

SOLUTION

Q.1. (A) Choose the correct answer and write the alphabet of it in front of the sub-question number. [4]

- (1) To draw the graph of $4x + 5y = 19$, find y when $x = 1$:
(a) 4 (b) 3 (c) 2 (d) -3 [1]
- (2) Out of the following equations which one is not a quadratic equation?
(a) $x^2 + 4x = 11 + x^2$ (b) $x^2 = 4x$
(c) $5x^2 = 90$ (d) $2x - x^2 = x^2 + 5$ [1]
- (3) For the given A.P. $a = 3.5$, $d = 0$, then $t_n = \dots$.
(a) 0 (b) 3.5 (c) 103.5 (d) 104.5 [1]
- (4) If $n(A) = 2$, $P(A) = \frac{1}{5}$, then $n(S) = ?$
(a) 10 (b) $\frac{5}{2}$ (c) $\frac{2}{5}$ (d) $\frac{1}{3}$ [1]

Ans. (1) - (b), (2) - (a), (3) - (b), (4) - (a)

Q.1. (B) Solve the following sub-questions. [4]

- (1) Find the value of the following determinant:

$$\begin{vmatrix} 4 & 3 \\ 2 & 7 \end{vmatrix}$$

Solution:

$$\begin{aligned} \begin{vmatrix} 4 & 3 \\ 2 & 7 \end{vmatrix} &= 4 \times 7 - 3 \times 2 && [1/2] \\ &= 28 - 6 \\ &= 22 && [1/2] [1] \end{aligned}$$

Ans. 22

- (2) Find the common difference of the following A.P.:
2, 4, 6, 8,

Solution:

Given A.P.: 2, 4, 6, 8, [1/2]

$$\therefore t_1 = 2, t_2 = 4, t_3 = 6, t_4 = 8$$

$$d = t_2 - t_1 = 4 - 2 = 2$$

$$d = t_3 - t_2 = 6 - 4 = 2$$

$$d = t_4 - t_3 = 8 - 6 = 2 \quad [1/2] [1]$$

Ans. The common difference is 2.

(3) On certain article if rate of CGST is 9%, then what is the rate of SGST?

Solution:

$$\text{CGST} = \text{SGST}$$

Ans. $\therefore$ If CGST = 9%, then SGST = 9% [1]

(4) If one coin is tossed, write the sample space 'S'.

Solution:

One coin is tossed.

Ans. $\therefore S = \{H, T\}$ [1]

Q.2. (A) Complete any two given activities and rewrite them. [4]

(1) Complete the following activity; find the value of x :

Solution:

$$5x + 3y = 9 \text{ (I)}$$

$$2x - 3y = 12 \text{ (II)}$$

Add equations (I) and (II)

$$\begin{array}{rcl} 5x + 3y & = & 9 \\ + & 2x - 3y & = 12 \\ \hline 7x & = & \boxed{21} \end{array} \quad [1/2]$$

$$\therefore x = \frac{\boxed{21}}{\boxed{7}} \quad [1/2]$$

$$\therefore x = \boxed{3} \quad [1/2] [2]$$

(2) Complete the following activity to determine the nature of the roots of the quadratic equation $x^2 + 2x - 9 = 0$.

Solution:

Compare $x^2 + 2x - 9 = 0$ with $ax^2 + bx + c = 0$

$$a = 1, b = 2, c = \boxed{-9} \quad [1/2]$$

$$\therefore b^2 - 4ac = (2)^2 - 4 \times \boxed{1} \times \boxed{-9} \quad [1]$$

$$\Delta = 4 + \boxed{36} = 40 \quad [1/2] [2]$$

$$\therefore b^2 - 4ac > 0$$

$\therefore$ The roots of the equation are real and unequal.

