

## Understanding Simultaneous Equations

Learning Objective – To think about simultaneous equations in context

If Jack buys 2 pens and 1 pencil the cost is 70p.  
If he buys 1 pen and 1 pencil the cost is 50p.

How much does one pen cost?  
How much does one pencil cost?

Sally buys 5 stickers and 1 piece of card and pays 85p.  
John buys 3 stickers and 1 piece of card and pays 65p.

How much does one sticker cost?  
How much does one piece of card cost?

5 plates of chips and 1 sandwich costs £8  
5 plates of chips and 3 sandwiches costs £12

How much does one sandwich cost?  
How much does one plate of chips cost?

One large chocolate bar and one box of chocolates costs £6  
Two large chocolate bars and three boxes of chocolates cost £14.50.

How much does one box of chocolates cost?  
How much is the price of one large chocolate bar?

If Simon buys 7 packs of sweets, he gets 30 pence change from a one pound coin.  
If Simon buys 8 packs of sweets and two sandwiches he pays £5.20.

Maurice buys 3 packs of sweets and 3 sandwiches, how much does she pay altogether?

Learning Objective – to solve simultaneous equations algebraically

Solve the following simultaneous equations by subtracting the two equations

$2x + y = 5$ $x + y = 3$	$3x + y = 13$ $x + y = 7$	$5x + 2y = 29$ $3x + 2y = 19$
$x + 2y = 9$ $3x + 2y = 23$	$x + 2y = 10$ $x + y = 9$	$4x + y = 4$ $2x + y = 2$
$10x + 2y = 31$ $9x + 2y = 28$	$3x + y = 29$ $2x + y = 19$	$6x + 4y = 1$ $x + 4y = 0.5$

Solve the following simultaneous equations – pre-multiplying where necessary

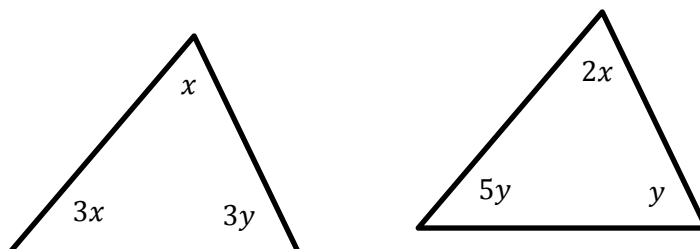
$3x + 2y = 18$ $x + y = 7$	$5x + 3y = 25$ $x + y = 7$	$3x + y = 27$ $x + 2y = 14$
$5x + 2y = 16$ $2x + 3y = 13$	$x + 3y = 17$ $2x + 2y = 26$	$3x + 5y = 26$ $x + 2y = 9$
$3x + 5y = 10$ $x + 10y = 5$	$x + 2y = 1$ $x + y = 2$	$x + 2y = -8$ $x + y = -5$

Solve the following problems in context

There are two types of rod. Rod A has a length of  $x$  and Rod B has a length of  $y$ . Peter has three of rod A and two of rod B and the total length is 17. Paul has two of rod A and three of rod B and the total length is 18.

Sally has five of rod A and six of rod B. what is the total length of her rods?

Write down two equations involving  $x$  and  $y$  for the following two triangles. Hence, find  $x$  and  $y$



Solving simultaneous equations by adding the two equations

$x + y = 4$ $x - y = 2$	$3x + y = 10$ $2x - y = 0$	$3x + 2y = 14$ $x - 2y = 2$
$4x + y = 13$ $x - y = -3$	$3x + 2y = 9$ $3x + y = 6$	$2y - x = 0$ $x + y = 6$
$x + y = 1$ $x - y = 11$	$2x + y = 3$ $4x - y = 0$	$3x + y = 0$ $x - y = -4$

Solve the following simultaneous equations – pre-multiplying where necessary

$2x + 2y = 6$ $x - y = 1$	$2x + 4y = 6$ $x - 2y = 3$	$5x - y = 1$ $3x + 2y = 11$
$x + 3y = 11$ $3x - 2y = 11$	$2x - 4y = 0$ $x + 2y = 1$	$4x - 5y = 35$ $x + 2y = 12$
$x + 2y = 1$ $x - y = 4$	$x + y = -5$ $x - 2y = 1$	$3x + 5y = 0$ $2x - 3y = 0$

Extension: Read the example on substitution, copy it down, and then try and use the technique to solve the questions afterwards

Example	Working Out
$y = 2x + 1$ $x + 2y = 12$  Substitute the first equation into the second equation to replace $y$ by the expression involving $x$	$x + 2y = 12$ becomes  $x + 2(2x + 1) = 12$  $x + 4x + 2 = 12$ $5x + 2 = 12$ $5x = 10$ $x = 2$  Now find $y$ $y = 2x + 1 = 2(2) + 1 = 5$

Questions: Solve the following simultaneous equations

$y = 4x + 1$ $x + 2y = 11$	$y = 2x + 3$ $2x + 2y = 18$	$y = x + 1$ $x + y = 7$
$y = x - 3$ $x + 2y = 9$	$y = 2x + 7$ $2x + y = 10$	$y = 2x - 13$ $x + 2y = -1$