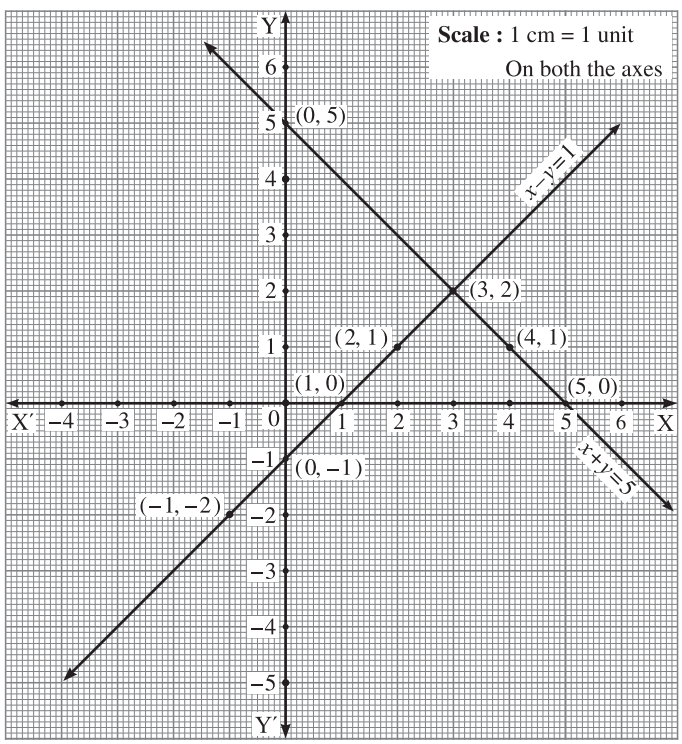
$\therefore\ y = 5 - x$

x	0	3	4	5
y	5	2	1	0
(x, y)	(0, 5)	(3, 2)	(4, 1)	(5, 0)

$x - y = 1$

$\therefore\ y = x - 1$

x	-1	0	1	2
y	-2	-1	0	1
(x, y)	$(-1, -2)$	$(0, -1)$	$(1, 0)$	$(2, 1)$



The coordinates of the point of intersection are (3, 2).

Ans. $x = \mathbf{3}$, $y = \mathbf{2}$ is the solution of the given simultaneous equations.

(ii) Solution :

$5m^2 + 13m + 8 = 0$

Comparing with standard form $ax^2 + bx + c = 0$,

$a = 5,\ b = 13,\ c = 8$

$b^2 - 4ac = (13)^2 - 4(5)\ (8)$

$= 169 - 160 = 9$

$m = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ ... (Formula)

$= \dfrac{-13 \pm \sqrt{9}}{2 \times 5} = \dfrac{-13 \pm 3}{10}$

$\therefore\ m = \dfrac{-13 + 3}{10}$ or $m = \dfrac{-13 - 3}{10}$

$\therefore\ m = \dfrac{-10}{10}$ or $m = \dfrac{-16}{10}$

$\therefore\ m = -1$ or $m = \dfrac{-8}{5}$

Ans. $\mathbf{-1, \dfrac{-8}{5}}$ are the roots of the given quadratic equation.

(iii) Solution :

The taxable value of each tin of lustre paint = ₹ 2800.

$\therefore$ the taxable value of two tins of lustre paint = ₹ 2800 × 2 = ₹ 5600

The rate of GST = 28%

$\therefore$ GST payable = 28% of ₹ 5600

$= \dfrac{28}{100} \times 5600$

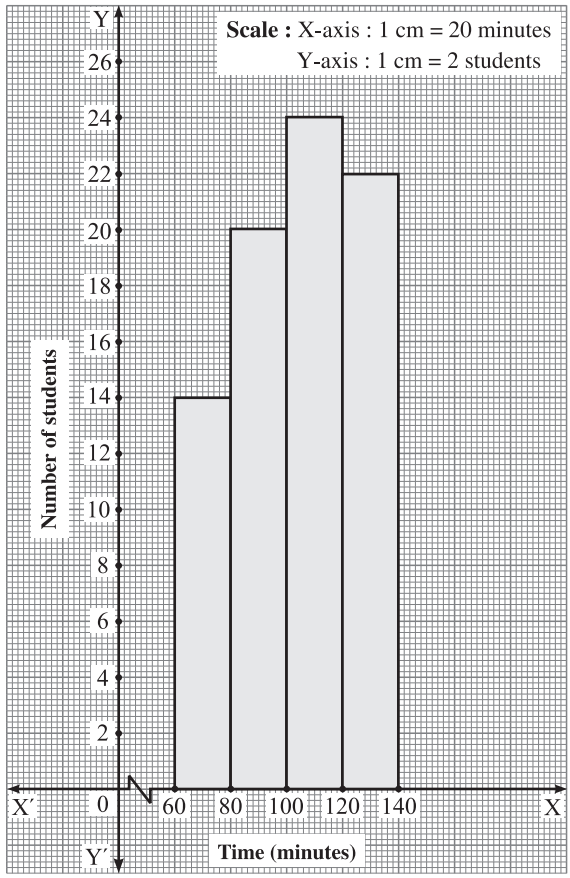
= ₹ 1568

$\text{CGST} = \text{SGST} = \dfrac{1}{2}\ \text{GST}$

$\therefore$ payable $\text{CGST} = \text{SGST} = \dfrac{1}{2} \times$ ₹ 1568 = ₹ 784.

