SIMULTANEOUS EQUATIONS

Solve these Simultaneous Equations

1 $3x + 2y = 8$

$5x - 2y = 8$

2 $2c + 3d = 13$

$2c - d = 1$

3 $3a - b = 5$

$5a - b = 9$

4 $-3c + 3d = -9$

$3c - d = 11$

Remember

1) The sign of a term is the sign in front of it.

2) To cancel a term with

OPPOSITE SIGNS **ADD**

SAME SIGNS **TAKE**

3) The rules for negative numbers

$3 - 5 = -2$ $\quad 3 + -1 = 3 - 1 = 2$

$3 - -1 = 3 + 1 = 4$ $\quad -9 - 11 = -20$

$-2 - -4 = -2 + 4 = 2$

4) Find the values of both letters.

5) Check by substituting that the answers are correct

Solve these simulataneous equations

1) $2x + y = 7$

$3x - y = 3$

$x =$, $y =$

2) $5x + 3y = 23$

$5x - y = 19$

$x =$, $y =$

3) $2x + 3y = 8$ times by 2

$4x + 2y = 8$

$4x + 2y = 8$

$x =$, $y =$

4) $2x + 3y = 12$

$5x - y = 13$ times by 3

$2x + 3y = 12$

$x =$, $y =$

5) $7x + 3y = 26$ times by 2

$4x + 2y = 16$ times by 3

$x =$, $y =$

6) $5x + 3y = 14$ times by 4

$6x - 4y = -6$ times by 3

$x =$, $y =$

1) $5x + 3y = 19$
$2x + 3y = 13$

2) $5x - 2y = 1$
$x - 2y = -3$

3) $3x - 2y = 7$
$2x + 2y = 8$

4) $2x + 4y = 8$
$-2x + 5y = 1$

5) $2x + y = 7$
$x + 2y = 5$

6) $2x - 2y = 6$
$3x + y = 13$

7) $5x - y = 7$
$4x + 2y = 14$

8) $3x - 4y = 7$
$2x - 2y = 6$

9) $4x + 2y = 8$
$3x + 5y = 13$

10) $2x + 3y = 7$
$3x - 2y = 4$

11) $3x - 3y = 3$
$4x - 2y = 6$

12) $7x - 2y = 1$
$4x + 5y = 19$

Simultaneous Equations - write simualtaneous equations for each question and solve them

1 2 cups of tea and 3 cakes cost £4.20

4 cups of tea and 1 cake costs £3.90

How much is a cup of tea?
How much is a cake?

2 4 cans and 3 crisps costs £3.40

3 cans and 6 crisps costs £4.05

How much is a can?
How much is a bag of crisps?

3 3 nuts and 4 bolts cost 69p

1 nut and 2 bolts cost 31p

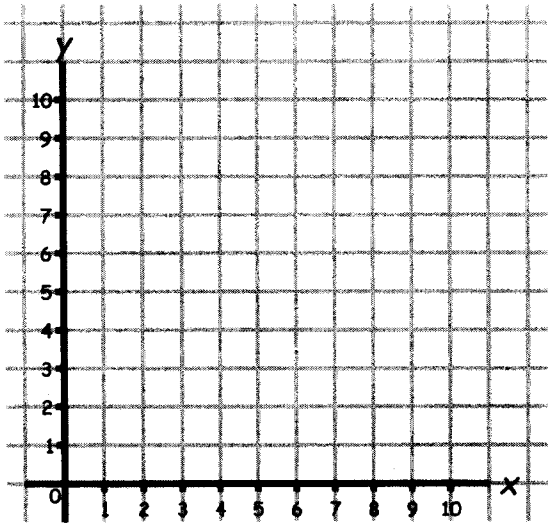
1 nut costs?
1 bolt costs?

4 4 screws and 2 nails weigh 17 grams.

3 screws and 5 nails weigh 32 grams.

1 screw weighs?
1 nail weighs?

