

A Simultaneous Equations: Linear

9 Solve the simultaneous equations.

$$\begin{aligned} 2x + y &= 7 & \textcircled{1} \\ 3x - y &= 8 & \textcircled{2} \end{aligned}$$

Sub. into $\textcircled{1}$:

$$\begin{aligned} \textcircled{1} + \textcircled{2}: \quad 2x + 3x &= 7 + 8 \\ 5x &= 15 \\ \div 5 & \quad \div 5 \\ \underline{x = 3} \end{aligned}$$

$$\begin{aligned} 2(3) + y &= 7 \\ 6 + y &= 7 \\ -6 & \quad -6 \\ \underline{y = 1} \end{aligned}$$

$$\begin{aligned} x &= \underline{3} \\ y &= \underline{1} \end{aligned} \quad [2]$$

5 Solve the simultaneous equations.

$$\begin{aligned} 2p - 3q &= 7 & \textcircled{1} \\ p + 3q &= 2 & \textcircled{2} \end{aligned}$$

$$\begin{aligned} \textcircled{1} + \textcircled{2}: \quad 3p &= 9 \\ \div 3 & \quad \div 3 \\ \underline{p = 3} \end{aligned}$$

$$\begin{aligned} \rightarrow \textcircled{2}: \quad 3 + 3q &= 2 \\ -3 & \quad -3 \\ 3q &= -1 \\ \div 3 & \quad \div 3 \\ \underline{q = -\frac{1}{3}} \end{aligned}$$

$$\begin{aligned} p &= \underline{3} \\ q &= \underline{-\frac{1}{3}} \end{aligned} \quad [2]$$

9 Solve the simultaneous equations.

$$3x - 2y = 21 \quad (1)$$

$$5x + 2y = 51 \quad (2)$$

$$\begin{aligned} (1) + (2): \quad 8x &= 72 \\ \div 8 \quad \quad \div 8 \\ \hline x &= 9 \end{aligned}$$

$$\begin{aligned} \rightarrow (2): \quad 5(9) + 2y &= 51 \\ 45 + 2y &= 51 \\ -45 \quad \quad -45 \\ \hline 2y &= 6 \\ \div 2 \quad \quad \div 2 \\ \hline y &= 3 \end{aligned}$$

$$\begin{aligned} x &= \underline{9} \\ y &= \underline{3} \end{aligned} \quad [2]$$

5 Solve the simultaneous equations.

$$\begin{aligned} (a) \quad x + 2y &= 13 \quad (1) \\ x + 5y &= 22 \quad (2) \end{aligned}$$

$$\begin{aligned} (2) - (1): \quad 3y &= 9 \\ \div 3 \quad \quad \div 3 \\ \hline y &= 3 \end{aligned}$$

$$\begin{aligned} \rightarrow (1): \quad x + 2(3) &= 13 \\ x + 6 &= 13 \\ -6 \quad \quad -6 \\ \hline x &= 7 \end{aligned}$$

$$\begin{aligned} x &= \underline{7} \\ y &= \underline{3} \end{aligned} \quad [2]$$

- 9 Solve the simultaneous equations.
You must show all your working.

$$3x - 2y = 19 \quad (1)$$

$$x + y = 3 \quad \times 2: \quad 2x + 2y = 6 \quad (2)$$

$$\begin{array}{r} (1) + (2): \quad 5x = 25 \\ \div 5 \qquad \div 5 \\ \hline x = 5 \end{array}$$

$$\begin{array}{r} \rightarrow x + y = 3: \quad 5 + y = 3 \\ -5 \qquad -5 \\ \hline y = -2 \end{array}$$

$$\begin{array}{l} x = \underline{\quad 5 \quad} \\ y = \underline{\quad -2 \quad} \end{array} \quad [3]$$

- 9 Solve the simultaneous equations.

