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Subject : Algebra **Total Marks : 40**

Class : X^th **Prelim Answer Paper - 1** **Time : 2 Hr.**

Q.1.A) Solve multiple choice questions. (4)

1. A die is rolled. What is the probability that the number appearing on upper face is less than 3 ?

Ans: b) $\frac{1}{3}$

2. GST system was introduced in our country from _____.

Ans: d) 1st July 2017

3. The formula to find mean from a grouped frequency table is $\overline{X} = A + \frac{\sum f_i u_i}{\sum f_i} \times g$ In the formula u_i = _____

Ans: c) $\frac{x_i - A}{g}$

4. The persons of O - blood are 40%. The classification of persons based on blood groups is to be shown by a pie diagram. What should be the measures of angle for the persons of O - blood group?

Ans: d) 144°

B) Solve the following questions. (4)

1. How many possibilities are there in the following event?

One number from 10 to 20 is written on each card. Select one card randomly.

Ans: Here possibility are :

$\{10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20\}$

$\therefore$ There are 11 cards bearing numbers 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20

$\therefore$ There are 11 possibilities.

2. Find the value of the following determinant.

$$\begin{vmatrix} 5 & -2 \\ -3 & 1 \end{vmatrix}$$

Ans:

$$\begin{vmatrix} 5 & -2 \\ -3 & 1 \end{vmatrix}$$

$= (5 \times 1) - [-2 \times (-3)]$

$= 5 - 6$

$= -1$

3. Two roots of quadratic equations are given; frame the equation.

i. 10 and -10

Ans: Let a = 10 and ß = -10

$\therefore \alpha + \beta = 10 - 10 = 0$

and $\alpha \times \beta = 10 \times -10 = -100$

$\therefore$ The required quadratic equation is

$x^2 - (a + ß)x + aß = 0$

$\therefore x^2 - 0x + (-100) = 0$

$\therefore x^2 - 100 = 0$

4. Is the following sequence A.P.? If it is A.P. find the common difference. 127, 132, 137, ...

Ans: Here

$t_1 = 127, t_2 = 132, t_3 = 137$

$t_2 - t_1 = 132 - 127 = 5,$

$t_3 - t_2 = 137 - 132 = 5$

This shows that the difference between any two consecutive terms is constant. Hence, the given

sequence is an A.P. with common difference
(d) 5.

Q.2. A) Complete the following Activities. (Any Two) (4)

1. Form a 'Road safety committee' of two, from 2 boys (B_1, B_2) and 2 girls(G_1, G_2). Complete the following activity to write the sample space.

(a) Committee of 2 boys = ☐

(b) Committee of 2 girls = ☐

(c) Committee of one boy and one girl = {__, __, __, __}

∴ Sample space = {__, __, __, __, __, __}

Ans: (a) Committee of 2 boys = $\{B_1\ B_2\}$

(b) Committee of 2 girls = $\{G_1\ G_2\}$

(c) Committee of one boy and one girl

$= \{B_1\ G_1, B_1\ G_2, B_2\ G_1, B_2\ G_2\}$

∴ Sample space

$= \{B_1B_2, G_1G_2, B_1G_1, B_1G_2, B_2G_1, B_2G_2\}$

2. Find the value of following determinant.

Ans: $\begin{vmatrix} \frac{7}{3} & \frac{5}{3} \\ \frac{3}{2} & \frac{1}{2} \end{vmatrix}$

$= \left(\frac{7}{3} \times \frac{1}{2}\right) - \frac{5}{3} \times \frac{3}{2}$

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

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

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

$= \frac{-4}{3}$.

3. First term and common difference of an A.P. are 6 and 3 respectively ; find S_{27}

a = 6, d = 3, S_{27} = ?

Ans: ∴ $S_n = \frac{n}{2}\left[2a + (n-1)d\right]$

∴ $S_{27} = \frac{27}{2}\left[12 + (27-1)3\right]$

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

$= 27 \times 45$

∴ $S_{27} = 1215$.