Solving Simultaneous Equations Graphically



$y = x + 2$

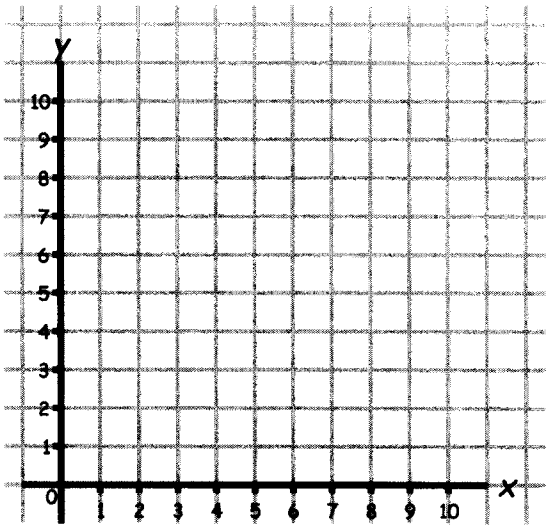
x	0	1	2	3	4	5	6	7	8
y									

$x + y = 6$

x	0	1	2	3	4	5	6
y							

The answer

x = ____, y = ____



$y = 2x$

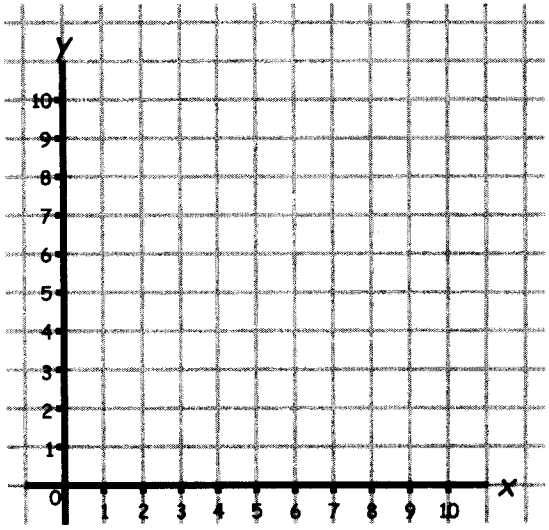
x	0	1	2	3	4	5
y						

$y = x + 3$

x	0	1	2	3	4	5	6
y							

The answer

x = ____, y = ____



$x + y = 8$

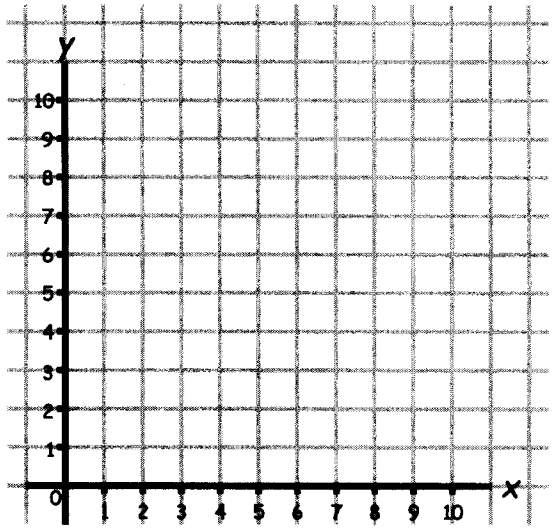
x	0	1	2	3	4	5	6	7	8
y									

$y = 3x$

x	0	1	2	3
y				

The answer

x = ____, y = ____



$y = 0.5x + 6$

x	0	1	2	3	4	5	6	7	8
y									

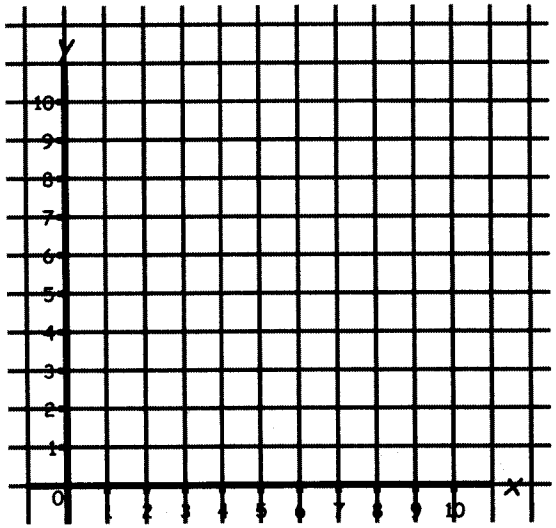
$y = 2x + 3$

x	0	1	2	3
y				

The answer

x = ____, y = ____

Solving Simultaneous Equations Graphically



$y + 2x = 8$

when $x = 0$, $y =$ plot(0,)

when $y = 0$, $x =$ plot (, 0)

