



QT Simultaneous Equations

Solve the simultaneous equations

1. $2y - 3x = 6$
 $2x + 2y = 1$

(3 marks)

$$\begin{array}{r} -3x + 2y = 6 \\ 2x + 2y = 1 \quad - \\ \hline -5x \quad \quad = 5 \\ x \quad \quad \quad = -1 \end{array}$$

~~Subst. Q. 1~~

$$\begin{array}{l} 2x + 2y = 1 \\ 2(-1) + 2y = 1 \\ -2 + 2y = 1 \\ 2y = 3 \\ y = 1.5 \end{array}$$

$$x = -1, y = 1.5$$

2. $2x + 3y = -3$ +3
 $3x - 2y = 28$ +2

(3 marks)

$$\begin{array}{r} 6x + 9y = -9 \\ 6x - 4y = 56 \quad - \\ \hline 13y = -65 \\ y = -5 \end{array}$$

~~Subst. Q. 1~~

$$\begin{array}{l} 2x + 3y = -3 \\ 2x + 3(-5) = -3 \\ 2x - 15 = -3 \\ 2x = 12 \\ x = 6 \end{array}$$

$$x = 6, y = -5$$



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3. A rectangle has a perimeter of 22m. The width is 3m less than the length. Find the length and width. (3 marks)



$$W = L - 3$$

$$W = 7 - 3$$

$$\underline{W = 4}$$

$$W = L - 3$$

$$\text{Perimeter} = 2L + 2W$$

$$2L + 2W = 22$$

$$2L + 2(L - 3) = 22$$

$$2L + 2L - 6 = 22$$

$$4L - 6 = 22$$

$$4L = 28$$

$$\underline{L = 7}$$

$$\therefore \underline{\underline{\text{Length} = 7\text{m}}}, \underline{\underline{\text{Width} = 4\text{m}}}.$$

4. A farmer has sheep and ostriches on his farm. He counts 92 heads and 194 legs. How many sheep and ostriches does he have? (4 marks)

$$S + \phi = 92 \quad (\times 2)$$

$$4S + 2\phi = 194$$

$$4S + 2\phi = 194$$

$$2S + 2\phi = 184$$

$$\underline{2S = 10}$$

$$S = 5$$

$$S + \phi = 92$$

$$S + \phi = 92$$

$$S + \phi = 92$$

$$\phi = 87$$

5 sheep

87 ostriches.



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5. $3x - y = -4$ $\times 1$
 $2x - 3y = 9$ $\times 3$

(4 marks)

$$\begin{array}{r} 6x - 4y = -8 \\ 6x - 9y = 27 \\ \hline 7y = -35 \\ y = -5 \end{array}$$

~~Solve for~~

$$\begin{array}{l} 3x - y = -4 \\ 3x - (-5) = -4 \\ 3x + 5 = -4 \\ 3x = -9 \\ x = -3 \end{array}$$

$$\underline{\underline{x = -3, y = -5}}$$

6. $3x = 9 + y$
 $x + 5y = 5$

(4 marks)

$$\begin{array}{r} 3x - y = 9 \\ x + 5y = 5 \quad \times 3 \\ \hline 3x - y = 9 \\ 3x + 15y = 15 \\ \hline -16y = 6 \\ y = -\frac{6}{16} \\ y = -\frac{3}{8} \\ \text{or } -0.375 \end{array}$$

~~Solve for~~

$$\begin{array}{l} 3x - y = 9 \\ 3x - (-\frac{3}{8}) = 9 \\ 3x + \frac{3}{8} = 9 \\ 3x = \frac{69}{8} \\ x = \frac{23}{8} \\ \text{or } 2.875 \end{array}$$

$$\underline{\underline{x = \frac{23}{8}, y = -\frac{3}{8}}}$$



QT Simultaneous Equations

7. Three apples and two bananas cost 75p.

Four apples and one banana cost 80p.

Find the price of one apple and one banana.

(4 marks)

$$\begin{array}{r}
 3A + 2B = 75 \\
 4A + 1B = 80 \quad \times 2 \\
 \hline
 3A + 2B = 75 \quad - \\
 8A + 2B = 160 \\
 \hline
 -5A \qquad = -85 \\
 \hline
 A = \underline{\underline{17p}}
 \end{array}$$

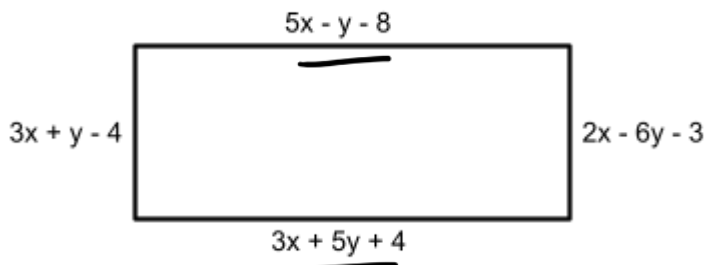
SUBSTITUTE

$$\begin{array}{r}
 3A + 2B = 75 \\
 3(17) + 2B = 75 \\
 51 + 2B = 75 \\
 2B = 24 \\
 B = \underline{\underline{12p}}
 \end{array}$$

8. The dimensions, in centimetres, of this rectangle are shown as algebraic expressions.

Work out the length and height of the rectangle.

(6 marks)



$$\begin{array}{r}
 5x - y - 8 = 3x + 5y + 4 \\
 2x - 6y = 12 \\
 x - 3y = 6 \\
 \hline
 3x + y - 4 = 2x - 6y - 3 \\
 x + 7y = 1
 \end{array}$$

$$\begin{array}{r}
 x + 7y = 1 \\
 x - 3y = 6 \quad - \\
 \hline
 10y = -5 \\
 y = \underline{\underline{-0.5}}
 \end{array}$$

SUBSTITUTE

$$\begin{array}{r}
 x + 7y = 1 \\
 x + 7(-0.5) = 1 \\
 x = \underline{\underline{4.5}}
 \end{array}$$

Length

$$5(4.5) - (-0.5) - 8 = \underline{\underline{16cm}}$$

Width

$$3(4.5) + (-0.5) = 4 = \underline{\underline{9cm}}$$



QT Simultaneous Equations

9. 3 teas and 2 coffees have a total cost of £7.80.

5 teas and 4 coffees have a total cost of £14.20.

Work out the cost of one tea and one coffee.

(4 marks)

$$\begin{array}{r} \textcircled{\times 2} \quad 3T + 2C = 780 \\ 5T + 4C = 1420 \\ \hline 6T + 4C = 1560 - \\ 5T + 4C = 1420 \\ \hline 1T = 140 \\ \text{Tea} = \underline{\underline{\pounds 1.40}} \end{array}$$

$$\begin{array}{r} \text{Subst} \\ 3T + 2C = 780 \\ 3(140) + 2C = 780 \\ 420 + 2C = 780 \\ 2C = 360 \\ 1C = 180 \\ \text{Coffee} = \underline{\underline{\pounds 1.80}} \end{array}$$

10. Solve the simultaneous equations where p is a constant. Give your answer in terms of p in their simplest form.

$$2x + 3y = 5p$$

$$y = 2x + p$$

(4 marks)

$$\begin{array}{r} 2x + 3y = 5p \\ -2x + y = p \\ \hline 4y = 6p \\ y = \frac{6}{4}p \\ y = \underline{\underline{1.5p}} \end{array}$$

$$\begin{array}{r} \text{Subst} \\ y = 2x + p \\ 1.5p = 2x + p \\ 0.5p = 2x \\ \frac{0.5p}{2} = x \\ x = \underline{\underline{0.25p}} \end{array}$$