$$5x + 2y = -12 \quad (1)$$

$$3x - y = -5 \quad \times 2: \quad 6x - 2y = -10 \quad (2)$$

$$\begin{array}{r} (1) + (2): \quad 11x = -22 \\ \div 11 \qquad \div 11 \\ \hline x = -2 \end{array}$$

$$\begin{array}{r} \rightarrow (1): \quad 5(-2) + 2y = -12 \\ -10 + 2y = -12 \\ +10 \qquad +10 \\ \hline 2y = -2 \\ \div 2 \qquad \div 2 \\ \hline y = -1 \end{array}$$

$$\begin{array}{l} x = \underline{\quad -2 \quad} \\ y = \underline{\quad -1 \quad} \end{array} \quad [3]$$

11 Solve the simultaneous equations.

$$\begin{aligned} 5x - 2y &= 12 \quad \times 2: 10x - 4y = 24 \quad (1) \\ 3x + 4y &= 2 \quad (2) \end{aligned}$$

$$\begin{aligned} (1) + (2): 13x &= 26 \\ \div 13 \quad \div 13 \\ \underline{x} &= \underline{2} \end{aligned}$$

$$\begin{aligned} \rightarrow (2): 3(2) + 4y &= 2 \\ 6 + 4y &= 2 \\ -6 \quad -6 \\ 4y &= -4 \\ \div 4 \quad \div 4 \\ \underline{y} &= \underline{-1} \end{aligned}$$

$$\begin{aligned} x &= \underline{2} \\ y &= \underline{-1} \end{aligned} \quad [3]$$

8 Solve the simultaneous equations.

$$\begin{aligned} 3x + 2y &= -1 \quad (1) \\ 7x - y &= 26 \quad \times 2: 14x - 2y = 52 \quad (2) \end{aligned}$$

$$\begin{aligned} (1) + (2): 17x &= 51 \\ \div 17 \quad \div 17 \\ \underline{x} &= \underline{3} \end{aligned}$$

$$\begin{aligned} \rightarrow (1): 3(3) + 2y &= -1 \\ 9 + 2y &= -1 \\ -9 \quad -9 \\ 2y &= -10 \\ \div 2 \quad \div 2 \\ \underline{y} &= \underline{-5} \end{aligned}$$

$$\begin{aligned} x &= \underline{3} \\ y &= \underline{-5} \end{aligned} \quad [3]$$

- 7 Solve the simultaneous equations.
You must show all your working.

$$\begin{aligned} 2x + y &= 3 \quad \times 5: 10x + 5y = 15 \quad \textcircled{1} \\ x - 5y &= 40 \quad \textcircled{2} \end{aligned}$$

$$\begin{aligned} \textcircled{1} + \textcircled{2}: \quad 11x &= 55 \\ \div 11 \quad \quad \div 11 \\ \hline x &= 5 \end{aligned}$$

$\rightarrow 2x + y = 3:$

$$\begin{aligned} 2(5) + y &= 3 \\ 10 + y &= 3 \\ -10 \quad \quad -10 \\ \hline y &= -7 \end{aligned}$$

$$\begin{aligned} x &= \underline{\quad 5 \quad} \\ y &= \underline{\quad -7 \quad} \quad [3] \end{aligned}$$

- 8 Solve the simultaneous equations.

$$\begin{aligned} 3x - 2y &= 12 \quad \textcircled{1} \\ 5x + y &= 7 \quad \times 2: 10x + 2y = 14 \quad \textcircled{2} \end{aligned}$$

$$\begin{aligned} \textcircled{1} + \textcircled{2}: \quad 13x &= 26 \\ \div 13 \quad \quad \div 13 \\ \hline x &= 2 \end{aligned}$$

$\rightarrow 5x + y = 7:$

$$\begin{aligned} 5(2) + y &= 7 \\ 10 + y &= 7 \\ -10 \quad \quad -10 \\ \hline y &= -3 \end{aligned}$$

$$\begin{aligned} x &= \underline{\quad 2 \quad} \\ y &= \underline{\quad -3 \quad} \quad [3] \end{aligned}$$

- 10 Solve the simultaneous equations.
You must show all your working.