(3) Complete the following table using given information:

Sr. No.	FV	Share is at	MV	
1.	₹100	Par	$\boxed{\text{₹}100}$	[1/2]
2.	$\boxed{\text{₹}75}$	Premium ₹500	₹575	[1/2]
3.	₹10	$\boxed{\text{Discount ₹}5}$	₹5	[1/2]
4.	₹200	Discount ₹50	$\boxed{\text{₹}150}$	[1/2] [2]

Q.2. (B) Solve the following sub-questions. (Any four) [8]

(1) Solve the following simultaneous equations:

$$x + y = 4, 2x - y = 2$$

Solution:

Add equations (I) and (II): [1/2]

$$x + y = 4 \quad \dots(\text{I})$$

$$2x - y = 2 \quad \dots(\text{II})$$

$$\hline 3x = 6$$

$$\therefore x = \frac{6}{3}$$

$$\therefore x = 2 \quad [1/2]$$

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

$$2 + y = 4 \quad [1/2]$$

$$\therefore y = 4 - 2$$

$$\therefore y = 2 \quad [1/2] [2]$$

Ans. (2, 2) is the solution of the given equations.

- (2) Write the following equation in the form $ax^2 + bx + c = 0$, then write the values of a, b, c :

$$2y = 10 - y^2$$

Solution:

$$2y = 10 - y^2$$

$$\therefore y^2 + 2y - 10 = 0$$

$$\text{Comparing with } ax^2 + bx + c = 0, \quad [1/2]$$

$$\text{Ans. } a = 1, \quad b = 2, \quad c = -10 \quad [1\frac{1}{2}] [2]$$

- (3) Write an A.P. whose first term is $a = 10$ and common difference $d = 5$.

Solution:

$$a = 10 \text{ and } d = 5 \text{ (given)}$$

$$\text{Now, } t_1 = a = 10 \quad [1/2]$$

$$t_2 = t_1 + d = 10 + 5 = 15 \quad [1/2]$$

$$t_3 = t_2 + d = 15 + 5 = 20$$

$$t_4 = t_3 + d = 20 + 5 = 25 \quad [1/2]$$

$$\text{Ans. The required A.P. is } 10, 15, 20, 25, \dots \quad [1/2] [2]$$

- (4) Courier service agent charged total ₹590 to courier a parcel from Nashik to Nagpur. In the tax invoice, taxable value is ₹500 on which CGST is ₹45 and SGST is ₹45. Find the rate of GST charged for this service.

Solution:

$$\text{Taxable value} = ₹500, \text{ CGST} = \text{SGST} = ₹45$$

$$\text{GST} = \text{CGST} + \text{SGST} \quad [1/2]$$

$$= 45 + 45$$

$$= ₹90 \quad [1/2]$$

$$\text{Rate of GST} = \frac{90}{500} \times 100 \quad [1/2]$$

$$= 18\%$$

$$\text{Ans. The rate of GST charged for this service is } 18\%. \quad [1/2] [2]$$

(5) Observe the following table and find mean:

Assumed mean $A = 300$

Class	Class mark x_i	$d_i = x_i - A$ $d_i = x_i - 300$	Frequency f_i	Frequency $\times$ Deviation $f_i d_i$
200–240	220	–80	5	–400
240–280	260	–40	10	–400
280–320	300 $\rightarrow A$	0	15	0
320–360	340	40	12	480
360–400	380	80	8	640
Total			$\sum f_i = 50$	$\sum f_i d_i = 320$

Solution:

$$A = 300, \sum f_i = 50, \sum f_i d_i = 320$$

$$\bar{d} = \frac{\sum f_i d_i}{\sum f_i} = \frac{320}{50} \quad [1/2]$$

$$= 6.4 \quad [1/2]$$

$$\text{Mean} = A + \bar{d} \quad [1/2]$$

$$= 300 + 6.4$$

$$\text{Ans.} \quad = 306.4 \quad [1/2] [2]$$

Q.3. (A) Complete any one activity and rewrite it. [3]

(1) Form a 'Road Safety Committee' of two, from 2 boys (B_1, B_2) and 2 girls (G_1, G_2).