Q.2. B) Solve the following questions. (Any four) (8)

1. Find the amount received when 300 shares of FV Rs. 100, were sold at a discount of Rs. 30.

Ans: Face value of share = Rs. 100

Discount = Rs. 30

∴ Market value = Face value – discount

= 100 – 30

= 70

∴ Market value of 1 share = Rs. 70

∴ Total amount obtained by selling 300 shares

= 300 × 70

= Rs. 21000

2. Determine the nature of roots of the following quadratic equations from their discriminant.

$2y^2 - 7y + 2 = 0$

Ans: $2y^2 - 7y + 2 = 0$

Comparing with $ay^2 + by + c = 0$

[Here y = x] we get,

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

$\Delta = b^2 - 4ac$

$= (-7)^2 - 4 \times 2 \times 2$

$= 49 - 16$

∴ $\Delta = 33$

As $\Delta > 0$, the roots of the quadratic equation are real and unequal.

3. A card is drawn at random from a pack of well shuffled 52 playing cards. Find the probability that the card drawn is -
(i) an ace. (ii) a spade.

Ans: One card is drawn from a pack of 52 cards.

$\therefore n(S) = 52$

i)A is the event of getting an ace. There are 4 ace cards.

$\therefore n(A) = 4$

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

$\therefore P(A) = \frac{4}{52} = \frac{1}{13}$

ii)B is the event of getting a spade. There are 13 spade cards.

$\therefore n(B) = 13$

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

$\therefore P(B) = \frac{13}{52} = \frac{1}{4}$

4. In year 2015, Mrs. Shaikh got a job with salary Rs. 1,80,000 per year. Her employer agreed to give Rs. 10,000 per year as increment. Then in how many years will her annual salary be Rs. 2,50,000?

Ans:

Year	First Year (2015)	Second Year (2016)	Third Year (2017)	----
Salary (Rs.)	[1,80,000]	[1,80,000 + 10,000]		----

$a = ₹\ 1,80,000,\ d = ₹\ 10,000,\ n = ?,$
$t_n = ₹\ 2,50,000$
$t_n = a + (n-1)d$
$\therefore 2,50,000 = 1,80,000 + (n-1) \times 10,000$
$\therefore (n-1) \times 10000 = 70,000$
$\therefore (n-1) = 7$
$\therefore n = 8$
In the 8th year her annual salary will be ₹ 2,50,000.

5. Solve the following simultaneous equations.
5m - 3n = 19 ; m - 6n = - 7

Ans: $5m - 3n = 19$ ...I
$m - 6n = -7$ ...II
Multiplying equation I by 2
$10m - 6n = 38$ ...III
Subtracting equation II from equation III

$$\begin{array}{rrrr} 10m & -6n & = & 38 \\ m & -6n & = & -7 \\ \hline - & + & + & \\ \hline 9m & & = & 45 \end{array}$$

$\therefore m = \frac{45}{9}$

$\therefore \mathbf{m = 5}$

Substituting $m = 5$ in equation I

$5m - 3n = 19$

$\therefore 5 \times 5 - 3n = 19$

$\therefore 25 - 3n = 19$

$\therefore -3n = 19 - 25$

$\therefore -3n = -6$

$\therefore n = \frac{-6}{-3}$

$\therefore \mathbf{n = 2}$

$m = 5, n = 2$ is the solution of given simultaneous equations.

Q.3. A) Complete the following Activity (Any one) (3)

1. The product of ages of Pragati 2 years ago and 3 years after is 84. Find her present age.

Ans: Let the present age of Pragati be x years.

Pragati's age 2 years ago = $\boxed{(x-2)}$ years and 3 years after = $\boxed{(x+3)}$ years According to given condition

$\boxed{(x-2)(x+3)} = 84$

$\therefore x(x+3) - 2(x+3) = 84$

$\therefore x^2 + 3x - 2x - 6 = 84$

$\therefore x^2 + x - 6 - 84 = 0$

$\therefore x^2 + x - 90 = 0$

$\therefore \boxed{x^2 + 10x - 9x - 90} = 0$

$\therefore x(x+10) - 9(x+10) = 0$

$\therefore (x+10)(x-9) = 0$

$\therefore x + 10 = 0$ or $x - 9 = 0$

$\therefore x = -10$ or $x = 9$

Now age cannot be negative

$\therefore x \neq -10$

$\therefore x = \boxed{9}$

$\therefore$ The present age of Pragati is $\boxed{9}$ years.