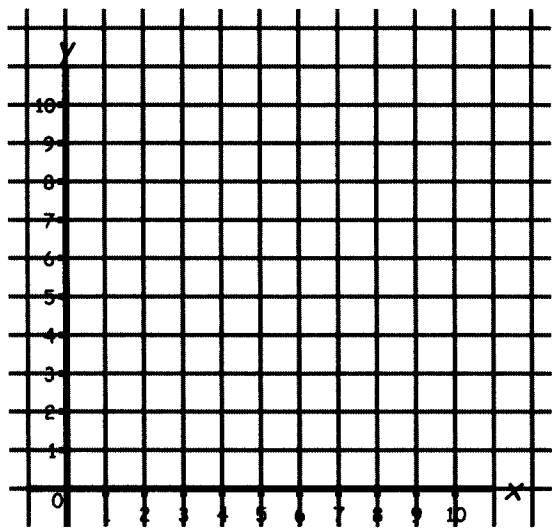
$3y + 2x = 12$

when $x = 0$, $y =$ plot(0,)

when $y = 0$, $x =$ plot (, 0)

$y + 2x = 8$

$3y + 2x = 12$ Answer $x =$ $y =$



$y + 2x = 10$

when $x = 0$, $y =$ plot(0,)

when $y = 0$, $x =$ plot (, 0)

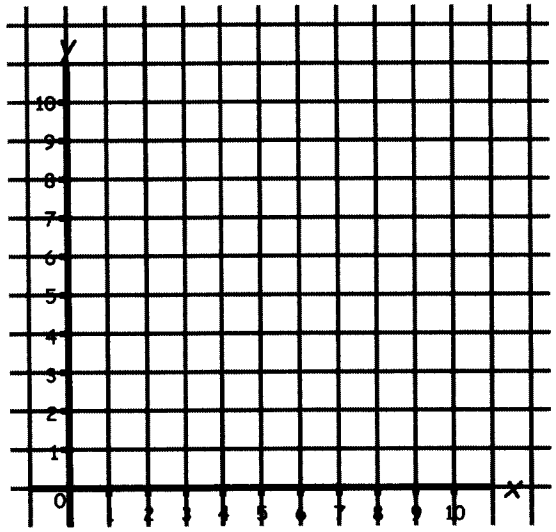
$y + x = 8$

when $x = 0$, $y =$ plot(0,)

when $y = 0$, $x =$ plot (, 0)

$y + 2x = 10$

$y + x = 8$ Answer $x =$ $y =$



$y + x = 8$

when $x = 0$, $y =$ plot(0,)

when $y = 0$, $x =$ plot (, 0)

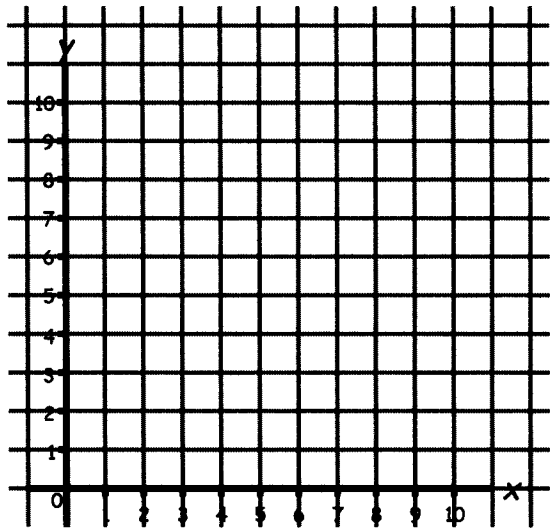
$3y = 4x + 3$

when $x = 0$, $y =$ plot(0,)

when $x = 6$, $y =$ plot (6 ,)

$y + x = 8$

$3y = 4x + 3$ Answer $x =$ $y =$



$2y + x = 8$

when $x = 0$, $y =$ plot(0,)

when $y = 0$, $x =$ plot (, 0)

$2y + 3x = 12$

when $x = 0$, $y =$ plot(0,)

