Assignment - I

1.Q) Solve the following simultaneous eqⁿ by the method of elimination.

1) $2x + 3y = 12$ — (1)

$x - y = 1$ — (2)

By multiplying eqⁿ (2) by 2 we get

$2x - 2y = 2$ — (3)

(3) - (1) $\Rightarrow$ $2x + 3y = 12$ — (1)

(-) (-) (-)

$-5y = -10$

$y = \frac{-10}{-5}$

$\boxed{y = 2}$

place $y = 2$ in eqⁿ (2)

$x - 2 = 1$

$\boxed{x = 3}$

$\therefore$ Solution : $(x, y) = (3, 2)$

2) $x - 3y = 1$ — (1)

$3x - 2y + 4 = 0$

$3x - 2y = -4$ — (2)

Multiplying eqⁿ (1) by 3 we get

$3x - 9y = 3$ — (3)

By subtracting eqn (3) & (2)

$$3x - 9y = 3 \quad \text{— (3)}$$
$$3x - 2y = -4 \quad \text{— (2)}$$
$$(-) \quad (+) \quad (+)$$
$$-7y = 7$$
$$\boxed{y = -1}$$

place $y = -1$ in eqn (2)

$$3x - 2(-1) = -4$$
$$3x + 2 = -4$$
$$3x = -4 - 2$$
$$3x = -6$$
$$\boxed{x = -2}$$

∴ Solution $(x, y) = (-2, -1)$

3) $5x - 6y = -30 \quad \text{— (1)}$
$5x + 4y = 20 \quad \text{— (2)}$

By Substracting eqn (1) from (2)

$$5x + 4y = 20 \quad \text{— (2)}$$
$$5x - 6y = -30 \quad \text{— (1)}$$
$$(-) \quad (+) \quad (+)$$
$$10y = 50$$
$$\boxed{y = 5}$$

place $y = 5$ in eqn (2)

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$5x + 4(5) = 20$

$5x + 20 = 20$

$5x = 20 - 20$

$5x = 0$

$x = 0/5$

$x = 0$

$\therefore$ Solution $(x, y) = (0, 5)$

4) $3x + y = 10$ — (1)

$x - y = 2$ — (2)

By Adding eq^n (1) & (2)

$3x + y = 10$ — (1)

$x - y = 2$ — (2)

$4x = 12$

$\boxed{x = 3}$

place $x = 3$ in eq^n (2)

$3 - y = 2$

$-y = 2 - 3$

$-y = -1$

$\boxed{y = 1}$

$\therefore$ Solution $(x, y) = (3, 1)$

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5) $3x - y - 2 = 0$

$3x - y = 2$ — (1)

$2x + y = 8$ — (2)

adding eqⁿ (1) & (2)

$$\begin{array}{r} 3x - y = 2 \quad \text{— (1)} \\ 2x + y = 8 \quad \text{— (2)} \\ \hline 5x = 10 \end{array}$$

$$\boxed{x = 2}$$

place $x = 2$ in eqⁿ (1)

$3(2) - y = 2$

$6 - y = 2$

$-y = 2 - 6$

$-y = -4$

$\boxed{y = 4}$

∴ Solution $(x, y) = (2, 4)$

P.S 1.1

4) $5m - 3n = 19$ — (1)

$m - 6n = -7$ — (2)

$$Dy = \begin{vmatrix} 4 & 4 \\ 6 & 8 \end{vmatrix} = 32 - 24 = 8$$

By Cramer's rule

$$x = \frac{Dx}{D} = \frac{-4}{-4} = 1$$

$$y = \frac{Dy}{D} = \frac{8}{-4} = -2$$

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

3) $x + 2y = -1$ — (1)

$2x + 8y = 12$ — (2)

$$D = \begin{vmatrix} 1 & 2 \\ 2 & -3 \end{vmatrix} = (1 \times -3) - (2 \times 2) = -3 - 4 = -7$$

$$Dx = \begin{vmatrix} -1 & 2 \\ +12 & -3 \end{vmatrix} = -1 \times -3 - (2 \times +2) = 3 - 24 = -21$$

$$Dy = \begin{vmatrix} 1 & -1 \\ 2 & 12 \end{vmatrix} = 1 \times 12 - (-1 \times 2) = 12 + 2 = 14$$

By Cramer's rule

$$x = \frac{Dx}{D} = \frac{-21}{-7} = 3$$

$$y = \frac{Dy}{D} = \frac{14}{7} = -2$$

$$(x, y) = (3, -2)$$

4] $6x - 4y = -12$; $8x - 3y = -2$

$$D = \begin{vmatrix} 6 & -4 \\ 8 & -3 \end{vmatrix} = (6x-3) - (-4x8)$$
$$-18 + 32$$
$$= 14$$

$$Dx = \begin{vmatrix} -12 & -4 \\ -2 & -3 \end{vmatrix} = (-12x-3) - (-4x-2)$$
$$36 - 8$$
$$= 28$$

$$Dy = \begin{vmatrix} 6 & -12 \\ 8 & -2 \end{vmatrix} = (6x-2) - (-12x8)$$
$$-12 + 96$$
$$= 84$$