2. M/s. Jay Chemicals purchased a liquid soap for Rs. 8000 (with GST) and sold it to the consumers for Rs. 10,000 (with GST). Rate of GST is 18%. Find the amount of CGST and SGST to be paid by Jay Chemicals.

Ans: Here, the prices are including GST.

Total value (value with GST)

= Taxable value + $\boxed{\text{GST}}$

If the taxable value of liquid soap is Rs. 100, then the total value is Rs. 118.

The ratio of $\frac{\text{Total Value}}{\text{Taxable Value}}$ is constant as the rate of GST is same.

i. For total value of Rs. 118, the taxable value is Rs. 100 and for total value of Rs. 8000, let the taxable value be Rs. x .

$\therefore \frac{x}{8000} = \frac{100}{118}$

$\therefore x = \frac{8000}{118} \times 100 = \boxed{\text{Rs.6779.66}}$

$\therefore$ GST paid at the time of purchase

= 8000 - 6779.66

Input tax = $\boxed{\text{Rs.1220.34}}$

$\therefore$ ITC = Rs, 1220.34

ii. For total value of Rs. 10,000 let the taxable value be Rs. y.

$\therefore \frac{y}{10000} = \frac{100}{118}$

$\therefore y = \frac{10,00,000}{118} = \boxed{\text{Rs.8474.58}}$

$\therefore$ Output tax (tax collected)

= 10000.00 –8474.58 = $\boxed{\text{Rs.1525.42}}$ ... (II)

$\therefore$ GST payable = Output tax - Input tax

= 1525.42 - 1220.34

= $\boxed{\text{Rs.305.08}}$

$\therefore$ Payable CGST = Payable SGST

= 305.08 ÷ 2 = Rs. 152.54

Jay Chemicals has to pay Rs. 152.54 CGST and Rs. 152.54 SGST.

Q.3.B) Solve the following questions. (Any two) (6)

1. Solve the following simultaneous equations using Cramer's method.

$2x + 3y = 2$; $x - \frac{y}{2} = \frac{1}{2}$

Ans: $2x + 3y = 2$

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

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

$D = \begin{vmatrix} 2 & 3 \\ 1 & -\frac{1}{2} \end{vmatrix}$

$= 2 \times \frac{-1}{2} - (3 \times 1)$

$= -1 - 3$

$\therefore D = -4$

$D_x = \begin{vmatrix} 2 & 3 \\ \frac{1}{2} & -\frac{1}{2} \end{vmatrix}$

$= 2 \times \frac{-1}{2} - (3 \times \frac{1}{2})$

$= -1 - \frac{3}{2}$

$= \frac{-2-3}{2}$

$\therefore D_X = \frac{-5}{2}$

$D_y = \begin{vmatrix} 2 & 2 \\ 1 & \frac{1}{2} \end{vmatrix}$

$= 2 \times \frac{1}{2} - (2 \times 1)$

$= 1 - 2$

$\therefore D_y = -1$

By Cramer's rule

$x = \frac{Dx}{D} = \frac{-5/2}{-4} = \frac{-5}{2} \times \frac{1}{-4} = \frac{5}{8}$

$y = \frac{Dy}{D} = \frac{-1}{-4} = \frac{1}{4}$

$\therefore x = \frac{5}{8}$ and $y = \frac{1}{4}$ is the solution of given simultaneous equations.

2. Check whether 301 is in the sequence 5, 11, 17, 23, ... ?

Ans: In the sequence 5, 11, 17, 23, ...

$t_1 = 5, t_2 = 11, t_3 = 17, t_4 = 23, ...$

$t_2 - t_1 = 11 - 5 = 6$

$t_3 - t_2 = 17 - 11 = 6$

This sequence is an A.P.