$$\begin{aligned} 3x - 8y &= 22 \quad (1) \\ x + 4y &= 4 \quad \times 2: 2x + 8y = 8 \quad (2) \end{aligned}$$

$$\begin{aligned} (1) + (2): \quad 5x &= 30 \\ \div 5 \quad \quad \div 5 \\ \underline{x} &= 6 \end{aligned}$$

$$\rightarrow x + 4y = 4:$$

$$\begin{aligned} 6 + 4y &= 4 \\ -6 \quad \quad -6 \end{aligned}$$

$$\begin{aligned} 4y &= -2 \\ \div 4 \quad \quad \div 4 \end{aligned}$$

$$\underline{y = -\frac{1}{2}}$$

$$\begin{aligned} x &= 6 \\ y &= -\frac{1}{2} \end{aligned} \quad [3]$$

- 4 (a) Solve the simultaneous equations.
You must show all your working.

$$\begin{aligned} 2p - q &= 7 \quad \times 2: 4p - 2q = 14 \quad (1) \\ 3p + 2q &= 7 \quad (2) \end{aligned}$$

$$\begin{aligned} (1) + (2): \quad 7p &= 21 \\ \div 7 \quad \quad \div 7 \\ \underline{p} &= 3 \end{aligned}$$

$$\begin{aligned} \rightarrow (2): \quad 3(3) + 2q &= 7 \\ 9 + 2q &= 7 \\ -9 \quad \quad -9 \\ 2q &= -2 \\ \div 2 \quad \quad \div 2 \\ \underline{q} &= -1 \end{aligned}$$

$$\begin{aligned} p &= 3 \\ q &= -1 \end{aligned} \quad [3]$$

- 8 Solve the simultaneous equations.
You must show all your working.

$$4x - 2y = -13 \quad \times 2: \quad 8x - 4y = -26 \quad (1)$$

$$-3x + 4y = 11 \quad (2)$$

$$(1) + (2): \quad 5x = -15$$

$$\quad \quad \quad \div 5 \quad \quad \div 5$$

$$\quad \quad \quad \underline{x = -3}$$

$$\rightarrow (2): \quad -3(-3) + 4y = 11$$

$$\quad \quad \quad 9 + 4y = 11$$

$$\quad \quad \quad -9 \quad \quad -9$$

$$\quad \quad \quad 4y = 2$$

$$\quad \quad \quad \div 4 \quad \quad \div 4$$

$$\quad \quad \quad \underline{y = \frac{1}{2}}$$

$$x = \underline{\quad -3 \quad}$$

$$y = \underline{\quad \frac{1}{2} \quad} \quad [3]$$

- 10 Solve the simultaneous equations.
You must show all your working.

$$4x + 3y = -10 \quad \times 4: \quad 16x + 12y = -40 \quad (1)$$

$$3x - 4y = 5 \quad \times 3: \quad 9x - 12y = 15 \quad (2)$$

$$(1) + (2): \quad 25x = -25$$

$$\quad \quad \quad \div 25 \quad \quad \div 25$$

$$\quad \quad \quad \underline{x = -1}$$

$$\rightarrow 4x + 3y = -10:$$

$$4(-1) + 3y = -10$$

$$-4 + 3y = -10$$

$$\quad \quad \quad +4 \quad \quad +4$$

$$\quad \quad \quad 3y = -6$$

$$\quad \quad \quad \div 3 \quad \quad \div 3$$

$$\quad \quad \quad \underline{y = -2}$$

$$x = \underline{\quad -1 \quad}$$

$$y = \underline{\quad -2 \quad} \quad [4]$$

11 Solve the simultaneous equations.

$$\begin{aligned}x - 3y &= 7 & \textcircled{1} \\2x - 3y &= 11 & \textcircled{2}\end{aligned}$$

$$\textcircled{2} - \textcircled{1}: \underline{x = 4}$$

$$\begin{aligned}\rightarrow \textcircled{1}: & \quad 4 - 3y = 7 \\& \quad -4 \quad \quad -4 \\& \quad -3y = 3 \\& \quad \div -3 \quad \div -3 \\& \quad \underline{y = -1}\end{aligned}$$

$$\begin{aligned}x &= \underline{4} \\y &= \underline{-1} \quad [2]\end{aligned}$$