By Cramer's rule=

$$x = \frac{Dx}{D} = \frac{28}{14} = 2$$

$$y = \frac{Dy}{D} = \frac{84}{14} = 6$$

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5) $4m + 6n = 54$ — (1)

$3m + 2n = 28$ — (2)

$$D = \begin{vmatrix} 4 & 6 \\ 3 & 2 \end{vmatrix} = 4\times2 - 6\times3$$
$$= 8 - 18$$
$$= -10$$

$$D_x = \begin{vmatrix} 6 & 54 \\ 2 & 28 \end{vmatrix} = 6\times28 - 54\times2$$
$$= 168 - 108$$
$$= 60$$

$$D_y = \begin{vmatrix} 4 & 54 \\ 3 & 28 \end{vmatrix}$$

$$Dx = \begin{vmatrix} 54 & 6 \\ 28 & 2 \end{vmatrix} = 54\times2 - 28\times6$$
$$= 108 - 168$$
$$= -60$$

$$Dy = \begin{vmatrix} 4 & 54 \\ 3 & 28 \end{vmatrix} = 4\times28 - 54\times3$$
$$= 112 - 162$$
$$= -50$$

By Cramer's rule

$$x = \frac{Dx}{D} = \frac{-60}{-10} = 6$$

$$y = \frac{Dy}{D} = \frac{-50}{-10} = 5$$

$$(x, y) = (6, 5)$$

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6) $2x + 3y = 2$ ——— (1)

$\frac{x}{2} - \frac{y}{2} = \frac{1}{2}$ ——— (2)

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

$$= -1 - 3$$

$$= -4$$

$$Dx = \begin{vmatrix} 2 & 3 \\ \frac{1}{2} & -\frac{1}{2} \end{vmatrix} = \frac{2 \times -1}{2} - \left(\frac{3 \times 1}{2}\right)$$

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

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

$$Dy = \begin{vmatrix} 2 & 2 \\ 1 & 1/2 \end{vmatrix} = \frac{2 \times 1}{2} - (2 \times 1)$$

$$= 1 - 2$$

$$= -1$$

By Cramer's rule

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

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

$$(x, y) = \left(\frac{5}{8}, \frac{1}{4}\right)$$

Problem Set 1

Q.1] Choose correct alternative for each of the following ques

1) To draw graph of $4x + 5y = 19$, Find y when $x = 1$.

→ B) 3

2) For simultaneous equations in variables x and y, $Dx = 49$, $Dy = -63$, $D = 7$ then what is x?

→ A) 7

3) Find the value of $\begin{vmatrix} 5 & 3 \\ -7 & -4 \end{vmatrix}$

→ D) 1

4) To solve $x + y = 3$; $3x - 2y = 4 = 0$ by determinant method find D.

→ C) -5

5) $ax + by = c$ and $mx + ny = d$ and $an \neq bm$ then these simultaneous equations have -

A-) 1) Only one common Solution

Q.2) Complete the following table to draw the graph $2x - 6y =$

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

Q.4) Find the values of each of the following determinants.

1) $\begin{vmatrix} 4 & 3 \\ 2 & 7 \end{vmatrix} = 4 \times 7 - 3 \times 2$

$= 28 - 6$

$= 22$

2) $\begin{vmatrix} 5 & -2 \\ -3 & 1 \end{vmatrix} = (5 \times 1) - (-2 \times -3)$

$= 5 - (+6)$

$= -1$

3) $\begin{vmatrix} 3 & -1 \\ 1 & 4 \end{vmatrix} = 3 \times 4 - (-1 \times 1)$

$= 12 + 1$

$= 13$

Q5) Solve the following equations by Cramer's method.

1) $6x - 3y = -10$ ——— (1)

$3x + 5y = 8$ ——— (2)

$$D = \begin{vmatrix} 6 & -3 \\ 3 & 5 \end{vmatrix} = 6\times5 - (-3\times3)$$
$$= 30 + 9$$
$$= 39$$

$$Dx = \begin{vmatrix} -10 & -3 \\ 8 & 5 \end{vmatrix} = -10\times5 - (8\times-3)$$
$$= -50 + 24$$
$$= -26$$

$$Dy = \begin{vmatrix} 6 & -10 \\ 3 & 8 \end{vmatrix} = 6\times8 - (-10\times3)$$
$$= 48 + 30$$
$$= 78$$

By Cramer's rule

$$x = \frac{Dx}{D} = \frac{-26}{39} = \frac{-2}{3}$$

$$y = \frac{Dy}{D} = \frac{78}{39} = 2$$

$$(x, y) = \left(\frac{-2}{3}, 2\right)$$

2) $4m - 2n = -4$ ——— (1)

$4m + 3n = 16$ ——— (2)

$$D = \begin{vmatrix} 4 & -2 \\ 4 & 3 \end{vmatrix} = 4\times3 - (-2\times4)$$
$$= 12 + 8$$
$$= 20$$

$$D_x = \begin{vmatrix} -4 & -2 \\ 16 & 3 \end{vmatrix} = -4\times3 - (-2\times16)$$
$$= -12 + 32$$
$$= 20$$

$$D_y = \begin{vmatrix} 4 & -4 \\ 4 & 16 \end{vmatrix} = 4\times16 - (-4\times4)$$
$$= 64 + 16$$
$$= 80$$