First term a = 5 and d = 6 If 301 is n^{th} term, then t_n=301

$t_n = a + (n - 1)d = 301$

$\therefore 301 = 5 + (n - 1) \times 6$

$= 5 + 6n - 6$

$\therefore 6n = 301 + 1 = 302$

$\therefore n = \frac{302}{6}$ But it is not an integer.

$\therefore$ 301 is not in the given sequence.

3. Determine the nature of roots of the following quadratic from their discriminant.

$3x^2 - 5x + 7 = 0$

Ans: $3x^2 - 5x + 7 = 0$

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

a = 3, b = -5, c = 7

$\Delta = b^2 - 4ac$

$= (-5)^2 - 4 \times 3 \times 7$

$= 25 - 84$

$\therefore \Delta = -59$

As $\Delta < 0$, the roots of the quadratic equation are not real.

4. Mr. Rohit is a retailer. He paid GST of Rs. 6500 at the time of purchase. He collected GST of Rs. 8000 at the time of sale. (i) Find his input tax and output tax. (ii) What is his Input tax credit ? (iii) Find his payable GST. (iv) Hence find the payable CGST and payable SGST.

Ans: Mr. Rohit's payable GST means, GST to be paid to the government by Mr. Rohit.

(i) Output tax (tax collected at the time of sale) = Rs. 8000.

(ii) Input tax (tax paid at the time of purchase) = Rs. 6500

$\therefore$ ITC = Rs. 6500.

(iii) GST payable = Output tax - ITC

= Rs. 8000 - Rs. 6500

= Rs. 1500

(iv) Payable CGST = $\frac{1500}{2}$ = Rs. 750 and Payable SGST = Rs. 750.

Q.4. Solve the following questions. (Any two) (8)

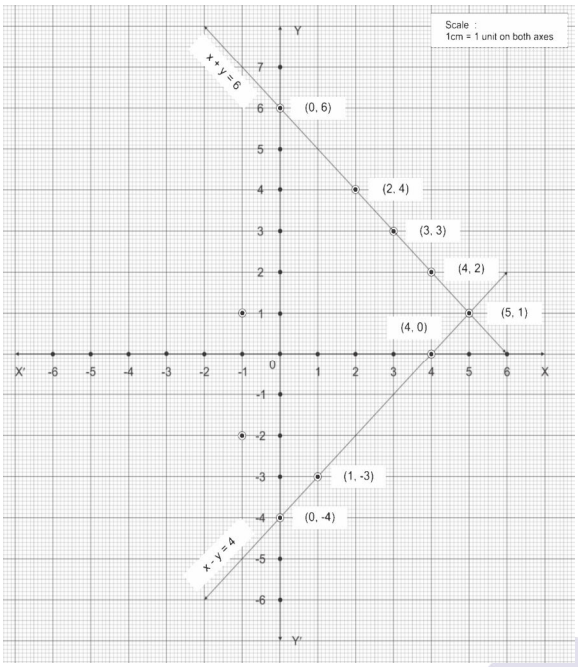
1. Solve the following simultaneous equations graphically. x + y = 6 ; x - y = 4

Ans: x + y = 6

x	0	2	3	4
y	6	4	3	2
(x, y)	(0,6)	(2,4)	(3,3)	(4,2)

x - y = 4

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



The coordinates of the point of intersection are (5, 1)

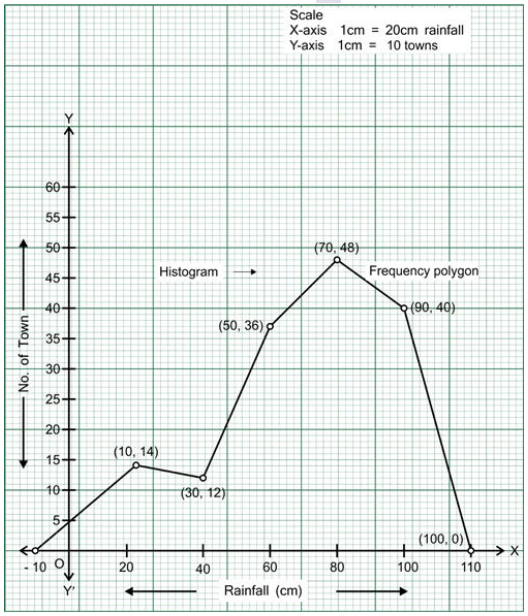
The solution of the given simultaneous equations is x = **5**, y = **1**.

