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## Business Mathematics

### Chapter 5-A

Linear, Quadratic

and

Simultaneous Equations

Exercise 5.A.1

Question 01: Solve the following equations.

$$1) 4x - 3 = 2x + 7$$

Sol:-

$$4x - 3 = 2x + 7$$

$$4x - 2x = 7 + 3$$

$$2x = 10$$

$$x = 5$$

$$x = \boxed{5} \text{ Ans}$$

Ans

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## Question 02: Solve:

$$1) 4(3x-2) = 7(2-5x) - 5x$$

Solve:

$$4(3x-2) = 7(2-5x) - 5x$$

$$12x-8 = 14-35x-5x$$

$$12x-8 = 14-40x$$

$$12+40x = 14+8$$

$$52x = 22$$

$$\begin{array}{r} x = \frac{1}{2} \cancel{2} \\ \cancel{2} \quad 6 \\ \hline 26 \end{array}$$

$$x = \frac{11}{26} \text{ dhs}$$

26

$$2) x-2[3x-2(x+1)] = 16$$

Sol:

$$x-2[3x-2(x+1)] = 16$$

$$x-2[3x-2x-2] = 16$$

$$x-2[x-2] = 16$$

$$x-2x+4 = 16$$

$$-x = 16-4$$

$$-x = 12$$

$$x = -12 \text{ dhs}$$

$$3) 100 - 7[3x-3(4-3)] = x$$

Solve:

$$100 - 7[3x-3(4-3)] = x$$

$$100 - 7[3x-12+9] = x$$

$$100 - 7[3x-3] = x$$

$$100 - 21x + 21 = x$$

$$-21x + 121 = x$$

$$-22x = -121$$

$$x = \frac{-121}{-22}$$

- 22

$$x = \frac{11}{2} \text{ dhs}$$

2

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$$2) \cancel{1} + 2 - \cancel{15} \cancel{14}$$

Sol:

$$\cancel{1} + 2 - \cancel{15}$$

$$\cancel{x} \quad \cancel{x} \quad \cancel{-}$$

$$\cancel{1} + \cancel{2} - \cancel{15}$$

$$\cancel{x}$$

$$3 - 15 \rightarrow 3 = 15x$$

$$\cancel{x}$$

$$3 - x \rightarrow x - 1$$

$$\cancel{15}$$

$$4) 1(x-3) + 5x - 5x = x-12 - x+3$$

Sol:

$$1(x-3) + 5x - 5x = x-12 - x+3$$

$$3(4) \quad 6 \quad 4 \quad 5 \quad 3$$

$$1(x-12) + 5x - 5x = 3(x-12) - 5(x+3)$$

$$3(4) \quad 6 \quad 4 \quad 15$$

$$x-12 + 5x - 5x = 3x-36 - 5x \cancel{+15}$$

$$12 \quad \cancel{6} \quad 4 \quad 15$$

$$x-12 + 2(5x) - 3(5x) = -2x - 51$$

$$12 \quad \quad \quad 15$$

$$x-12 + 10x - 15x = -2x - 51$$

$$12 \quad \quad \quad 15$$

$$-4x - 12 = -2x - 51$$

$$12 \quad \quad \quad 15$$

$$15(-4x-12) = 12(-2x-51)$$

$$3) \cancel{3x-4} + \cancel{x-3} = 7$$

$$3 \quad 2 \quad 6$$

Sol:

$$3x-4 + x-3 = 7$$

$$3 \quad 2 \quad 6$$

$$2(3x-4) + 3(x-3) = 7$$

$$6 \quad \quad \quad 6$$

$$6x-8 + 3x-9 = 7$$

$$6 \quad \quad \quad 6$$

$$9x-17 = 7$$

$$6 \quad \quad \quad 6$$

$$6(9x-17) = 42$$

$$54x - 102 = 42$$

$$54x = 42 + 102$$

$$54x = 144$$

$$x = 144 \cancel{+2} 29.8$$

$$84.27 \approx 3$$

$$x = 8 \text{ dms.}$$

$$-60x - 180 = -24x - 612$$

$$-60x + 24x = -612 + 180$$

$$-36x = -432$$

$$x = -432$$

$$-36$$

$$x = 12 \text{ dms.}$$

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$$5) \quad 3(x-1) - 5(x-4) - 2(x-6) + 3$$

16                  12                  5                  4

Sol:

$$3(x-1) - 5(x-4) = 2(x-6) + 3$$

16                  12                  5                  4

$$3x - 3 - 5x + 20 = 2x - 12 + 3$$

16                  12                  5                  4

$$3(3x-3) - 4(5x-20) = 4(2x-12) + 5(3)$$

48                  20

$$9x - 9 - 20x + 180 = 8x - 48 + 15$$

48                  20

$$-11x + 71 = 8x - 33$$

48                  20

$$20(-11x + 71) = 48(8x - 33)$$

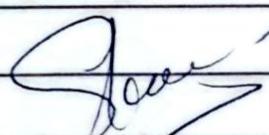
~~$$-220x + 1420 = 384x - 1584$$~~

~~$$-220 - 384x = -1584 - 1420$$~~

~~$$-604x = -3004$$~~

$x = \frac{3004}{604}$

$$x = \frac{-604}{302} = \frac{151}{151} \text{ dñs.}$$



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$$4) [2(3x-4)-(4x-2)] - 4(x+10) = 14x-20$$