10 Solve the simultaneous equations.

$$\begin{aligned}4x - 5y &= 13 & \times 2: & 8x - 10y = 26 & \textcircled{1} \\3x - 2y &= 8 & \times 5: & 15x - 10y = 40 & \textcircled{2}\end{aligned}$$

$$\begin{aligned}\textcircled{2} - \textcircled{1}: & \quad 7x = 14 \\& \quad \div 7 \quad \quad \div 7 \\& \quad \underline{x = 2}\end{aligned}$$

$$\begin{aligned}\rightarrow 3x - 2y &= 8: \\3(2) - 2y &= 8 \\6 - 2y &= 8 \\& \quad -6 \quad \quad -6 \\& \quad -2y = 2 \\& \quad \div -2 \quad \div -2 \\& \quad \underline{y = -1}\end{aligned}$$

$$\begin{aligned}x &= \underline{2} \\y &= \underline{-1} \quad [4]\end{aligned}$$

11 Solve the simultaneous equations.

$$\frac{1}{2}x - \frac{1}{3}y = 7 \quad \times 3: \quad \frac{3}{2}x - y = 21 \quad (1)$$

$$3x + y = 6 \quad (2)$$

$$(1) + (2): \quad 3x + \frac{3}{2}x = 27$$

$$\frac{6}{2}x + \frac{3}{2}x = 27$$

$$\frac{9}{2}x = 27$$

$$\times 2 \quad \times 2$$

$$9x = 54$$

$$\div 9 \quad \div 9$$

$$\underline{x = 6}$$

$$\rightarrow (2): \quad 3(6) + y = 6$$

$$18 + y = 6$$

$$-18 \quad -18$$

$$\underline{y = -12}$$

$$x = \underline{6}$$

$$y = \underline{-12} \quad [3]$$

8 Solve the simultaneous equations.

$$\frac{1}{2}x + \frac{2}{3}y = 8 \quad \times 3: \quad \frac{3}{2}x + 2y = 24 \quad (1)$$

$$3x - y = 18 \quad \times 2: \quad 6x - 2y = 36 \quad (2)$$

$$(1) + (2): \quad \frac{3}{2}x + 6x = 60$$

$$\frac{3}{2}x + \frac{12}{2}x = 60$$

$$\frac{15}{2}x = 60$$

$$\times 2 \quad \times 2$$

$$15x = 120$$

$$\div 15 \quad \div 15$$

$$\underline{x = 8}$$

$$\rightarrow 3x - y = 18:$$

$$3(8) - y = 18$$

$$24 - y = 18$$

$$-24 \quad -24$$

$$-y = -6$$

$$\underline{y = 6}$$

$$x = \underline{8}$$

$$y = \underline{6} \quad [3]$$

- 12 Solve the simultaneous equations.
You must show all your working.

$$\frac{3x}{2} + 5y = 5 \quad \times 3: \quad \frac{9x}{2} + 15y = 15 \quad (1)$$

$$4x - 3y = 46 \quad \times 5: \quad 20x - 15y = 230 \quad (2)$$

$$(1) + (2): \quad \frac{9}{2}x + 20x = 245$$

$$\frac{9}{2}x + \frac{40}{2}x = 245$$

$$\frac{49}{2}x = 245$$

$$49x = 490$$

$$x = 10$$

$$\rightarrow 4x - 3y = 46:$$

$$4(10) - 3y = 46$$

$$40 - 3y = 46$$

$$-40 \quad -40$$

$$-3y = 6$$

$$\div -3 \quad \div -3$$

$$y = -2$$

$$x = 10$$

$$y = -2 \quad [4]$$

- 10 Solve the simultaneous equations.

$$2x + 3y = 5 \quad (1)$$

$$y = 3x + 9 \quad (2)$$

Sub. (2) into (1):

$$2x + 3(3x + 9) = 5$$

$$2x + 9x + 27 = 5$$

$$11x + 27 = 5$$

$$-27 \quad -27$$

$$11x = -22$$

$$\div 11 \quad \div 11$$

$$x = -2$$

$$\rightarrow (2): \quad y = 3(-2) + 9$$

$$= -6 + 9$$

$$= 3$$

$$x = -2$$

$$y = 3 \quad [3]$$

21 The n th term of a sequence is $an^2 + bn - 4$.

The first term is -3 and the second term is 2 .

Find the value of a and the value of b .