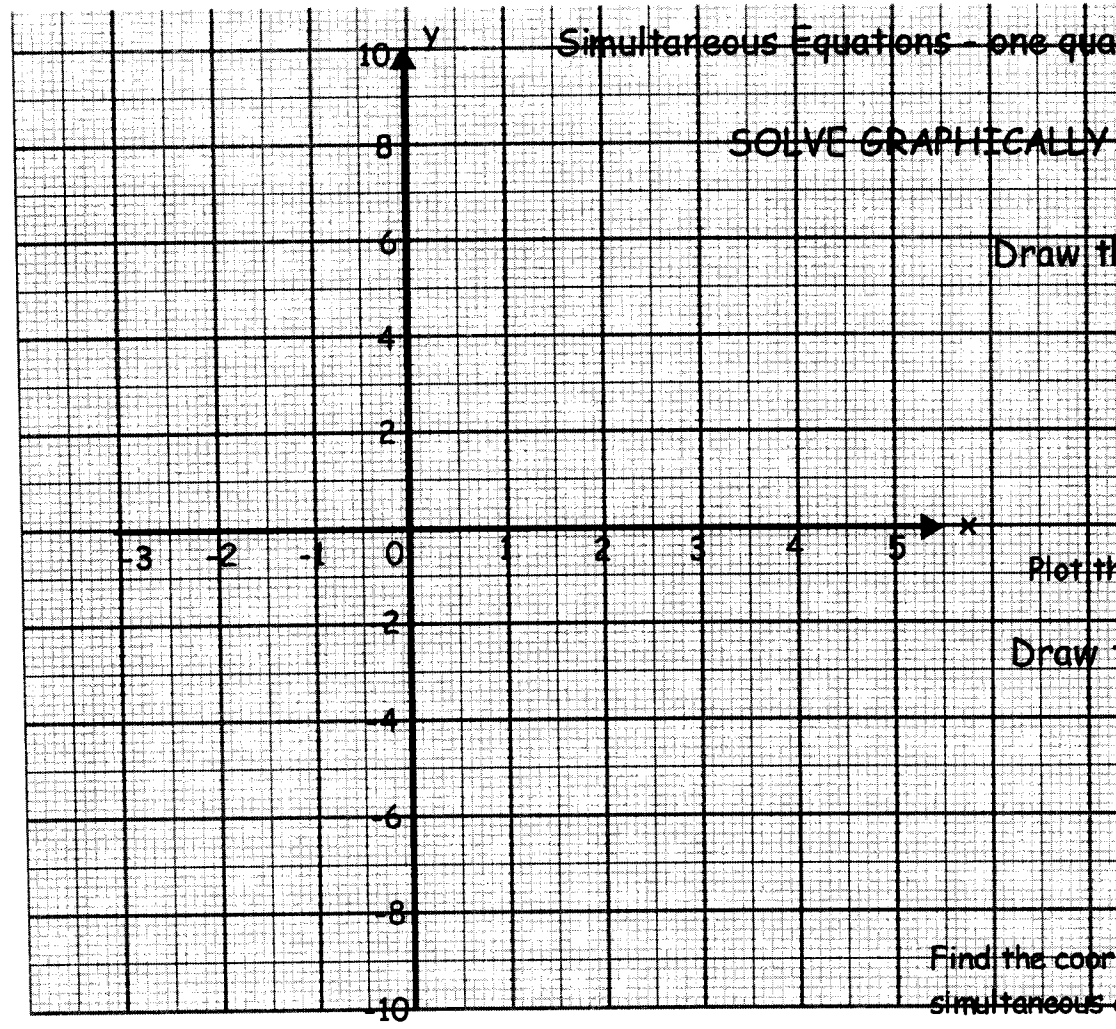
when $y = 0$, $x =$ plot (, 0)

$2y + x = 8$

$2y + 3x = 12$ Answer $x =$ $y =$

Simultaneous Equations - one quadratic one linear

SOLVE GRAPHICALLY $y = x^2 - 2x - 8$ and $y = 2x - 3$



Draw the graph of $y = x^2 - 2x - 8$

x	-3	-2	-1	0	1	2	3	4	5
y									

Plot the points on the graph and join them with a smooth curve.

Draw the graph of $y = 2x - 3$

x	-3	-2	-1	0	1	2	3	4	5
y									

Find the coordinates of the points where the graphs cross. This is the solution to the simultaneous equations.

For a given x coordinate they both have the same y coordinate, therefore they cross

Another way of writing this is $x^2 - 2x - 8 = 2x - 3$

the curve — the straight line

What values of x make the curve and the line have the same y value?

Simultaneous Equations – one quadratic, one linear

SOLVE ALGEBRAICALLY

Example – Solve these pair of simultaneous equations $y = x^2 - 2x - 8$ and $y = 2x - 3$

As both equations are of the form "y =", put them equal to each other.

$x^2 - 2x - 8 = 2x - 3$ By doing this we are finding the value of x that makes them have the same y value

Rearrange this to make a quadratic that is equal to 0. $x^2 - 4x - 5 = 0$

Solve this by factorising $(x - 5)(x + 1) = 0$ $x = 5$ or $x = -1$

For each value of x find the value of y. You can use either the curve or the straight line for this.

When $x = 5$ $y = 2 \times 5 - 3 = 7$

When $x = -1$ $y = 2 \times -1 - 3 = -5$

The final answer is $x = 5, y = 7$ and $x = -1, y = -5$

Have a go at solving these ones

1) $y = x^2 + x + 1$ and $y = 6x + 15$

2) $y = x^2 + 5x$ and $y = x + 5$

3) $y = x^2 + 2x + 2$ and $y = 3x + 4$

4) $y = -x^2 + x + 6$ and $y = x + 5$