



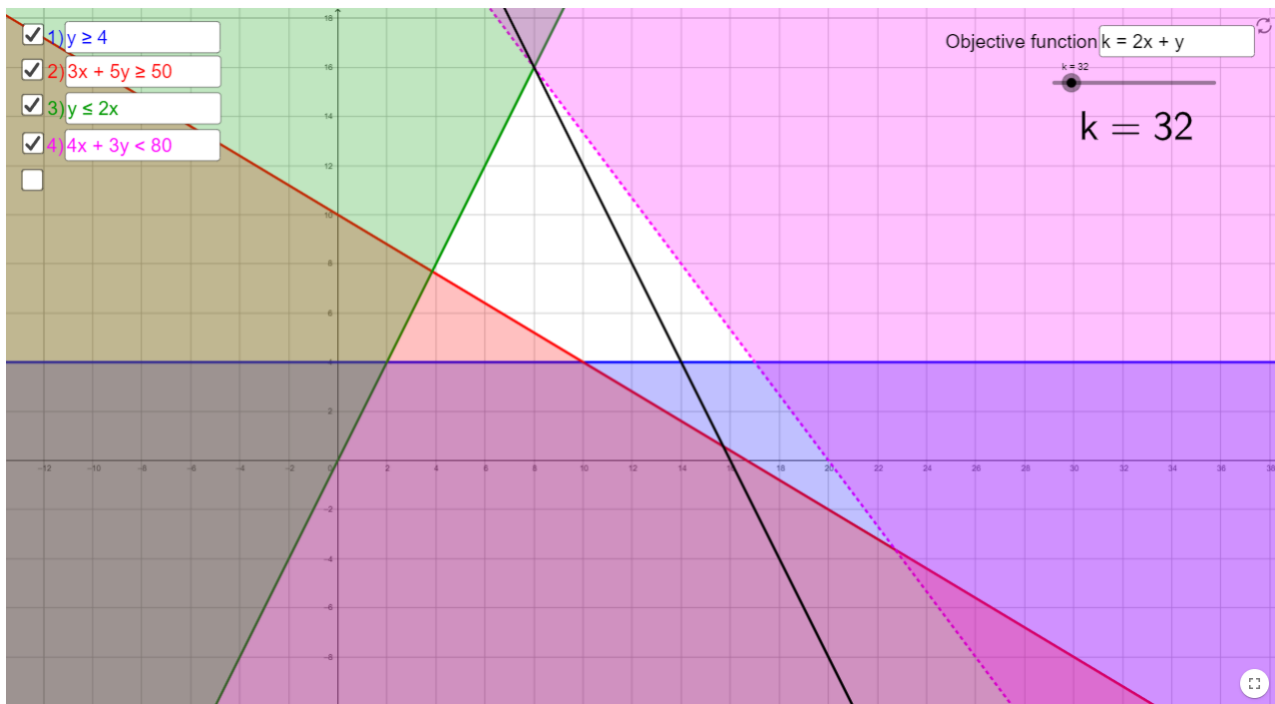
Solving Linear Equations



Did you know ?



Linear programming is a method that involves solving a set of linear equations or inequalities in order to find the best solution.



It is very useful in industry for finding the best level of production, or the maximum profit depending on varying costs, sales, mix of products or availability of labour etc...

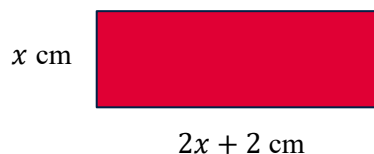


Solving Linear 1



Solve the equations

- $8x - 3 = 5x + 13$
- $3x + 1 > 10$ and $2x + 7 < 15$
- $3(x + 6) > 12$
- $24 - 3x = 9$
- $14 \geq 8 + 5x$
- $6 - 2x < 5x + 34$
- $\frac{2x+3}{7} = \frac{4x-5}{3}$
- The perimeter of the rectangle is 24cm. Find the value of x .