1st term: when $n=1$:

$$\begin{aligned} a(1)^2 + b(1) - 4 &= -3 \\ a + b - 4 &= -3 \\ &\quad +4 \quad +4 \\ a + b &= 1 \quad (1) \end{aligned}$$

2nd term: when $n=2$:

$$\begin{aligned} a(2)^2 + b(2) - 4 &= 2 \\ 4a + 2b - 4 &= 2 \\ &\quad +4 \quad +4 \\ 4a + 2b &= 6 \\ \div 2 \quad \div 2 \quad \div 2 & \\ 2a + b &= 3 \quad (2) \end{aligned}$$

$$(2) - (1):$$

$$a = 2$$

$\rightarrow (1):$

$$\begin{aligned} 2 + b &= 1 \\ -2 \quad -2 \end{aligned}$$

$$b = -1$$

$$\begin{aligned} a &= 2 \\ b &= -1 \end{aligned} \quad [5]$$

22 These are the first four terms of a sequence.

2.75

6

11.25

20

The n th term of this sequence is $\frac{1}{4}n^3 + an^2 + bn$.

Calculate the value of a and the value of b .

1st term: $n=1$:

$$\frac{1}{4}(1)^3 + a(1)^2 + b(1) = 2.75$$

$$0.25 + a + b = 2.75$$

-0.25 -0.25

$$a + b = 2.5 \quad (1)$$

2nd term: $n=2$:

$$\frac{1}{4}(2)^3 + a(2)^2 + b(2) = 6$$

$$\frac{1}{4} \times 8 + 4a + 2b = 6$$

$$2 + 4a + 2b = 6$$

-2 -2

$$4a + 2b = 4$$

$\div 2$ $\div 2$ $\div 2$

$$2a + b = 2 \quad (2)$$

$$(2) - (1):$$

$$a = -0.5$$

$$\rightarrow (1):$$

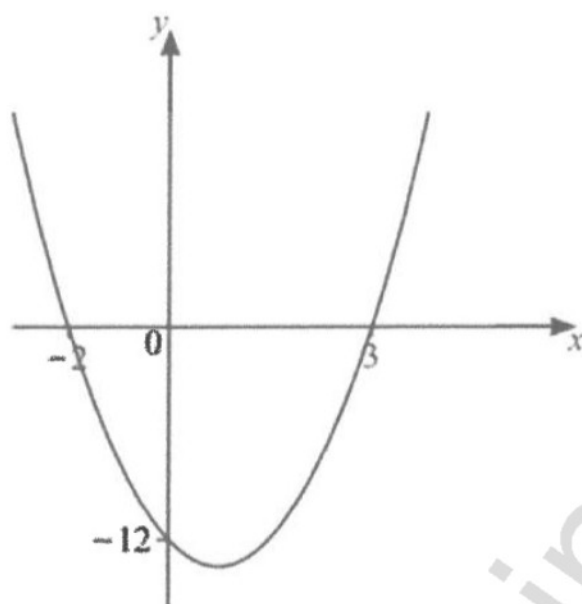
$$-0.5 + b = 2.5$$

$+0.5$ $+0.5$

$$b = 3$$

$$a = -0.5$$

$$b = 3 \quad [5]$$



NOT TO
SCALE

The equation of the curve is $y = ax^2 + bx - 12$.

Find the value of a and the value of b .

At $(3, 0)$, $x = 3$ and $y = 0$:

$$0 = a(3)^2 + b(3) - 12$$

$$0 = 9a + 3b - 12$$

$$9a + 3b = 12 \quad \div 3$$

$$3a + b = 4 \quad (1)$$

At $(-2, 0)$, $x = -2$ and $y = 0$:

$$0 = a(-2)^2 + b(-2) - 12$$

$$0 = 4a - 2b - 12$$

$$4a - 2b = 12 \quad \div 2$$

$$2a - b = 6 \quad (2)$$

→ (1) + (2):

$$5a = 10$$

$$\div 5 \quad \div 5$$

$$a = 2$$

→ (1): $3(2) + b = 4$

$$6 + b = 4$$

$$-6 \quad -6$$

$$b = -2$$

$$a = \underline{\quad 2 \quad}$$

$$b = \underline{\quad -2 \quad} \quad [3]$$