

Samples Equation of a straight line SOLUTIONS

1. First we number the equations for convenience:

$$5x + 4y = 68 \quad (1)$$

$$-6x = 2y - 6 \quad (2)$$

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

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

Dividing both sides of (3) by 2 gives

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

Substituting for y in equation (1),

$$5x + 4 \times (-3x + 3) = 68 \quad (5)$$

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

$$\begin{aligned} 5x - 12x + 12 &= 68 \\ -7x &= 56 \\ x &= -8 \end{aligned}$$

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

$$y = -3 \times (-8) + 3 = 27$$

Hence the simultaneous solution to equations (1) and (2) is $(-8, 27)$.

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

(1) $5 \times (-8) + 4 \times 27 = 68$ $-40 + 108 = 68$ $68 = 68$	(2) $-6 \times (-8) = 2 \times 27 - 6$ $48 = 54 - 6$ $48 = 48$
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Both equations turned into true statements, as required. Hence the answer is correct.)

2. First we number the equations for convenience:

$$-6y = 54x \quad (1)$$

$$2y - 36 = -6x \quad (2)$$

We solve these using substitution. Dividing both sides of equation (1) by -6 gives

$$y = -9x \quad (3)$$

Substituting for y in equation (2),

$$2 \times (-9x) - 36 = -6x \quad (4)$$

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

$$\begin{aligned} -18x - 36 &= -6x \\ -12x &= 36 \\ x &= -3 \end{aligned}$$

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

$$y = -9 \times (-3) = 27$$

Hence the simultaneous solution to equations (1) and (2) is $(-3, 27)$.

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

$$\begin{array}{ll} (1) & -6 \times 27 = 54 \times (-3) \\ & -162 = -162 \\ (2) & 2 \times 27 - 36 = -6 \times (-3) \\ & 54 - 36 = 18 \\ & 18 = 18 \end{array}$$

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

3. First we number the equations for convenience:

$$\begin{array}{ll} 30 - 36x = 6y & (1) \\ 10y - 54 = -60x & (2) \end{array}$$

We solve these using substitution. Dividing both sides of equation (1) by 6 gives

$$5 - 6x = y \quad (3)$$

Substituting for y in equation (2),

$$10 \times (5 - 6x) - 54 = -60x \quad (4)$$

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

$$\begin{array}{l} 50 - 60x - 54 = -60x \\ -4 = 0 \end{array}$$

This statement is **never true**, so there is no solution to our simultaneous equations. The lines are parallel.

4. First we number the equations for convenience:

$$\begin{array}{ll} 7x - 28y - 14 = 0 & (1) \\ 17 = -7y - 5x & (2) \end{array}$$

We solve these using substitution. Rearranging equation (1) with x on the left-hand side gives

$$7x = 28y + 14 \quad (3)$$

Dividing both sides of (3) by 7, gives

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

Substituting for x in equation (2),

$$17 = -7y - 5 \times (4y + 2) \quad (5)$$

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

$$\begin{array}{l} 17 = -7y - 20y - 10 \\ 27 = -27y \\ -1 = y \end{array}$$

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

$$x = 4 \times (-1) + 2 = -2$$

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

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

$$\begin{aligned}(1) \quad & 7 \times (-2) - 28 \times (-1) - 14 = 0 \\ & -14 + 28 - 14 = 0 \\ & 0 = 0\end{aligned}$$

$$\begin{aligned}(2) \quad & 17 = -7 \times (-1) - 5 \times (-2) \\ & 17 = 7 + 10 \\ & 17 = 17\end{aligned}$$

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

5. First we number the equations for convenience:

$$\begin{aligned}-54y - 27 &= -9x & (1) \\ -6y &= 7x + 219 & (2)\end{aligned}$$

We solve these using substitution. Dividing both sides of equation (1) by -9 gives

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

Substituting for x in equation (2),

$$-6y = 7 \times (6y + 3) + 219 \quad (4)$$

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

$$\begin{aligned}-6y &= 42y + 21 + 219 \\ -48y &= 240 \\ y &= -5\end{aligned}$$

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

$$x = 6 \times (-5) + 3 = -27$$

Hence the simultaneous solution to equations (1) and (2) is $(-27, -5)$.

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

$$\begin{aligned}(1) \quad & -54 \times (-5) - 27 = -9 \times (-27) \\ & 270 - 27 = 243 \\ & 243 = 243\end{aligned}$$

$$\begin{aligned}(2) \quad & -6 \times (-5) = 7 \times (-27) + 219 \\ & 30 = -189 + 219 \\ & 30 = 30\end{aligned}$$

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