Ans. The amount of CGST and SGST charged in the tax invoice is ₹ **784** each.

(iv) Ans.



Q. 4. **(i) Proof :** Let α and β be the roots of the quadratic equation

$ax^2 + bx + c = 0$.

One root is half of the other root.

Let $\alpha = \frac{\beta}{2}$ ... (1)

$\alpha + \beta = \frac{-b}{a}$ and $\alpha\beta = \frac{c}{a}$

$\alpha + \beta = \frac{-b}{a}$

$\therefore (\alpha + \beta)^2 = \left(\frac{-b}{a}\right)^2$ ... (Squaring both the sides)

$\therefore \left(\frac{\beta}{2} + \beta\right)^2 = \frac{b^2}{a^2}$ ... [From (1)]

$\therefore \left(\frac{3\beta}{2}\right)^2 = \frac{b^2}{a^2}$

$\therefore \frac{9\beta^2}{4} = \frac{b^2}{a^2}$

$\therefore b^2 = \frac{9a^2\beta^2}{4}$ ... (2)

$\alpha\beta = \frac{c}{a}$

$\therefore \frac{\beta}{2} \times \beta = \frac{c}{a}$ ... [From (1)]

$\therefore \frac{\beta^2}{2} = \frac{c}{a}$

$\therefore \beta^2 = \frac{2c}{a}$ ... (3)

Substituting the value of β^2 from equation (3) in equation (2),

$b^2 = \frac{9a^2}{4} \times \frac{2c}{a}$

$\therefore b^2 = \frac{9ac}{2}$.

[**Note :** The proof can be given by taking $\beta = 2\alpha$.]

(ii) Solution :

The sum invested in shares = ₹ 2,50,590.

MV of the share = ₹ 250 ... (1)

Brokerage at 0.2% on MV ₹ 250

$= ₹\ 250 \times \frac{0.2}{100} = ₹\ 0.50$ ... (2)

GST on brokerage at 18% $= ₹\ 0.50 \times \frac{18}{100} = ₹\ 0.09$ ... (3)

Cost of 1 share = MV + brokerage + GST

= ₹ (250 + 0.50 + 0.09) ... [From (1), (2) and (3)]

= ₹ 250.59

(a) The number of shares purchased

$= \frac{\text{Investment}}{\text{Cost of 1 share}}$

$= \frac{₹\ 250590}{₹\ 250.59}$

= 1000.

(b) Total brokerage = Brokerage per share × Number of shares

= ₹ 0.50 × 1000 = ₹ 500

(c) Total GST = GST per share × Number of shares

= ₹ 0.09 × 1000 = ₹ 90

Ans. (a) **1000 shares** (b) **₹ 500** (c) **₹ 90.**

(iii) Solution :

Number of trees planted	0–10	10–20	20–30	30–40	40–50
Number of students	30	70 f_0	100 f_1	70 f_2	40

The maximum frequency is 100

$\therefore$ 20–30 is the modal class

$L = 20, f_1 = 100, f_0 = 70, f_2 = 70, h = 10$

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

$$= 20 + \left[\frac{100 - 70}{2(100) - 70 - 70}\right] \times 10$$

$$= 20 + \frac{30}{200 - 140} \times 10$$

$$= 20 + \frac{30}{60} \times 10$$

$$= 20 + 5 = 25$$

Ans. Mode of trees planted is **25.**

Q. 5. (i) Solution :

Sample space

$S = \{A, B, C, D, E, O\}$ $\quad \therefore n(S) = 6$

Event M : English vowel appears on the upper face of the die.

$\therefore M = \{A, E, O\}$ $\quad \therefore n(M) = 3$

$$P(M) = \frac{n(M)}{n(S)} \quad \text{... (Formula)}$$

$$\therefore P(M) = \frac{3}{6} \quad \therefore P(M) = \frac{1}{2}$$

Ans. The probability of the event that English vowel appears on the upper face of the die is $\mathbf{\frac{1}{2}}$.

(ii) Solution :

Let one linear equation in two variables be

$7x + 5y = 24$ ... (1)

Equation obtained by interchanging the coefficients of the variables is

$5x + 7y = 24$ ... (2)

Adding equations (1) and (2),

$7x + 5y = 24$ ... (1)

$5x + 7y = 24$ ... (2)

$12x + 12y = 48$

$\therefore\ x + y = 4$ ... (Dividing both the sides by 12) ... (3)

Subtracting equation (2) from equation (1),

$7x + 5y = 24$ ... (1)

$5x + 7y = 24$ ... (2)

$- \quad - \quad -$

$2x - 2y = 0$ $\therefore\ x - y = 0$ (Dividing by 2) ... (4)

Adding equations (3) and (4),

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

$x - y = 0$ ... (4)

$2x = 4$ $\therefore\ x = 2$

Substituting $x = 2$ in equation (3),

$2 + y = 4$ $\therefore\ y = 4 - 2$ $\therefore\ y = 2$

Ans. $(x, y) = (\mathbf{2, 2})$ is the solution.

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