By Cramer's rule

$$x = \frac{D_x}{D} = \frac{20}{20} = 1$$

$$y = \frac{D_y}{D} = \frac{80}{20} = 4$$

$$(x, y) = (1, 4)$$

3) $3x - 2y = \frac{5}{2}$ ——— (1)

$\frac{1}{3}x + 3y = -\frac{4}{3}$ ——— (2)

$$D = \begin{vmatrix} 3 & -2 \\ \frac{1}{3} & 3 \end{vmatrix} = 3\times3 - \left(-2\times\frac{1}{3}\right)$$
$$9 + \frac{2}{3}$$
$$\frac{27+2}{3} = \frac{29}{3}$$

$$D_x = \begin{vmatrix} 5/2 & -2 \\ -4/3 & 3 \end{vmatrix} = \frac{5}{2}\times3 - \left(-2\times-\frac{4}{3}\right)$$
$$\frac{15}{2} - \frac{8}{3}$$

$$\frac{95 - 16}{6} = \frac{29}{6}$$

$$D_y = \begin{vmatrix} 3 & 5/2 \\ 1/3 & -4/3 \end{vmatrix} = 3 \times \frac{-4}{3} - \left(\frac{5}{2} \times \frac{1}{3}\right)$$

$$\frac{-4 - 5}{6}$$

$$\frac{-24 - 5}{6} = \frac{-29}{6}$$

By Cramer's rule.

$$x = \frac{D_x}{D} = \frac{29}{6} \Big/ \frac{29}{3} = \frac{29}{6} \times \frac{3}{29} = \frac{1}{2}$$

$$y = \frac{D_y}{D} = \frac{-29}{6} \Big/ \frac{29}{3} = \frac{-1}{2}$$

4) $7x + 3y = 15$ ——— (1)

$12 - 5x + 12y = 39$ ——— (2)

$$D = \begin{vmatrix} 7 & 3 \\ -5 & 12 \end{vmatrix} = 7 \times 12 - (3 \times -5)$$

$$= 99$$

$$D_x = \begin{vmatrix} 15 & 3 \\ 39 & 12 \end{vmatrix} = 15 \times 12 - (3 \times 39)$$

$$= 63$$

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$$D_y = \begin{vmatrix} 7 & 15 \\ -5 & 39 \end{vmatrix} = [7 \times 39] - [15 \times -5]$$

$$= 273 + 75$$

$$= 348$$

By Cramer's rule

$$x = \frac{D_x}{D} = \frac{63}{99} = \frac{21}{33} = \frac{7}{11}$$

$$y = \frac{D_y}{D} = \frac{348}{99} = \frac{116}{33}$$

$$\frac{x+y-8}{2} = \frac{x+2y-14}{3} = \frac{3x-y}{4}$$

$$\frac{x+y-8}{2} = \frac{x+2y-14}{3}$$

$$3(x+y-8) = 2(x+2y-14)$$

$$3x+3y-24 = 2x+4y-28$$

$$3x-2x+3y-4y = -28+24$$

$$x-y = -4 \quad \text{---} \quad (1)$$

$$\frac{x+y-8}{2} = \frac{3x-y}{4}$$

$$4(x+y-8) = 2(3x-y)$$

$$4x+4y-32 = 6x-2y$$

$$4x-6x+4y+2y = 32$$

$$-2x+6y = 32$$

$\div$ by 2 $\quad -x+3y = 16 \quad \text{---} \quad (2)$

Adding (1) & (2)

$$x - y = -4$$

$$-x + 3y = 16$$

$$2y = 12$$

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$y = 6$

Substituting $y = 6$ in eq^n (1)

$$x - 6 = -4$$

$$x = 2$$

$$(x, y) = (2, 6)$$

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Q.2) Which of the following equation is quadratic?

1) $x^2 + 2x + 11 = 0$

→

highest

1) The degree of the variable x is 2
2) There is only one variable x
3) $a \neq 0$.

∴ It is Quadratic Equation.

2) $x^2 - 2x + 5 = x^2$

$-2x + 5 = 0$

1) The highest degree of the variable x is 1
2) $a = 0$
3)

∴ It is not a Quadratic Equation.

3) $(x+2)^2 = 2x^2$

$x^2 + 4x + 4 = 2x^2$

$-x^2 + 4x + 4 = 0$

$x^2 - 4x - 4 = 0$

1) The highest degree of the variable x is 2.
2) There is only one variable x.
3) $a \neq 0$

∴ It is a Quadratic Equation.

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Q4) Out of the roots of quadratic equation $2x^2 + kx - 2 = 0$ is -2, find k

Put $x = -2$ in eq given equation.

$$2(-2)^2 + K(-2) - 2 = 0$$

$$8 + -2K - 2 = 0$$

$$-2K = 2 - 8$$

$$-2k = -6$$

$$K = \frac{-6}{-2}$$

$$\boxed{K = 3}$$