



Department Of AHS

Final Term Summer-2020

Subject: Mathematics-1
Instructor: Anwar Shamim

Duration: 240 Minutes
Total Marks: 50

Note: Attempt all questions. Manage your time properly.

Q.No. 1

(10+10)

(a) Solve the system with two variables by Cramer's rule.

$$X - 2y = 1$$

$$3X + y = 10$$

(b) Solve the system with two variables by Inversion method.

$$X - 3y = 0$$

$$2X + y = 7$$

Q.No.(02)

(5+5+5)

Solve the Following Quadratic Equation by Using Factorization Method

(a) $4Y^2 + 15Y + 6 = 4Y$

(b) $X^2 + 15X = -50$

(c) $Y^2 = 6Y + 27$

Q.No.(03)

(7+8)

Solve the Following Quadratic Equation by Using Factorization Method.

(a) The sum of two numbers is 27 and their product is 50. Find the numbers.

(b) The Three sides of a right angled triangle are X, X+1 and 5. Find X and the area, if the longest side is 5.

Date :

DATE: 25th Sep, 2020

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PAPER: MATHS

DEPARTMENT OF AHS
BS - HND

INSTRUCTOR: ANWAR SHAMIM

QUESTION 1:

PART (a): Solve the following system with two variables by cramer's rule.

$$\begin{aligned} \rightarrow x - 2y &= 1 \\ 3x + y &= 10 \end{aligned}$$

Solution:

→ CRAMER'S RULE:

$$\begin{aligned} x - 2y &= 1 \\ 3x + y &= 10 \end{aligned}$$

$$\begin{bmatrix} 1 & -2 \\ 3 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 1 \\ 10 \end{bmatrix}$$

A X B

$$AX = B$$

Divide both side by A

$$\frac{AX}{A} = \frac{B}{A}$$

$$X = \frac{B}{A}$$

$$X = A^{-1}B$$

$$[A] = \begin{bmatrix} 1 & -2 \\ 3 & 1 \end{bmatrix} = 1(1) - (-2)(3) = 1 + 6 = 7$$

Now apply cramer's rule.

* For x :-

$$Ax = \begin{bmatrix} 1 & -2 \\ 10 & 1 \end{bmatrix}$$

$$[Ax] = \begin{bmatrix} 1 & -2 \\ 10 & 1 \end{bmatrix} = 1(1) - (-2)(10) = 1 + 20 = 21$$

$$x = \frac{[Ax]}{[A]} = \frac{21}{7} = 3$$

* For y :-

$$[Ay] = \begin{bmatrix} 1 & 1 \\ 3 & 10 \end{bmatrix} = 1(10) - 1(3) = 10 - 3 = 7$$

$$y = \frac{[Ay]}{[A]} = \frac{7}{7} = 1$$

$$\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 3 \\ 1 \end{bmatrix} \text{ (Answer)}$$

Part (b) :

$$\begin{aligned}x - 3y &= 0 \\ 2x + y &= 7\end{aligned}$$

Solution:-

$$\begin{aligned}x - 3y &= 0 \rightarrow (1) \\ 2x + y &= 7 \rightarrow (2)\end{aligned}$$

$$\begin{bmatrix} 1 & -3 \\ 2 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 0 \\ 7 \end{bmatrix}$$

A X B

$$AX = B$$

Divide both side by A.

$$\frac{AX}{A} = \frac{B}{A} \rightarrow X = \frac{B}{A} \rightarrow X = A^{-1}B$$

★ Find the value of X:

$$X = A^{-1}B = ?$$

$$A^{-1} = \frac{\text{adj}A}{[A]}$$

$$* \text{adj } A = \begin{bmatrix} 1 & -3 \\ 2 & 1 \end{bmatrix}$$

$$\rightarrow \text{adj } A = \begin{bmatrix} 1 & 3 \\ -2 & 1 \end{bmatrix}$$

$$* [A] = \begin{bmatrix} 1 & -3 \\ 2 & 1 \end{bmatrix}$$

$$\rightarrow [A] = 1(1) - (-3)(2)$$

$$= 1 + 6$$

$$= 7$$

$$A^{-1} = \frac{\text{adj } A}{[A]}$$

Putting values in formula.

