Samples **Simultaneous Equations SOLUTIONS**

1. We need to find a solution for two simultaneous linear equations.
First we number the equations for convenience:

$$-70y - 14 = -7x \qquad (1)$$
$$0 = 6x - 352 + 8y \qquad (2)$$

We solve these using substitution. Dividing both sides of equation (1) by -7 gives

$$10y + 2 = x \qquad (3)$$

Substituting for x in equation (2),

$$0 = 6 \times (10y + 2) - 352 + 8y \qquad (4)$$

Now (4) is an equation only involving y which gives:

$$0 = 60y + 12 - 352 + 8y$$
$$340 = 68y$$
$$5 = y$$

Next we substitute the value for y into equation (3) to obtain the value for x, giving

$$x = 10 \times 5 + 2 = 52$$

Hence the simultaneous solution to equations (1) and (2) is $(52, 5)$.

(As good boys and girls always do, check your answers by substituting into equations (1) and (2):

(1) $-70 \times 5 - 14 = -7 \times 52$
$-350 - 14 = -364$
$-364 = -364$

(2) $0 = 6 \times 52 - 352 + 8 \times 5$
$0 = 312 - 352 + 40$
$0 = 0$

Both equations turned into true statements, as required. Hence the answer is correct.)

2. We need to find a solution for two simultaneous linear equations.
First we number the equations for convenience:

$$20x - 16 = 2y \qquad (1)$$
$$-90x + 9y + 72 = 0 \qquad (2)$$

We solve these using substitution. Rearranging equation (2) with y on the left-hand side gives

$$9y = 90x - 72 \qquad (3)$$

Dividing both sides of (3) by 9, gives

$$y = 10x - 8 \qquad (4)$$

Substituting for y in equation (1),

$$20x - 16 = 2 \times (10x - 8) \qquad (5)$$

Now (5) is an equation only involving x which gives:

$$20x - 16 = 20x - 16$$
$$-16 = -16$$

This statement is **always true**, so there is an infinite number of solutions to our simultaneous equations. The lines are superimposed.

3. We need to find a solution for two simultaneous linear equations.
First we number the equations for convenience:

$$\begin{aligned} 8x &= 9y - 433 \qquad (1) \\ 0 &= 28 + 24x + 4y \qquad (2) \end{aligned}$$

We solve these using substitution. Rearranging equation (2) with y on the left-hand side gives

$$-4y = 24x + 28 \qquad (3)$$

Dividing both sides of (3) by -4, gives

$$y = -6x - 7 \qquad (4)$$

Substituting for y in equation (1),

$$8x = 9 \times (-6x - 7) - 433 \qquad (5)$$

Now (5) is an equation only involving x which gives:

$$\begin{aligned} 8x &= -54x - 63 - 433 \\ 62x &= -496 \\ x &= -8 \end{aligned}$$

Next we substitute the value for x into equation (4) to obtain the value for y, giving

$$y = -6 \times (-8) - 7 = 41$$

Hence the simultaneous solution to equations (1) and (2) is $(-8, 41)$.

(As good boys and girls always do, check your answers by substituting into equations (1) and (2):

(1) $8 \times (-8) = 9 \times 41 - 433$
$-64 = 369 - 433$
$-64 = -64$

(2) $0 = 28 + 24 \times (-8) + 4 \times 41$
$0 = 28 - 192 + 164$
$0 = 0$

Both equations turned into true statements, as required. Hence the answer is correct.)