Sol:

*Rizzi*

$$[2(3x-4)-(4x-2)] - 4(x+10) = 14x-20$$

*R*

$$[6x-8-4x+2]-4x-40 = 14x-20$$

*R R*

$$(2x-6)-4x-40 = 14x-20$$

$$2x-6-4x-40 = 14x-20$$

$$-2x-46 = 14x-20$$

$$-2x-14x = -20+46$$

$$-16x = 26$$

$$x = \frac{26}{-16}$$

$$x = -\frac{13}{8} \text{ Ans.}$$

*Good**Ans**Ans**R*

$$5(y-7)-2y = 1-3[(4y+7)-2(y-3)]$$

Sol:

~~$$5(y-7)-2y = 1-3[(4y+7)-2(y-3)]$$~~

~~$$5y-35-2y = 1-3[4y+7-2y+6]$$~~

~~$$3y-35 = 1-3(2y+13)$$~~

~~$$3y-35 = 1-6y-39$$~~

~~$$3y-35 = -6y-38$$~~

~~$$3y+6y = -38+35$$~~

~~$$9y = -3$$~~

~~$$y = -\frac{3}{9}$$~~

~~$$y = -\frac{1}{3} \text{ Ans}$$~~

*Show**R R**R R*

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Question 03: find the two consecutive integers whose sum are 99.

Solution:

Suppose first integer =  $x$

Then

Second integer =  $x+1$

Given Condition

$$x + x + 1 = 99$$

$$2x + 1 = 99$$

$$2x = 99 - 1$$

$$2x = 98$$

$$x = \frac{98}{2}$$

$$x = 49$$

Then

First Integer = 49

Second Integer =  $x+1 = 49+1 = 50$

To Check

$$49 + 50 = 99$$

$$99 = 99$$

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Question 04.: find the two consecutive odd integers whose sum are 140.

Solution:

Suppose First integer -  $x$

Then

Second integer -  $x+2$   
Given Condition

$$x + x + 2 = 140$$

$$2x + 2 = 140$$

$$2x = 140 - 2$$

$$2x = 138$$

$$x = \frac{138}{2}$$

$$x = 69$$

So,

First Integer  $\Rightarrow x = 69$

Second Integer  $\Rightarrow x+2$

$$\Rightarrow 69 + 2$$

$$= 71$$

To check

$$69 + 71 = 140$$

$$140 = 140$$

Note:- Even or odd waly question ma  $x+1$  Nahi  $x+2$  use krya hai.

Reason:- Even:- 2, 4, 6, ...  
Odd:- 1, 3, 5, ...

Dono ma 2 digits ka fark hota hai issi lia  $x+2$  use kia jata.

Good Answer

100

100

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Question 05: The sum of two consecutive even integers is 66. Find the two integers.

Solution:

Suppose First integer =  $x$

Then :

Second integer =  $x+2$

Given Condition

$$x + x+2 = 66$$

$$2x+2 = 66$$

$$2x = 66 - 2$$

$$2x = 64$$

$$x = 32$$

2

$$x = 32$$

So,

First Integer -  $x = 32$

Second Integer =  $x+2$

$$= 32 + 2$$

$$= 34$$

To Check

$$32 + 34 = 66$$

$$66 = 66$$



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## Exercise 5.A.2

Question 01: Solve the following equations by the method Factorization.

$$1) 2x^2 + 15x + 18 = 0$$

Sol:

$$2x^2 + 15x + 18 = 0$$

$$2x^2 + 12x + 3x + 18 = 0$$

$$2x(x+6) + 3(x+6) = 0$$

$$(2x+3)(x+6) = 0$$

$$2) x^2 - 11x + 28 = 0$$

Sol:

$$x^2 - 11x + 28 = 0$$

$$x^2 - 4x - 7x + 28 = 0$$

$$x(x-4) - 7(x-4) = 0$$

$$(x-7)(x-4) = 0$$

$$2x+3 = 0 ; x+6 = 0$$

$$x-7 = 0 ; x-4 = 0$$

$$2x = -3$$

$$x = -6$$

$$x = 7$$

$$x = 4$$

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

$$\frac{2}{2}$$

$$S.S \{ 7, 4 \}$$

$$S.S \{ -3, -6 \}$$

Rizwan Riaz Qureshi

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$$3) 9x^2 - 6x - 8 = 0$$

Sol:

$$9x^2 - 6x - 8 = 0$$

$$9x^2 - 12x + 6x - 8 = 0$$

$$3x(3x-4) + 2(3x-4) = 0$$

$$(3x+2)(3x-4) = 0$$

$$3x+2 = 0 ; 3x-4 = 0$$

$$3x = -2$$

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

$$3$$

$$3x = 4$$

$$x = \frac{4}{3}$$

$$3$$

$$\text{S.S} \left\{ -\frac{2}{3}, \frac{4}{3} \right\}$$

$$8x^2 = 72$$

Sol:

$$8x^2 = 72$$

$$x^2 = \frac{72}{8}$$

$$8$$

$$x^2 = 9$$

Taking square root on B/S

$$\sqrt{x^2}, \sqrt{9}$$

$$x = \pm 3$$

$$\text{S.S} \left\{ \pm 3 \right\}$$

$$5) 8x^2 - 38x + 9 = 0$$

Sol:

$$8x^2 - 38x + 9 = 0$$

$$8x^2 - 2x - 36x + 9 = 0$$

$$2x(4x-1) - 9(4x-1) = 0$$

$$(2x-9)(4x-1) = 0$$

$$6) x^2 + 10x + 21 = 0$$

Sol:

$$x^2 + 10x + 21 = 0$$

$$x^2 + 3x + 7x + 21 = 0$$

$$x(x+3) + 7(x+3) = 0$$

$$(x+7)(x+3) = 0$$

$$2x-9 = 0 ; 4x-1 = 0$$

$$2x = 9$$

$$x = \frac{9}{2}$$

$$2$$

$$\text{S.S} \left\{ \frac{9}{2}, \frac{1}{4} \right\}$$

$$x+7 = 0 ; x+3 = 0$$

$$x = -7$$

$$x = -3$$

$$\text{S.S} \left\{ -7, -3 \right\}$$

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7)  $15x^2 + 6x - 21 = 0$

Sol:

$15x^2 + 6x - 21 = 0$

$15x^2 + 21x - 15x - 21 = 0$

$3x(5x+7) - 3(5x+7) = 0$

$(3x-3)(5x+7) = 0$

$3x-3=0 ; 5x+7=0$

$3x=3$

$x=1$

S.S  $\left\{ \begin{array}{l} 1, -7 \\ 5 \end{array} \right\}$

9)  $6x^2 + 12x = 18 + 35x$

Sol:

$6x^2 + 12x = 18 + 35x$

$6x^2 - 35x + 12x - 18 = 0$

$6x^2 - 23x - 18 = 0$

$6x^2 - 27x + 4x - 18 = 0$

$3x(2x-9) + 2(2x-9) = 0$

$(3x+2)(2x-9) = 0$

$3x+2=0 ; 2x-9=0$

$3x=-2 ; 2x=9$

$x=-2$

$x=9$

S.S  $\left\{ \begin{array}{l} -2, 9 \\ 3, 2 \end{array} \right\}$

8)  $12x^2 - 15 = 24 - 27x$

Sol:

$12x^2 - 15 = 24 - 27x$

$12x^2 + 27x - 15 - 24 = 0$

$12x^2 + 27x - 39 = 0$

$12x^2 + 39x - 12x - 39 = 0$

$3x(4x+13) - 3(4x+13) = 0$

$(3x-3)(4x+13) = 0$

$3x-3=0 ; 4x+13=0$

$3x=3 ; 4x=-13$

$x=1 ; x=-\frac{13}{4}$

$x=1 ; x=-\frac{13}{4}$

10)  $x^2 + 10x = 8(2x-1)$

Sol:

$x^2 + 10x = 8(2x-1)$

$x^2 + 10x = 16x - 8$

$x^2 + 10x - 16x + 8 = 0$

$x^2 - 6x + 8 = 0$

$x^2 - 4x - 2x + 8 = 0$

$x(x-4) - 2(x-4) = 0$

$(x-2)(x-4) = 0$

$x-2=0 ; x-4=0$

$x=2 ; x=4$

S.S  $\left\{ 2, 4 \right\}$

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Question 02: Solve the following questions by Completing Square method.

$$1) 6x^2 - 5x - 6 = 0$$

Sol:

$$6x^2 - 5x - 6 = 0$$

$$6x^2 - 5x - 6$$

Divide both sides by 6

$$\frac{6x^2}{6} - \frac{5x}{6} - \frac{6}{6}$$

$$x^2 - \frac{5x}{6} = 1$$

$$6$$

$$\therefore (a-b)^2 = a^2 - 2ab + b^2$$

$$2) 3x^2 - 5x + 1 = 0$$

Sol:

$$3x^2 - 5x + 1 = 0$$

$$3x^2 - 5x = -1$$

Divide both sides by 3

$$\frac{3x^2}{3} - \frac{5x}{3} = \frac{-1}{3}$$

$$x^2 - \frac{5x}{3} = \frac{-1}{3}$$

$$3$$

$$\therefore (a-b)^2 = a^2 - 2ab + b^2$$

$$(x^2 - 2(x)\left(\frac{5}{12}\right) + \left(\frac{5}{12}\right)^2) = 1 + \left(\frac{5}{12}\right)^2$$

$$(x^2 - 2(x)\left(\frac{5}{6}\right) + \left(\frac{5}{6}\right)^2) = -1 + \left(\frac{5}{6}\right)^2$$

$$\left(\frac{x-5}{12}\right)^2 = \frac{1+25}{144}$$

$$\left(\frac{x-5}{6}\right)^2 = \frac{-1+25}{36}$$

$$\left(\frac{x-5}{12}\right)^2 = \frac{144+25}{144}$$

$$\left(\frac{x-5}{6}\right)^2 = \frac{-12+25}{36}$$

$$\left(\frac{x-5}{12}\right)^2 = \frac{169}{144}$$

$$\left(\frac{x-5}{6}\right)^2 = \frac{13}{36}$$

Taking sq. root on B/S

Taking sq. root on B/S

$$\left(\frac{x-5}{12}\right) = \pm \sqrt{\frac{169}{144}}$$

$$\left(\frac{x-5}{6}\right) = \pm \sqrt{\frac{13}{36}}$$

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$$\frac{x-5}{12} = \pm \frac{13}{12}$$