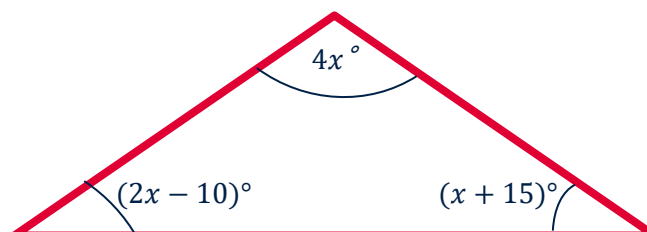


Solving Linear 2



Solve the equations

- $6x + 5 = 47$
- $5x + 7 = x + 25$
- $7(x - 4) = 14$
- $29 - 4x < 22$
- $3x < 2x - 1 < 4x + 2$
Hint: Split into two inequalities
- $19 + 2x = 3x + 15$
- $\frac{3x-1}{5} \geq \frac{3x+5}{2}$
- Find the value of x in the triangle below





Piggy in the Middle

The number in the middle of each group of 3 adjoining cells is the average of its two neighbours.

5			23	
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- What number goes in the right-hand cell?



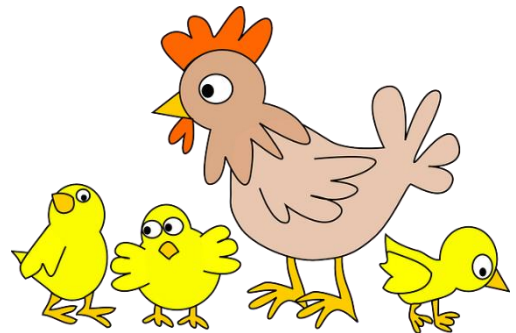
Chicken Run

Victoria has just bought some chickens. She wants to keep them safe in a small enclosure.

The enclosure will be a rectangle where the length is 3m longer than the width.

Victoria has only got 30m of fencing. The area of the enclosure has to be greater than 20m^2 . The length and width are integers.

- How many different size enclosures can Victoria make?





Crack the code

Can you decode this message?

12 1 4 7 5 3 12 4 2 5
7 4 3 3 6 15 4 9 2 6 9 8 4 10

Solve the equations in the boxes below. Each letter will have a different positive integer solution between 0 and 16.

1.
$$\frac{4r}{d-4} + \frac{2h}{s} = 2$$

2.
$$\frac{g-9}{y+4} = \frac{2}{3}$$

3.
$$3rh + m = 13$$

4.
$$\frac{4g}{5} = 12$$

5.
$$\frac{2c-5+3(c-2)}{2c-1} = 2$$

6.
$$e^3 < 72$$

7.
$$\frac{s+3y}{8s} = \frac{3}{4}$$

8.
$$\frac{6k}{s} - 5 = 11$$

9.
$$100 < t^2 < 169$$

10.
$$\frac{8}{3a} = \frac{4}{a+3}$$

11.
$$\frac{6r+8}{y} = 4$$

12.
$$2(3m+4) = 7m+1$$

Hint:

Try solving the equations in the following order:

4, 5, 10, 2, 11, 12, 7, 8, 3, 1, 9, 6



Linear Simultaneous Equations

There are two main ways to solve simultaneous equations.

Elimination

$$3x + 2y = 9$$

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

Add the two equations together to eliminate y

$$8x = 8$$

$$x = 1$$

Now we have a value for x we can put it into one of the original equations to find y

$$3 \times 1 + 2y = 9$$

$$3 + 2y = 9$$

$$2y = 6$$

$$y = 3$$

Substitution

$$y + 3x = 5$$

$$2y + 7x = 11$$

Rearrange the first equation in terms of y and then substitute into the second equation

$$2(5 - 3x) + 7x = 11$$

$$10 - 6x + 7x = 11$$

$$x = 1$$

Now we have a value for x we can put it into one of the original equations to find y

$$y + 3 \times 1 = 5$$

$$y + 3 = 5$$

$$y = 2$$

Which method is best and when?

Solve the following:

1.

