

MT

2018 ____ 1100

Seat No.

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MT - MATHEMATICS (71) Algebra - SEMI PRELIM - II - PAPER - IV

Time : 2 Hours

(Pages 5)

Max. Marks : 40

Q.1. (A) Solve the following : (Any 4) 4

1. Write the set in Roster form : Set of even prime numbers from 1 to 50
2. Check whether the given rational number has terminating or recurring type of decimal form : $\frac{17}{125}$
3. For the polynomial $p(x) = x^3$, find $p(1)$, $p(0)$ and $p(-2)$.
4. By using variables x and y form any five linear equations in two variables.
5. Solve: $|4 - 9|$
6. Write any three rational numbers between the two numbers given below. -4.5 and -4.6

Q.1. (B) Solve the following : (Any 2) 4

1. Solve the following simultaneous equations.
 $3x - 5y = 16$; $x - 3y = 8$
2. Simplify: $\sqrt{310} \div \sqrt{5}$
3. If $P \subseteq M$, then the value of $P \cap (P \cup M)$?

Q.2. (A) Solve the following : 4

1. To solve $x + y = 3$; $3x - 2y - 4 = 0$ by determinant method find D.
(A) 5 (B) 1 (C) -5 (D) -1
2. There are 40 cards in a bag. Each bears a number from 1 to 40. One card is drawn at random. What is the probability that the card bears a number which is a multiple of 5?
(A) $\frac{1}{5}$ (B) $\frac{3}{5}$ (C) $\frac{4}{5}$ (D) $\frac{1}{3}$

3. Which of the following quadratic equations has roots 3, 5 ?
 (A) $x^2 - 15x + 8 = 0$ (B) $x^2 - 8x + 15 = 0$
 (C) $x^2 + 3x + 5 = 0$ (D) $x^2 + 8x - 15 = 0$
4. For simultaneous equations in variables x and y , $D_x = 49$, $D_y = -63$, $D = 7$ then what is x ?
 (A) 7 (B) -7 (C) $\frac{1}{7}$ (D) $-\frac{1}{7}$

Q.2. (B) Solve the following : (Any 2) 4

1. In a hockey team there are 6 defenders, 4 offenders and 1 goalee. Out of these, one player is to be selected randomly as a captain. Find the probability of the selection that -
 (i) The goalee will be selected.
 (ii) A defender will be selected.
2. Find the value D and D_y
 $4m - 2n = -4$; $4m + 3n = 16$
3. Find the value of discriminant.
 $m^2 - 2m + 1 = 0$

Q.3. (A) Solve the following activity : (Any 2) 4

1. A two digit number and the number with digits interchanged add up to 143. In the given number the digit in unit's place is 3 more than the digit in the ten's place. Find the original number.

Solution:

Let the digit in units place is x and that in tens place is y .

\therefore The number = $\square y + x$

\therefore The number obtained by interchanging the digits is = $\square x + y$

According to first condition,

Two digit number + Number obtained by interchanging the digits = 143

$10y + x + \square = 143$

$\square x + \square y = 143$

$\therefore x + y = \square$... (i)

According to second condition,

Digit in units place = Digit in ten's place + 3

$\therefore x = \square + 3$

$\therefore x - y = 3$... (ii)

Adding (i) and (ii) we get

$$2x = \square$$

$$x = 8$$

Putting this value at x in (ii) we get,

$$\therefore x + y = 13$$

$$\therefore 8 + \square = 13$$

$$\therefore y = 5$$

$$\therefore \text{The Original number is } 10y + x = \square + 8 = 58$$

$$2. \quad y^2 + \frac{1}{3}y = 2$$

Solution:

$$y^2 + \frac{1}{3}y = 2$$

$$3y^2 + y = 6 \dots (\text{Multiplying both sides by } 3)$$

$$\therefore 3y^2 + y - 6 = 0$$

Comparing with $ay^2 + by + c = 0$ we get,

$$a = 3, b = 1, c = -6.$$

$$\begin{aligned} \therefore b^2 - 4ac &= (1)^2 - 4 \times 3 \times (-6) \\ &= \square + \square \\ &= \square \end{aligned}$$

$$y = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \quad \dots (\text{Formula})$$

$$\therefore y = \frac{-(1) \pm \sqrt{\square}}{2 \times 3}$$

$$\therefore y = \frac{-1 \pm \sqrt{\square}}{6}$$

$$\therefore y = \frac{-1 + \sqrt{\square}}{6} \quad \text{or} \quad y = \frac{-1 - \sqrt{\square}}{6}$$

$$\therefore \text{The roots of given quadratic equation are } \frac{-1 + \sqrt{\square}}{6} \quad \text{and} \quad \frac{-1 - \sqrt{\square}}{6} .$$

3. 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.

Solution:

- (1) Committee with 2 boys =
- (2) Committee with 2 girls =
- (3) Committee of one boy and one girl =

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$$\therefore \text{Sample space} = \{B_1B_2, B_1G_1, B_1G_2, B_2G_1, B_2G_2, G_1G_2\}$$

Q.3. (B) Solve the following activity : (Any 2)

4

1. Solve using Elimination by substitution method.
 $5x + 2y = -3$; $x + 5y = 4$
2. Form the quadratic equation from the roots given below :
0 and 7
3. 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,
(i) a red balloon (ii) a blue balloon

Q.4. Solve the following : (Any 3)

9

1. The sum of father's age and twice the age of his son is 70. If we double the age of the father and add it to the age of his son the sum is 95. Find their present ages.
2. Solve the following quadratic equation by completing the square method.
 $x^2 + x - 20 = 0$
3. Write sample space 'S' and number of sample points $n(S)$ for the following experiment. Also write events A,B,C in the set form and write $n(A), n(B), n(C)$.
From three men and two women, environment committee of two persons is to be formed.
Condition for event A : There must be at least one woman member.
Condition for event B : One man, one woman committee to be formed.
Condition for event C : There should not be a woman member.

4. Solve the following simultaneous equations.

$$\frac{27}{x-2} + \frac{31}{y+3} = 85 ; \frac{31}{x-2} + \frac{27}{y+3} = 89$$

Q.5 Solve the following : (Any 1)

4

1. Solve the following simultaneous equations graphically.
 $x + y = 0 ; 2x - y = 9$
2. Pintu takes 6 days more than those of Nishu to complete certain work. If they work together, they finish it in 4 days. How many days would it take to complete the work if they work alone?

Q.6 Solve the following : (Any 1)

3

1. Find m if $(m - 12)x^2 + 2(m - 12)x + 2 = 0$ has real and equal roots.
2. If two dice are rolled simultaneously, find the probability of the following events.
 - (i) The sum of the digits on the upper faces is at least 10.
 - (ii) The sum of the digits on the upper faces is 33.
 - (iii) The digit on the first die is greater than the digit on second die.

Best of Luck 🍀