$$\frac{x-5}{6} = \pm \frac{\sqrt{13}}{6}$$

$$\frac{x-5}{12} = \frac{13}{12}; \quad \frac{x-5}{12} = -\frac{13}{12}$$

$$\frac{x-5}{6} = \frac{5}{6} \pm \frac{\sqrt{13}}{6}$$

$$\frac{x}{12} = \frac{13+5}{12} \quad \frac{x}{12} = \frac{-13+5}{12}$$

$$\frac{x}{12} = \frac{18}{12} \quad \frac{x}{12} = \frac{-8}{12}$$

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

$$S.S \left\{ \begin{array}{l} 3 \\ 2 \end{array}, \begin{array}{l} -2 \\ 3 \end{array} \right\}$$

$$3) 4x^2 + 20 = 18 + 35x$$

Sol:

$$4x^2 + 20 = 18 + 35x$$

$$4x^2 - 35x = 18 - 20$$

$$4x^2 - 35x = -2$$

Divide both sides by 4

$$4x^2 - 35x = -2$$

$$4 \quad 4 \quad 4^2$$

$$x^2 - 35x = -1$$

$$4 \quad 2$$

$$\therefore (a-b)^2 = a^2 - 2ab + b^2$$

$$(x)^2 - 2(x)\left(\frac{35}{8}\right) + \left(\frac{35}{8}\right)^2 = -1 + \left(\frac{35}{8}\right)^2$$

$$S.S \left\{ \begin{array}{l} 5 \\ 6 \end{array} \pm \sqrt{13} \right\}$$

$$4) 3x^2 - 2x = 12$$

Sol:

$$3x^2 - 2x = 12$$

Divide both sides by 3

$$3x^2 - 2x = 12$$

$$3 \quad 3 \quad 3$$

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

$$3$$

$$\therefore (a-b)^2 = a^2 - 2ab + b^2$$

$$(x)^2 - 2(x)\left(\frac{2}{6}\right) + \left(\frac{2}{6}\right)^2 = 4 + \left(\frac{2}{6}\right)^2$$

$$\left(\frac{x-2}{6}\right)^2 = 4 + \frac{4}{36}$$

$$\left(\frac{x-2}{6}\right)^2 = \frac{144+4}{36}$$

$$\left(\frac{x-2}{6}\right)^2 = \frac{148}{36}$$

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$$\left(\frac{x-35}{8}\right)^2 = \frac{-1+1225}{2-64}$$

Taking sq. root on b/s

$$\left(\frac{x-35}{8}\right)^2 = \frac{-32+1225}{64}$$

$$\sqrt{\left(\frac{x-2}{6}\right)^2} = \sqrt{\frac{148}{36}}$$

$$\left(\frac{x-35}{8}\right)^2 = \frac{1193}{64}$$

$$x-2 = \pm \sqrt{\frac{148}{6}}$$

Taking sq. root on B/S

$$x = \frac{2 \pm \sqrt{148}}{6}$$

$$\sqrt{\left(\frac{x-35}{8}\right)^2} = \sqrt{\frac{1193}{64}}$$

$$x - \frac{2 \pm \sqrt{148}}{6}$$

$$\frac{x-35}{8} = \pm \sqrt{\frac{1193}{64}}$$

$$x = \frac{35 \pm \sqrt{1193}}{8}$$

$$x = \frac{35 \pm \sqrt{1193}}{8}$$

$$S.S \left\{ \frac{35 \pm \sqrt{1193}}{8} \right\}$$

$$5) x^2 + 6x - 20 = 0$$

Sol:

$$x^2 + 6x - 20 = 0$$

$$x^2 + 6x = 20$$

$$\therefore (a+b)^2 = a^2 + 2ab + b^2$$

$$(x)^2 + 2(x)(3) + (3)^2 - 20 + (3)^2$$

$$(x+3)^2 = 20 + 9$$

$$6) 9x^2 - 24x = 65$$

Sol:

$$9x^2 - 24x = 65$$

Divide both sides by 9

$$\frac{9x^2 - 24x}{9} = \frac{65}{9}$$

$$x^2 - \frac{8}{3}x = \frac{65}{9}$$

$$\therefore (a-b)^2 = a^2 - 2ab + b^2$$

$$(x)^2 - 2(x)\left(\frac{8}{3}\right) + \left(\frac{8}{3}\right)^2 = \frac{65}{9} + \left(\frac{8}{3}\right)^2$$

$$\left(\frac{x-8}{3}\right)^2 = \frac{65}{9} + \left(\frac{48}{9}\right)^2$$

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$$(x+3)^2 = 29$$

Taking sq. root on B/S

$$\sqrt{(x+3)^2} = \sqrt{29}$$

$$x+3 = \pm \sqrt{29}$$

$$x = -3 \pm \sqrt{29}$$

$$\left(\frac{x-4}{3}\right)^2 = \frac{65}{9} + \left(\frac{4}{3}\right)^2$$

$$\left(\frac{x-4}{3}\right)^2 = \frac{65}{9} + \frac{16}{9}$$

$$\left(\frac{x-4}{3}\right)^2 = \frac{65}{9} + \frac{16}{9}$$

$$\left(\frac{x-4}{3}\right)^2 = \frac{81}{9}$$

Taking sq. root on B/S

$$7) 25x^2 - 216 = 30x$$

$$25$$

Sol:

$$25x^2 - 216 = 30x$$

$$25$$

$$25x^2 - 30x = 216$$

$$25$$

$$\therefore (a-b)^2 = a^2 - 2ab + b^2$$

$$(5x)^2 - 2(5x)(3) + 3^2 = 216 + 3^2$$

$$25$$

$$x = \frac{9+4}{3}$$

$$x = \frac{9-4}{3}$$

$$x = -\frac{9+4}{3}$$

$$x = -\frac{9-4}{3}$$

$$(5x-3)^2 = 216 + 9$$

$$25$$

$$x = \frac{13}{3}$$

$$x = -\frac{5}{3}$$

$$(5x-3)^2 = 216 + 225$$

$$25$$

$$\text{S.S } \left\{ \frac{13}{3}, -\frac{5}{3} \right\}$$

$$(5x-3)^2 = 441$$

$$25$$

Taking sq. root on B/S

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$$\sqrt{(5x-3)^2} = \sqrt{441}$$

25

$$5x-3 = \pm 21$$

5

$$\begin{matrix} 5x-3 = 21 \\ 5 \end{matrix} ; \quad \begin{matrix} 5x-3 = -21 \\ 5 \end{matrix}$$

$$\begin{matrix} 5x = 21+3 \\ 5 \end{matrix} \quad \begin{matrix} 5x = -21+3 \\ 5 \end{matrix}$$

$$\begin{matrix} 5x = 21+15 \\ 5 \end{matrix} \quad \begin{matrix} 5x = -21+15 \\ 5 \end{matrix}$$

$$\begin{matrix} 5x = 36 \\ 5 \end{matrix} \quad \begin{matrix} 5x = -6 \\ 5 \end{matrix}$$

$$\begin{matrix} x = 36 \\ 5 \times 5 \end{matrix} \quad \begin{matrix} x = -6 \\ 5 \times 5 \end{matrix}$$

$$\begin{matrix} x = 36 \\ 25 \end{matrix} \quad \begin{matrix} x = -6 \\ 25 \end{matrix}$$

$$S.S \quad \left\{ \begin{matrix} 36 & , & -6 \\ 25 & , & 25 \end{matrix} \right\}$$

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Question 03: Solve the following equations by using Quadratic formula.

$$1) 3x^2 + 6x + 2 = 0$$

$$2) 3$$

Sol:

$$3x^2 + 6x + 2 = 0$$

Using Quadratic formula

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-6 \pm \sqrt{(6)^2 - 4(3)(2)}}{2(3)}$$

$$x = \frac{-6 \pm \sqrt{36 - 24}}{6}$$

$$x = \frac{-6 \pm \sqrt{12}}{6}$$

$$x = \frac{-6 \pm 2\sqrt{3}}{6}$$

$$x = \frac{1}{3}(-3 \pm \sqrt{3})$$

$$x = -3 \pm \frac{\sqrt{3}}{3} \text{ Ans.}$$

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$$2) \frac{3}{x-2} - \frac{1}{x+2} = 5$$

Sol:

$$\frac{3}{x-2} - \frac{1}{x+2} = 5$$

$$3(x+2) - 1(x-2) = 5(x-2)(x+2)$$

$$3x+6 - x+2 = 5$$

$$(x-2)(x+2)$$

$$2x+8 = 5$$

$$x^2 + 2x - 2x - 8 = 0$$

$$2x+8 = 5(x^2-4)$$

$$2x+8 = 5x^2-20$$

$$-5x^2 + 2x + 8 + 20 = 0$$

$$-5x^2 + 2x + 28 = 0$$

$$-(5x^2 - 2x - 28) = 0$$

$$5x^2 - 2x - 28 = 0$$

Using Quadratic formula

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-(-2) \pm \sqrt{(-2)^2 - 4(5)(28)}}{2(5)}$$

$$x = 2 \pm \sqrt{4 + 560}$$

$$10$$

$$3x^2 - 1 = 11x$$

Sol:

$$3x^2 - 1 = 11x$$

$$12$$

Multiply both sides by 12

$$12(3x^2 - 1) = 11x \times 12$$

$$36x^2 - 12 = 11x$$

$$36x^2 - 11x - 12 = 0$$

Using Quadratic for

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{-(-11) \pm \sqrt{(-11)^2 - 4(36)(-12)}}{2(36)}$$

$$2(36)$$

$$= -11 \pm \sqrt{121 + 1728}$$

$$72$$

$$= -11 \pm \sqrt{1849}$$

$$72$$

$$= 11 \pm 43$$

$$72$$

$$11 + 43 ; 11 - 43$$

$$72$$

$$54 - 32$$

$$72$$

$$72$$

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$$= 2 \pm \sqrt{564} \\ 10$$

$$= 2 \pm \sqrt{141 \times 4} \\ 10$$

$$= 2 \pm 2\sqrt{141} \\ 10$$

$$= 2(1 \pm \sqrt{141})$$

$$= 1 \pm \sqrt{141} \quad \text{Ans} \\ 5$$

$$4) 5t - 6t^2 = 1$$

Sol: .