Solution:

Complete the following activity to write the sample space:

(a) Committee of 2 boys = $\{\boxed{B_1, B_2}\}$ [1/2]

(b) Committee of 2 girls = $\{\boxed{G_1, G_2}\}$ [1/2]

(c) Committee of one boy and one girl
 $= \{\boxed{B_1, G_1}, \boxed{B_1, G_2}, \boxed{B_2, G_1}, \boxed{B_2, G_2}\}$ [1]

(d) $\therefore$ Sample space (S) =
 $\{(B_1, B_2), (B_1, G_1), \boxed{B_1, G_2}, \boxed{B_2, G_1}, (B_2, G_2), (G_1, G_2)\}$
[1] [3]

(2) Fill in the boxes with the help of given information:

Tax invoice of services provided (Sample)								
Food Junction, Khed-Shivapur, Pune						Invoice No. 58		
Mob. No. 7588580000, email-ahar.khed@yahoo.com								
GSTIN: 27AAAAA5555B1ZA						Invoice Date 25 Feb, 2020		
SAC	Food Items	Qty	Rate (in ₹)	Taxable amount	CGST		SGST	
9963	Coffee	1	20	₹ 20.00	2.5%	₹ 0.50	2.5%	₹ 0.50
9963	Masala Tea	1	10	₹ 10.00	2.5%	₹ 0.25	2.5%	₹ 0.25
9963	Masala Dosa	2	60	₹ 120	2.5%	₹ 3	2.5%	₹ 3.00
			Total	₹ 150.00		₹ 3.75		₹ 3.75
Grand Total							= ₹ 157.50	

Note: 1/2 mark for each box.

[3]

Q.3. (B) Solve the following sub-questions. (Any two) [6]

(1) Solve the following simultaneous equations using Cramer's rule:

$$4m + 6n = 54; 3m + 2n = 28$$

Solution:

$$4m + 6n = 54; 3m + 2n = 28$$

$$D = \begin{vmatrix} 4 & 6 \\ 3 & 2 \end{vmatrix} = 4 \times 2 - 6 \times 3$$

$$= 8 - 18$$

$$= -10$$

[1/2]

$$D_m = \begin{vmatrix} 54 & 6 \\ 28 & 2 \end{vmatrix} = 54 \times 2 - 6 \times 28$$

$$= 108 - 168$$

$$= -60$$

[1/2]

$$\begin{aligned}
 D_n &= \begin{vmatrix} 4 & 54 \\ 3 & 28 \end{vmatrix} = 4 \times 28 - 54 \times 3 \\
 &= 112 - 162 \\
 &= -50 \quad [1/2]
 \end{aligned}$$

By Cramer's rule,

$$m = \frac{D_m}{D} = \frac{-60}{-10} = 6 \quad [1/2]$$

$$n = \frac{D_n}{D} = \frac{-50}{-10} = 5 \quad [1/2]$$

Ans. $\therefore$ (6, 5) is the solution of the given equations. $[1/2] [3]$

(2) Solve the following quadratic equation by formula method:

$$x^2 + 10x + 2 = 0$$

Solution:

$$x^2 + 10x + 2 = 0$$

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

$$a = 1, b = 10, c = 2 \quad [1/2]$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \quad [1/2]$$

$$\therefore x = \frac{-10 \pm \sqrt{(10)^2 - 4 \times 1 \times 2}}{2 \times 1} \quad [1/2]$$

$$= \frac{-10 \pm \sqrt{100 - 8}}{2}$$

$$= \frac{-10 \pm \sqrt{92}}{2} \quad [1/2]$$

$$= \frac{-10 \pm 2\sqrt{23}}{2}$$

$$= \frac{2(-5 \pm \sqrt{23})}{2} \quad [1/2]$$

$$\text{Ans. } \therefore x = -5 + \sqrt{23} \text{ or } x = -5 - \sqrt{23} \quad [1/2] [3]$$

- (3) A two digit number is formed with digits 2, 3, 5, 7, 9 without repetition. What is the probability of the following events?

Event A: The number formed is an odd number.

