

Simultaneous Equations – Section Test

(Answers)

1)

$$x + 3y = 5 \quad (1)$$

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

Adding:

$$x + 3y = 5$$

$$9x - 3y = 15$$

$$\hline 10x = 20$$

$$x = 2$$

2)

Substituting $x = 2$ into equation (1):

$$2 + 3y = 5$$

$$3y = 3$$

$$y = 1$$

3)

$$5a + 7b = 17 \quad (1)$$

$$a = 1 - 3b \quad (2)$$

Substituting (2) into (1):

$$5(1 - 3b) + 7b = 17$$

$$5 - 15b + 7b = 17$$

$$-8b = 12$$

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

Substituting $b = -\frac{3}{2}$ into (2):

$$a = 1 - 3 \times -\frac{3}{2} = 1 + \frac{9}{2} = \frac{11}{2}$$

4)

$$2x = 5y - 2 \quad (1)$$

$$6y = 1 + 4x \quad (2)$$

Substituting (1) into (2):

$$6y = 1 + 2(5y - 2)$$

$$6y = 1 + 10y - 4$$

$$-4y = -3$$

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

Substituting $y = \frac{3}{4}$ into (1):

$$2x = 5 \times \frac{3}{4} - 2 = \frac{15}{4} - 2 = \frac{7}{4}$$

$$x = \frac{7}{8}$$

5)

$$s^2 + 2t^2 = 6 \quad (1)$$

$$3s - t = 5 \quad (2)$$

$$(2) \Rightarrow t = 3s - 5$$

Substituting into (1):

$$s^2 + 2(3s - 5)^2 = 6$$

$$s^2 + 2(9s^2 - 30s + 25) = 6$$

$$s^2 + 18s^2 - 60s + 50 = 6$$

$$19s^2 - 60s + 44 = 0$$

$$(19s - 22)(s - 2) = 0$$

$$s = \frac{22}{19} \text{ or } s = 2$$

Substitute these values for s into (2):

When

$$s = 2, t = 3 \times 2 - 5 = 1$$

When

$$s = \frac{22}{19}, t = 3 \times \frac{22}{19} - 5 = \frac{66}{19} - 5 = -\frac{29}{19}$$

So, the values of t are $t = 1$ and $t = -\frac{29}{19}$

6)

$$x^2 + 2y = 5 \quad (1)$$

$$2x - 3y = 12 \quad (2)$$

(2)

$$\Rightarrow x = \frac{12 + 3y}{2}$$

Substituting into (1):

$$\left(\frac{12 + 3y}{2} \right)^2 + 2y = 5$$

$$\frac{144 + 72y + 9y^2}{4} + 2y = 5$$

$$144 + 72y + 9y^2 + 8y = 20$$

$$9y^2 + 80y + 124 = 0$$

$$(9y + 62)(y + 2) = 0$$

$$y = -\frac{62}{9} \text{ or } y = -2$$

7)

$$x + 2y - 4z = 7$$

$$3x - 2y - 11z = -12$$

$$x + 2y + 6z = -3$$

Eliminate y by combining equations

$$4x - 15z = -5$$

$$4x - 5z = -15$$

$$-10z = 10$$

$$z = -1$$

substitute

$$4x + 15 = -5$$

$$4x = -20$$

$$x = \frac{-20}{4} = -5$$

8)

$$5x - y - 2z = 6$$

$$2x + y + 6z = -3$$

$$3x - 2y + 13z = -12$$

Eliminate y by combining equations

$$7x + 4z = 3$$

$$7x + 25z = -18$$



$$21z = -21$$

$$z = -1$$



$$7x - 4 = 3$$

$$x = 1$$

substitute

$$5 - y + 2 = 6$$

$$y = 1$$

9)

$$4x - 4y + 3z = 0$$

$$6x - 2y + 5z = 10$$

$$-2x + 2y - z = 2$$

by combining the top and bottom equations we can eliminate x and y
 $z = 4$

substitute

$$\begin{array}{lcl} 4x - 4y + 12 = 0 & \rightarrow & 12x - 4y + 40 = 20 \\ 6x - 2y + 20 = 10 & \rightarrow & 4x - 4y + 12 = 0 \end{array} \rightarrow \begin{array}{l} 8x + 28 = 20 \\ 8x = -8 \\ x = -1 \end{array}$$

10)

$$2x + 2y - 9z = 16$$

$$6x + 7y - 26z = 62$$

$$10x + 18y - 55z = 156$$

by combining the top and bottom equations we can eliminate z

$$\begin{array}{lcl} 6x + 7y - 26z = 62 & & 10x + 18y - 55z = 156 \\ 6x + 6y - 27z = 48 & \rightarrow & 10x + 10y - 45z = 80 \\ y + z = 14 & & 8y - 10z = 76 \end{array}$$

combine

$$\begin{array}{l} 8y + 8z = 112 \\ 8y - 10z = 76 \\ 18z = 36 \\ z = 2 \end{array}$$

substitute

$$\begin{array}{lcl} 2x + 2y - 18 = 16 & \rightarrow & 18x + 18y = 306 \\ 10x + 18y - 110 = 156 & \rightarrow & 10x + 18y = 266 \end{array} \rightarrow \begin{array}{l} 8x = 40 \\ x = 5 \end{array}$$