$$5t - 6t^2 = -1 \\ -6t^2 + 5t + 1 = 0$$

$$-(6t^2 - 5t - 1) = 0$$

$$6t^2 - 5t - 1 = 0$$

Using Quadratic formula

$$t = -b \pm \sqrt{b^2 - 4ac} \\ 2a$$

$$= -(-5) \pm \sqrt{(-5)^2 - 4(6)(-1)} \\ 2(6)$$

$$= 5 \pm \sqrt{25 + 24} \\ 12$$

$$= 5 \pm \sqrt{49} \\ 12$$

$$= 5 \pm 7 \\ 12$$

$$\frac{3}{4}; -\frac{4}{9} \\ 5.5 \left\{ \frac{3}{4}, -\frac{4}{9} \right\}$$

$$5) \frac{y^2}{2} - \frac{y}{6} = 1 \\ 12$$

Sol:

$$\frac{y^2}{2} - \frac{y}{6} = 1 \\ 12$$

$$6y^2 - 2y = 1 \\ 12 \quad 12$$

$$6y^2 - 2y = 1 \\ 6y^2 - 2y - 1 = 0$$

Using Quadratic for

$$y = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{-(-2) \pm \sqrt{(-2)^2 - 4(6)(-1)}}{2(6)}$$

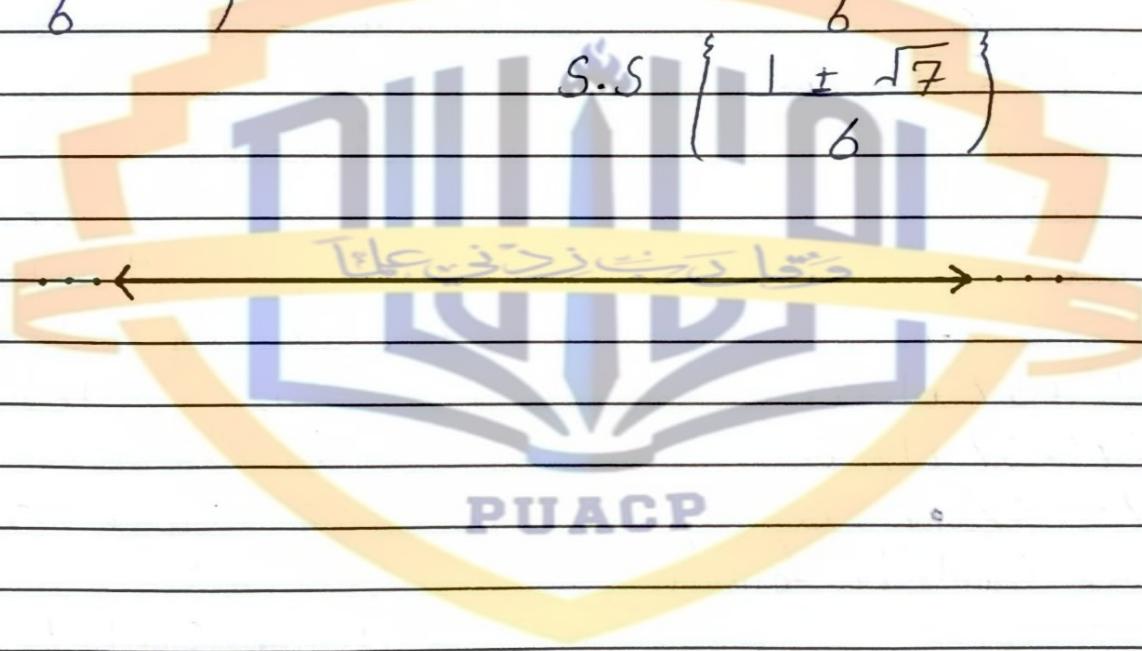
$$= \frac{2 \pm \sqrt{4 + 24}}{12}$$

$$= \frac{2 \pm \sqrt{28}}{12}$$

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$$\begin{array}{l} -5+7 \quad ; \quad 5-7 \\ 12 \qquad \qquad 12 \\ -12 \qquad \qquad -2 \\ 12 \qquad \qquad 12 \\ = 1 \qquad \qquad -1 \\ \qquad \qquad \qquad 6 \end{array} \quad -2 \pm \sqrt{7 \times 4}$$
$$= 12$$
$$= 2 \pm 2\sqrt{7}$$
$$= 12$$
$$= 2(1 \pm \sqrt{7})$$
$$= 12$$
$$= 1 \pm \sqrt{7}$$



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## Exercise 5. A. 3

### Question 01:

Solve the following pairs  
of simultaneous equations.

$$\begin{aligned} 1) \quad 5x + 2y &= 64 \\ 2x - y &= 4 \end{aligned}$$

Sol:

$$5x + 2y = 64 \rightarrow (1)$$

$$2x - y = 4 \rightarrow (2)$$

By Elimination method

$$\begin{aligned} 2) \quad 2x + 4y &= 100 \\ 3x - 5y &= 132 \end{aligned}$$

Sol:

$$2x + 4y = 100 \rightarrow (i)$$

$$3x - 5y = 132 \rightarrow (ii)$$

By Elimination method

Multiply eq. (1) by 2

$$2(5x + 2y) = 64 \times 2$$

$$10x + 4y = 128 \rightarrow (3)$$

Multiply eq. (i) with 3

$$3(2x + 4y) = 100 \times 3$$

$$6x + 12y = 300 \rightarrow (iii)$$

Multiply eq. (2) by 5

$$5(2x - y) = 4 \times 5$$

$$10x - 5y = 20 \rightarrow (4)$$

Multiply eq. (ii) with 2

$$2(3x - 5y) = 132 \times 2$$

$$6x - 10y = 264 \rightarrow (iv)$$

Subtract eq. (4) from eq. (3)

$$10x + 4y = 128$$

$$\pm 10x \mp 5y = \pm 20$$

$$9y = 108$$

Subtract eq. (iv) from eq. (iii)

$$6x + 12y = 300$$

$$\pm 6x \mp 10y = \pm 264$$

$$22y = 36$$

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$$\begin{array}{r} y = 108 \\ \quad 9 \\ \hline y = 12 \end{array}$$

$$\begin{array}{r} y = 36 \\ \quad 22 \\ \hline y = 14 \end{array}$$

Put value of  $y$  in eq(i)

$$2x - y = 4$$

$$2x - 12 = 4$$

$$2x = 4 + 12$$

$$2x = 16$$

$$x = 16$$

$$2 \quad x = 8$$

$$\left\{ \begin{array}{l} 8, 12 \end{array} \right.$$

$$2x + 4y = 100$$

$$2x + 4(18) = 100$$

$$2x + 72 = 100$$

$$11$$

$$2x = 100 - 72$$

$$11$$

$$2x = 100 - 72$$

$$11$$

$$2x = 1028$$

$$\begin{array}{r} 11 \\ \times 2 \\ \hline x = 1028 \end{array}$$

$$3) \quad 3x + 2y = 81$$

$$2x - 3y = 15$$

Sol:

$$3x + 2y = 81 \rightarrow (i)$$

$$2x - 3y = 15 \rightarrow (ii)$$

By Elimination method

$$\left\{ \begin{array}{l} 514, 18 \\ 11, 11 \end{array} \right.$$

Multiply eq(i) with (2)

$$2(3x + 2y) = 81 \times 2$$

$$6x + 4y = 162 \rightarrow (iii)$$

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Multiply eq(ii) with 3

$$3(2x - 3y) = 15 \times 3$$

$$6x - 9y = 45 \rightarrow \text{iv}$$

Subtract eq(iv) from eq(iii)

~~$$6x + 4y = 162$$~~

~~$$\pm 6x \mp 9y = \pm 45$$~~

~~$$13y = 117$$~~

~~$$y = 117 / 13$$~~

~~$$y = 9$$~~

Put value of y in eq(iii)

~~$$2x - 3y = 15$$~~

~~$$2x - 3(9) = 15$$~~

~~$$2x - 27 = 15$$~~

~~$$2x = 15 + 27$$~~

~~$$2x = 42$$~~

~~$$x = 42 / 2$$~~

~~$$x = 21$$~~

$$\{(21, 9)\}$$

$$4) 3x + 2y = 12$$

$$x + y = 5$$

Sol:

$$3x + 2y = 12 \rightarrow \text{i}$$

$$x + y = 5 \rightarrow \text{ii}$$

By Elimination method

Multiply eq(ii) with 3

$$3(x + y) = 3 \times 3$$

$$3x + 3y = 15 \rightarrow \text{iii}$$

Subtract eq(iii) from eq(i)

$$3x + 2y = 12$$

$$\pm 3x \pm 3y = \pm 15$$

$$-y = -3$$

$$y = 3$$

Put value of y in eq(iii)

$$x + y = 5$$

$$x + 3 = 5$$

$$x = 5 - 3$$

$$x = 2$$

$$\{(2, 3)\}$$

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$$5) \begin{array}{l} 3x + 4y = 24 \\ x + 3y = 4 \\ \hline 3 \quad 4 \end{array}$$

Sol:

$$\begin{array}{l} 3x + 4y = 24 \rightarrow (i) \\ x + 3y = 4 \\ \hline 3 \quad 4 \end{array}$$

$$4x + 3y = 4$$

12

$$4x + 3y = 4 \times 12$$

$$4x + 3y = 48 \rightarrow (ii)$$

By Elimination method

$$\begin{array}{l} 2x - y = 6 \\ 2x - 3y = 10 \\ \hline 3 \quad 4 \end{array}$$

Sol:

$$\begin{array}{l} 2x - y = 6 \rightarrow (i) \\ 2x - 3y = 10 \\ \hline 3 \quad 4 \end{array}$$

$$4(2x) - 3(3y) = 10$$

12

$$8x - 9y = 10$$

12

$$8x - 9y = 120 \rightarrow (ii)$$

By Elimination method

Multiply eq (i) with 4

$$4(3x + 4y) = 24 \times 4$$

$$12x + 16y = 96 \rightarrow (iii)$$

Multiply eq (i) with 8

$$8(2x - y) = 6 \times 8$$

$$16x - 8y = 48 \rightarrow (iv)$$

Multiply eq (ii) with 3

$$3(4x + 3y) = 48 \times 3$$

$$12x + 9y = 144 \rightarrow (v)$$

Multiply eq (ii) with 2

$$2(8x - 9y) = 120 \times 2$$

$$16x - 18y = 240 \rightarrow (vi)$$

Subtract eq (iv) from eq (iii)

$$\begin{array}{r} 12x + 16y = 96 \\ \pm 12x \pm 9y = \pm 144 \\ \hline 7y = -48 \end{array}$$