Event B: The number formed is a multiple of 5.

Solution:

$$S = \{23, 25, 27, 29, 32, 35, 37, 39, 52, 53, 57, 59, 72, 73, 75, 79, 92, 93, 95, 97\} \quad [1/2]$$

$$\therefore n(S) = 20 \quad [1/2]$$

Event A: The number formed is an odd number.

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

$$\therefore n(A) = 16 \quad [1/2]$$

$$P(A) = \frac{n(A)}{n(S)} = \frac{16}{20} = \frac{4}{5} \quad [1/2]$$

Event B: The number formed is a multiple of 5.

$$\therefore B = \{25, 35, 75, 95\}$$

$$\therefore n(B) = 4 \quad [1/2]$$

$$P(B) = \frac{n(B)}{n(S)} = \frac{4}{20} = \frac{1}{5} \quad [1/2] [3]$$

Ans. $P(A) = \frac{4}{5}$ and $P(B) = \frac{1}{5}$

- (4) The frequency distribution table shows the number of mango trees in a grove and their yield of mangoes. Find the median of data:

No. of Mangoes	No. of Trees
50–100	33
100–150	30
150–200	90
200–250	80
250–300	17

Solution:

No. of Mangoes	No. of Trees	c.f. less than type
50–100	33	33
100–150	30	63 $\rightarrow$ c.f.
150–200	90 $\rightarrow f$	153
200–250	80	233
250–300	17	250

[1]

$$\frac{N}{2} = \frac{250}{2} = 125$$

$$L = 150, f = 90, c.f. = 63, h = 50 \quad [1/2]$$

$$\text{Median} = L + \left[\frac{\frac{N}{2} - c.f.}{f} \right] \times h \quad [1/2]$$

$$= 150 + \left[\frac{125 - 63}{90} \right] \times 50 \quad [1/2]$$

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

$$= 150 + \frac{310}{9}$$

$$= 150 + 34.44$$

$$\text{Ans.} \quad = 184.44 \text{ mangoes} \quad [1/2] [3]$$

Q.4. Solve the following sub-questions. (Any two) [8]

- (1) If the first term of A.P. is p , second term is q and last term is r , then show that sum of all terms is $(q + r - 2p) \times \frac{(p + r)}{2(q - p)}$.

Solution:

$$t_1 = p, t_2 = q, t_n = r \quad (\text{Given}) \quad [1/2]$$

$$d = t_2 - t_1 = (q - p)$$

$$t_n = a + (n - 1)d \quad [1/2]$$

$$\therefore r = p + (n - 1)(q - p) \quad [1/2]$$

$$\therefore (n - 1) = \frac{(r - p)}{(q - p)}$$

$$\therefore n = \frac{(r - p)}{(q - p)} + 1$$

$$\therefore n = \frac{(r - p) + (q - p)}{(q - p)}$$

$$\therefore n = \frac{r - p + q - p}{(q - p)}$$

$$\therefore n = \frac{q + r - 2p}{(q - p)} \quad [1/2]$$

$$S_n = \frac{n}{2} [t_1 + t_n] \quad [1/2]$$

$$= \frac{(q + r - 2p)}{(q - p)} \times (p + r) \quad [1]$$

$$= \frac{(q + r - 2p)}{(q - p)} \times \frac{1}{2} \times (p + r)$$

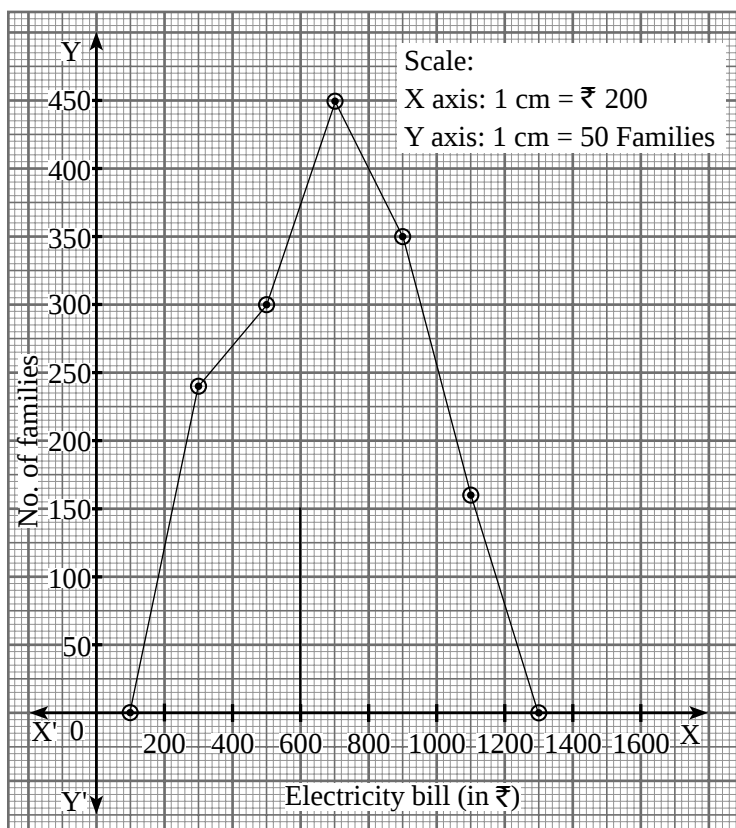
$$= (q + r - 2p) \times \frac{(p + r)}{2(q - p)} \quad [1/2] [4]$$

(2) Show the following data by a frequency polygon:

Electricity bill (₹)	Families
200–400	240
400–600	300
600–800	450
800–1000	350
1000–1200	160

Solution:

Class (Electricity bill in ₹)	Class Mark	Frequency (Families)	co-ordinates of points
0–200	100	0	(100, 0)
200–400	300	240	(300, 240)
400–600	500	300	(500, 300)
600–800	700	450	(700, 450)
800–1000	900	350	(900, 350)
1000–1200	1100	160	(1100, 160)
1200–1400	1300	0	(1300, 0)



- For each column 1/2 Mark [1½ + 1/2]
- For correct scale and axes [1/2]
- For frequency polygon [1½] [4]

- (3) The sum of the squares of five consecutive natural numbers is 1455. Find the numbers.

Solution:

Let the numbers be $a - 1, a, a + 1, a + 2, a + 3$ [1/2]

$$\therefore (a - 1)^2 + a^2 + (a + 1)^2 + (a + 2)^2 + (a + 3)^2 = 1455$$

(as per given condition) [1/2]

$$\therefore a^2 - 2a + 1 + a^2 + a^2 + 2a + 1 + a^2 + 4a + 4 + a^2 + 6a + 9 = 1455$$

[1/2]

$$\therefore 5a^2 + 10a + 15 = 1455$$

$$\therefore 5a^2 + 10a + 15 - 1455 = 0$$

$$\therefore 5a^2 + 10a - 1440 = 0$$

$$\therefore a^2 + 2a - 288 = 0$$

[1/2]

$$\therefore a^2 - 16a + 18a - 288 = 0$$

$$\therefore a(a - 16) + 18(a - 16) = 0$$

$$\therefore (a - 16)(a + 18) = 0$$

[1/2]

$$\therefore a - 16 = 0 \quad \text{or} \quad a + 18 = 0$$

[1/2]

$$\therefore a = 16 \quad \text{or} \quad a = -18$$

But a natural number cannot be negative. [1/2]

$$\therefore a = 16$$

$$\therefore a - 1 = 15$$

and $a + 1 = 17$

$$a + 2 = 18$$

$$a + 3 = 19$$

Ans. The required numbers are 15, 16, 17, 18, 19. [1/2] [4]

Q.5. Solve the following sub-questions. (Any one) [3]