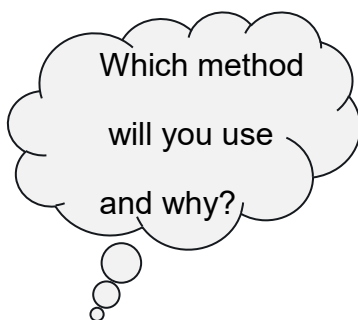
$$2x + y = 7$$

$$2x - y = 1$$

2.

$$3x + 2y = 7$$

$$3x + 5y = 4$$



3.

$$y = 4x + 3$$

$$3x + 2y = 28$$

4.

$$4x + 3y = -4$$

$$6x - 2y = 7$$



Maths at the Movies



Maths movie makes millions!

“Our latest movie ‘Sum-body loves you’ has generated £15 million in online sales and rentals in the first week of it being released”

Simultaneous Studios said at the weekend.

We are unable to tell you how much of that total represents the £6 digital rental versus the £15 cost of purchasing the movie. But we do know there were 1 945 000 transactions overall.

Is there really no way of finding out how many rentals and how many sales there were of the film?

Use what you have learnt so far to calculate how many individual rentals and sales there were of ‘Sum-body loves you’



Taxi!

There are two taxi companies



Initial Charge: $\pounds x$
then
 $\pounds 1$ per mile



Initial Charge: $\pounds 2x$
then
80p per mile

They both charge $\pounds 12$ for a journey of the same distance.

- What is the distance?
- What is the value of x ?



Solving Graphically

Use the graphs to solve these pairs of equations

1. $3x + y = 10$

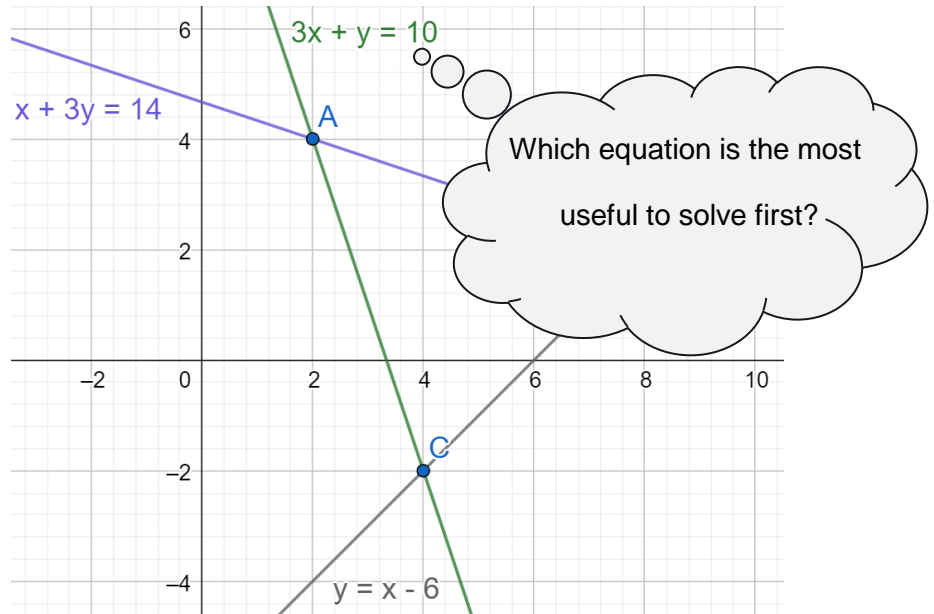
$x + 3y = 14$

2. $y = x - 6$

$3x + y = 10$

3. $x + 3y = 14$

$y = x - 6$



Puzzle to Ponder

Can you explain algebraically why there are no solutions to the simultaneous equations

$$y = 2x + 7$$

$$2y - 4x = 16$$



Triple Simultaneous Equations

Solve:

$$5x + 3y + z = 24$$

$$4y + 2z = 16$$

$$3z = 18$$



Mean Problem

x , y and z satisfy

$$x + y + 3z = 121$$

$$x + 3y + z = 678$$

$$3x + y + z = 356$$

Find the mean of x, y, z , without using a calculator

Hint:

- Write an expression for the mean of x, y, z
- Do you need to find x, y, z separately to find the mean?