Subtract eq (iv) from eq (iii)

$$\begin{array}{r} 16x - 8y = 48 \\ \pm 16x \mp 18y = \pm 240 \\ \hline 10y = -192 \end{array}$$

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$$y = -\frac{48}{7}$$

$$y = -\frac{192}{105}$$

Put value of y in eq(i)

$$y = -\frac{96}{5}$$

$$3x + 4y = 24$$

$$3x + 4\left(-\frac{48}{7}\right) = 24$$

$$3x - \frac{192}{7} = 24$$

$$3x = 24 + \frac{192}{7}$$

$$3x = \frac{168 + 192}{7}$$

$$3x = 360$$

$$x = \frac{360}{7 \times 3}$$

$$x = \frac{120}{7}$$

$$\left( \frac{120}{7}, -\frac{48}{7} \right)$$

Putting value of y in eq(iii)

$$8x - 9y = 120$$

$$8x - 9\left(-\frac{96}{5}\right) = 120$$

$$8x + \frac{864}{5} = 120$$

$$8x = 120 - \frac{864}{5}$$

$$8x = \frac{600 - 864}{5}$$

$$8x = -\frac{264}{5}$$

$$x = -\frac{264}{5 \times 8}$$

$$x = -\frac{33}{5}$$

$$\left( -\frac{33}{5}, -\frac{96}{5} \right)$$

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7)  $2x + 3y = 20 \dots 0$

$3x + 5y - 11 = 0$

Sol:

$2x + 3y - 20 = 0$

$2x + 3y = 20 \rightarrow (i)$

$3x + 5y - 11 = 0$

$3x + 5y = 11 \rightarrow (ii)$

By Elimination method

8)  $x - 4y = 4$

$-2y + x = 7$

Sol:

$x - 4y = 4 \rightarrow (i)$

$-2y + x = 7$

$x - 2y = 7 \rightarrow (ii)$

Subtract eq(ii) from eq(i)

Multiply eq(i) with 3

$3(2x + 3y) = 3(20)$

$6x + 9y = 60 \rightarrow (iii)$

~~$x - 4y = 4$~~

~~$\pm x + 2y = \pm 7$~~

$-2y = -3$

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

Multiply eq(ii) with 2

$2(3x + 5y) = 2(11)$

$6x + 10y = 22 \rightarrow (iv)$

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

Subtract eq(iv) from eq(iii)

Put value of y in eq(iii)

$6x + 9y = 60$

$x - 2y = 7$

$\pm 6x \pm 10y = \pm 22$

$x - 2\left(\frac{3}{2}\right) = 7$

$-y = 38$

$x - 6 = 7$

$y = -38$

$x$

Put value of y in eq(ii)

$3x + 5y = 11$

$x - 3 = 7$

$3x + 5(-38) = 11$

$x = 7 + 3$

$3x - 190 = 11$

$x = 10$

{ $10, \frac{3}{2}$ }.

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$$3x - 11 + 190$$

$$3x = 201$$

$$x = \frac{201}{3}$$

3.

$$x = 67$$

$$\{ 67, -38 \}$$

$$10) \sqrt{2}x + \sqrt{2}y = 1$$

$$\sqrt{2}x - \sqrt{2}y = 7$$

Sol:

$$\sqrt{2}x + \sqrt{2}y = 1 \rightarrow (i)$$

$$\sqrt{2}x - \sqrt{2}y = 7 \rightarrow (ii)$$

By Elimination method

Add eq (i) with eq (ii)

$$9) y + 2x = 4$$

$$-2y + x = 7$$

Sol:

$$y + 2x = 4$$

$$2x + y = 4 \rightarrow (i)$$

$$-2y + x = 7$$

$$x - 2y = 7 \rightarrow (ii)$$

By Elimination method

$$\cancel{\sqrt{2}x + \sqrt{2}y = 1}$$

$$\cancel{\sqrt{2}x - \sqrt{2}y = 7}$$

$$2\sqrt{2}x = 8$$

$$x = \frac{8}{2\sqrt{2}}$$

$$x = 4$$

$$\sqrt{2}$$

Put value of x in (i)

Multiply eq (ii) with 2

$$2(x - 2y) \leftarrow 2(7)$$

$$2x - 4y = 14 \rightarrow (iii)$$

$$\sqrt{2}x + \sqrt{2}y = 1$$

$$\sqrt{2}\left(\frac{4}{\sqrt{2}}\right) + \sqrt{2}y = 1$$

$$4 + \sqrt{2}y = 1$$

$$\sqrt{2}y = 1 - 4$$

$$\sqrt{2}y = -3$$

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

Subtract eq (iii) from eq (i)

$$\cancel{2x + y = 4}$$

$$\cancel{\pm 2x - 4y = \pm 14}$$

$$5y = -10$$

$$\left\{ \frac{4}{\sqrt{2}}, \frac{-3}{\sqrt{2}} \right\}$$

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

$$y = -2$$

Put value of  $y$  in eq(ii)

$$x - 2y = 7$$

$$x - 2(-2) = 7$$

$$x + 4 = 7$$

$$x = 7 - 4$$

$$x = 3$$

$$\{ 3, -2 \}$$

Ghosh

28/10/2024

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