2. The following table shows the average rainfall in 150 towns. Show the information by a frequency polygon.

Average rainfall (cm)	0 – 20	20 – 40	40 – 60	60 – 80	80 – 100
No. of towns	14	12	36	48	40

Ans:

Class	Class mark	Frequency	Co – ordnates of int
–20 – 0	–10	0	(–10, 0)
0 – 20	10	14	(10, 14)
20 – 40	30	12	(30, 12)
40 – 60	50	36	(50, 36)
60 – 80	70	48	(70, 48)
80 – 100	90	40	(90, 40)
100 – 120	110	0	(110, 0)



3. The roots of quadratic equation $(m-12)x^2 + 2(m-12)x + 2 = 0$ are real and equal then find the value of m.

Ans: $(m-12)x^2 + 2(m-12)x + 2 = 0$

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

$a = m - 12$, $b = 2(m-12)$, $c = 2$

$\Delta = b^2 - 4ac$

$= [2(m-12)]^2 - 4 \times (m-12) \times 2$

$= 4(m^2 - 24m + 144) - 8(m-12)$

$= 4m^2 - 96m + 576 - 8m + 96$

$\therefore \Delta = 4m^2 - 104m + 672$

The roots are real and equal so Δ must be zero.

$\therefore 4m^2 - 104m + 672 = 0$

$\therefore m^2 - 26m + 168 = 0$ ...Divided both sides by 4

$\therefore m^2 - 14m - 12m + 168 = 0$

$\therefore m(m-14) - 12(m-14) = 0$

$\therefore m - 14 = 0$ or $m - 12 = 0$

$\therefore m = 14$ or $m = 12$

Since $m - 12 = a$ in quadratic equation $a \neq 0$.

$\therefore m \neq 12$

$\therefore m = 14$

5. Solve the following questions.
(Any one) **(3)**

1. Write sample space 'S' and number of sample point n(S) for each of the following experiments. Also write events A, B, C in the set form and write n(A), n(B), n(C). Three coins are tossed simultaneously.

i)Condition for event A : To get at least two heads.

ii)Condition for event B : To get no head.

iii)Condition for event C : To get head on the second coin.

Ans: S = { HHH, HTH, THH, HHT, HTT, THT, TTH, TTT }

$\therefore n(S) = 8$

i)A is the event of getting at least two heads.

A = { THH, HTH, HHT, HHH }

$\therefore n(A) = 4$

ii)B is the event of getting no head.

B = { TTT }

$\therefore n(B) = 1$

iii)C is the event of getting head on the second coin.

C = { HHH, THH, HHT, THT }

$\therefore$ n(C) = 4

2. The following frequency distribution table shows the classification of the number of vehicles and the volume of petrol filled in them. Find the mode of the volume.

Petrol filled (Litre)	1 – 3	4 – 6	7 – 9	10 – 12	13 – 15
No. of vehicle	33	40	27	18	12

Ans: The given classes are not continuous. So, let us make them continuous and rewrite the table.

Class	Continuous classes	Frequency
1 – 3	0.5 – 3.5	$33 \rightarrow f_0$
4 – 6	3.5 – 6.5	$40 \rightarrow f_1$
7 – 9	6.5 – 9.5	$27 \rightarrow f_2$
10 – 12	9.5 – 12.5	18
13 – 15	12.5 – 15.5	12

From the above table, the modal class is 3.5 - 6.5

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

$$= 3.5 + \frac{40 - 33}{2(40) - 33 - 27} \times 3$$

$$= 3.5 + \frac{7}{80 - 60} \times 3$$

$$= 3.5 + \frac{21}{20}$$

$$= 3.5 + 1.05$$

$$= 4.55$$

$\therefore$ The mode of the volume of petrol filled is = 4.55 litre.

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