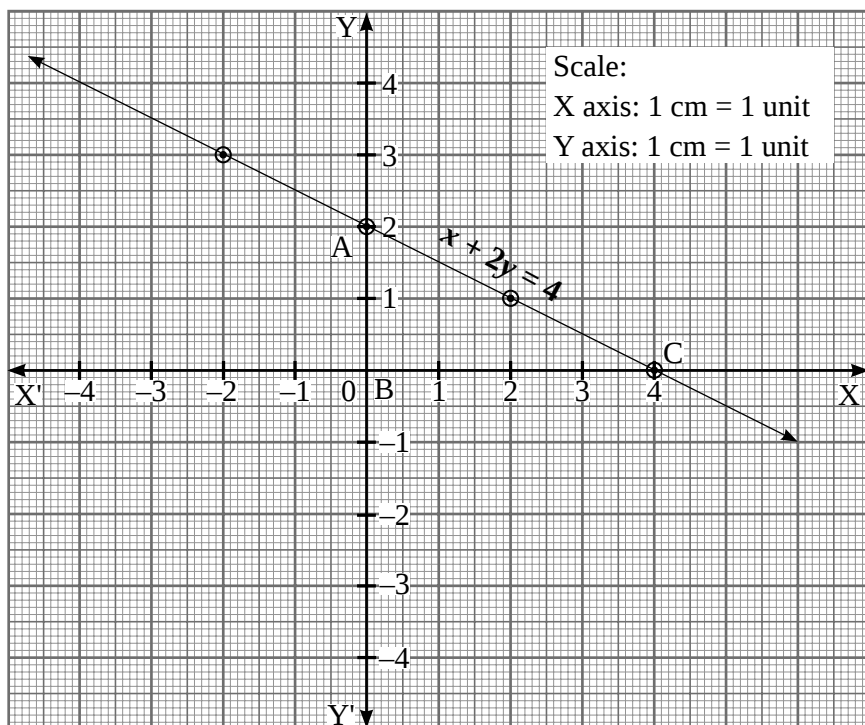
- (1) Draw the graph of the equation $x + 2y = 4$. Find the area of the triangle formed by the line intersecting the X-axis and Y-axis.

Solution:

$$x + 2y = 4$$

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

x	2	0	-2
y	1	2	3
x, y	(2, 1)	(0, 2)	(-2, 3)



Let $\triangle ABC$ be formed by the line intersecting the X-axis and Y-axis.

Base $BC = 4$ units and height $AB = 2$ units

$$A(\triangle ABC) = \frac{1}{2} \times BC \times AB$$

$$= \frac{1}{2} \times 4 \times 2$$

$$= 4 \text{ sq. units}$$

Ans. Area of the triangle is 4 sq. units.

- To prepare a table [1/2]
- Draw correct line of the given equation [1]
- For finding the area of the triangle by any method [1]
- Area of triangle = 4 sq. units [1/2] [3]

- (2) A survey was conducted for 180 people in a city. 70 ate pizza, 60 ate burgers and 50 ate chips. Draw a pie diagram for the given information.

Solution:

$$\begin{aligned}\theta \text{ for the people who ate pizza} &= \frac{\text{No. of people who ate pizza}}{\text{Total no. of people}} \times 360^\circ \\ &= \frac{70}{180} \times 360^\circ \\ &= 70 \times 2^\circ \\ &= 140^\circ \quad [1/2]\end{aligned}$$

$$\begin{aligned}\theta \text{ for the people who ate burgers} &= \frac{\text{No. of people who ate burgers}}{\text{Total no. of people}} \times 360^\circ \\ &= \frac{60}{180} \times 360^\circ \\ &= 60 \times 2^\circ \\ &= 120^\circ \quad [1/2]\end{aligned}$$

$$\begin{aligned}\theta \text{ for the people who ate chips} &= \frac{\text{No. of people who ate chips}}{\text{Total no. of people}} \times 360^\circ \\ &= \frac{50}{180} \times 360^\circ \\ &= 50 \times 2^\circ \\ &= 100^\circ \quad [1/2]\end{aligned}$$

Pie diagram

[1½] [3]