$$A^{-1} = \frac{\begin{bmatrix} 1 & 3 \\ -2 & 1 \end{bmatrix}}{7}$$

$$\rightarrow A^{-1} = \frac{1}{7} \begin{bmatrix} 1 & 3 \\ -2 & 1 \end{bmatrix}$$

$$A^{-1} B = ?$$

$$X = A^{-1} B$$

$$X = \frac{1}{7} \begin{bmatrix} 1 & 3 \\ -2 & 1 \end{bmatrix} \begin{bmatrix} 0 \\ 7 \end{bmatrix} = \frac{1}{7} \begin{bmatrix} 1(0) + 3(7) \\ -2(0) + 1(7) \end{bmatrix}$$

$$= \frac{1}{7} \begin{bmatrix} 0 + 21 \\ 0 + 7 \end{bmatrix} \rightarrow \frac{1}{7} \begin{bmatrix} 21 \\ 7 \end{bmatrix}$$

$$= \begin{bmatrix} \frac{21 \times 1}{7} \\ \frac{7 \times 1}{7} \end{bmatrix} = \begin{bmatrix} 21/7 \\ 7/7 \end{bmatrix} = \begin{bmatrix} 3 \\ 1 \end{bmatrix} \text{ (Answer)}$$

QUESTION 3:

Part (a):

The sum of two numbers is 27 and their product is 50. Find the numbers.

Solution:

Let one number be x , then the other number will be $50/x$.

$$x \left(x + \frac{50}{x} \right) = 27(x)$$

$$x^2 + 50 = 27x$$

$$-27x \rightarrow x^2 - 27x + 50 = 0$$

$$x^2 - 25x - 2x + 50 = 0$$

$$x(x-25) - 2(x-25) = 0$$

$$(x-2)(x-25) = 0$$

$$x=2, x=25 \text{ (Answer.)}$$

Part (b):

The three sides of a right angled triangle are x , $x+1$ and 5 . Find x and the area, if the longest side is 5 .

Solution:

The hypotenuse = 5

$$x^2 + (x+1)^2 = 5^2 \text{ (Pythagoras theorem)}$$

$$\rightarrow x^2 + x^2 + 2x + 1 = 25$$

$$\rightarrow x^2 + x^2 + 2x + 1 - 25 = 0$$

$$\rightarrow x^2 + x^2 + 2x - 24 = 0$$

$$\rightarrow 2x^2 + 2x - 24 = 0$$

$$\rightarrow 2(x^2 + x - 12) = 0$$

$$\rightarrow x^2 + x - 12 = 0$$

$$\rightarrow x^2 - 3x + 4x - 12 = 0$$

$$\rightarrow x(x-3) + 4(x-3) = 0$$

$$\rightarrow (x-4)(x-3) = 0$$

$$\rightarrow x = -4, \quad x = 3$$

Now Area

$$A = \frac{3 \times 4}{2} = \frac{12}{2} = 6 \text{ cm}^2 \text{ (Answer)}$$

QUESTION # 2:

Solve the following Quadratic Equation by using Factorization method.

a) $4y^2 + 15y + 6 = 4y$

Solution:

$$4y^2 + 15y + 6 = 4y$$

$$\rightarrow 4y^2 + 15y - 4y + 6 = 0$$

$$\rightarrow 4y^2 + 11y + 6 = 0$$

$$\rightarrow 4y^2 - 8y - 3y + 6 = 0$$

$$\rightarrow 4y(y-2) - 3(y-2) = 0$$

$$\rightarrow (4y-3)(y-2) = 0$$

$$\rightarrow (4y-3)(y-2) = 0$$

$$\rightarrow 4y-3=0, y=2$$

$$\rightarrow 4y=3, y=2$$

$$\rightarrow y = \frac{3}{4}, y = 2 \text{ (Answer)}$$

$$b) x^2 + 15x = -50$$

Solution:

$$\rightarrow x^2 + 15x + 50 = 0$$

$$\rightarrow x^2 + 10x + 5x + 50 = 0$$

$$\rightarrow x(x+10) + 5(x+10) = 0$$

$$\rightarrow (x+5)(x+10) = 0$$

$$\rightarrow x = -5, x = -10 \text{ (Answer)}$$

$$c) y^2 = 6y + 27$$

Solution:

$$y^2 - 6y - 27 = 0$$

$$\rightarrow y^2 - 9y - 3y - 27 = 0$$

$$\rightarrow y(y-9) - 3(y-9) = 0$$

$$\rightarrow (y-3)(y-9) = 0$$

$$\rightarrow y = 3, y = 9 \text{ (Answer)}$$