Linear equations

Thursday, 3 January 2019 9:13 am

By the end of the lesson I would hope that you have an understanding of the concepts below which you can apply to a number of complex questions:

- How to manipulate linear expressions without fractions
- How to manipulate linear expressions with fractions
- Solve simultaneous linear equations
- Solve worded problems using linear equations

RECAP

We've just started this chapter so how can there be a recap :)

Linear Expressions (A recap)

We have been working with these types of questions for years.
They simply require you to collect like terms.

Example:
Solve $4x - 6 = 3x + 5$

$4x - 6 = 3x + 5$
$4x - 3x - 6 = 5$
$x - 6 = 5$
$x = 11$

Example:
Solve $4(3 - x) - 3(4 + 2x) = 20$

$4(3-x) - 3(4+2x) = 20$
$12 - 4x - 12 - 6x = 20$
$-10x = 20$
$x = \frac{20}{-10}$
$x = -2$

Linear Expressions with fractions

It's strange how everyone seems to hate fractions!
Sadly, this course is littered with them. It's now time to get over the fear and start to love them.
The basic fact is, to remove a fractional component (the denominator) you simply multiply all terms by the denominator you are trying to remove.

Example:
Solve $\frac{3x}{4} - 4 = 17$

$\frac{3x}{4} - 4 = 17$ $\times 4$

$\frac{3x}{1} \times \frac{4}{1}$

$3x - 16 = 68$
$3x = 84$
$x = 28$

Example:
Solve $\frac{2}{3x-1} = \frac{3}{7}$

$\frac{2}{3x-1} = \frac{3}{7}$

$2 = \frac{3}{7} \times (3x-1)$

$2 \times 7 = 3x(3x-1)$

$14 = 9x - 3$

$17 = 9x$

$x = \frac{17}{9}$

$=$

$\frac{2}{(3x-1)} = \frac{3}{7}$

$2 \times 7 = 3 \times (3x-1)$

$14 = 9x - 3$

$x = \frac{17}{9}$

Solving simultaneous linear equations

There are so many ways to solve these types of questions it's staggering.
We can use:

- Elimination
- Substitution
- Matrices
- CAS
- Graphically

As this is a CAS course, I'm going to show you how to use the CAS first!
Then using elimination and substitution.
I'll use the same example for all the methods of solving.

Example:
Solve the equations shown below

$x - 5 = y$
$4y - 2x = -8$

$x = 6 \quad y = 1$

By CAS (shown in video)

Substitution

$y = x - 5$

$4y - 2x = -8$

$4(x-5) - 2x = -8$

$4x - 20 - 2x = -8$

$2x - 20 = -8$

$2x = 12$

$x = 6$

$=$

$y = x - 5$

$y = 6 - 5$

$y = 1$

$=$

Elimination

$x - y = 5 \quad \times 2$

$-2x + 4y = -8$

$-2x + 2y = -10$

$-\ -2x + 4y = -8$

$-2y = -2$

$y = 1$

$=$

$x - y = 5$

$x - 1 = 5$

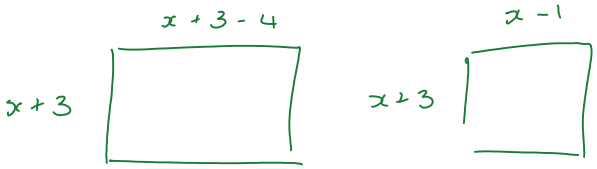
$x = 6$

$=$

Solving worded problems

These types of problems also seem to confuse people.
All good!
We just need to be able to extract the important information from the question and ignore the rest.
But … this takes practice.
It's a skill which is learnt and not something which can come naturally.

Example
The length of a rectangle is 3 cm more than the width. If the length were to be decreased by 4 cm and the width increased by 3 cm, the perimeter would be 28 cm. Calculator the dimensions of the rectangle.



$2(x-1) + 2(x+3) = 28$

$2x - 2 + 2x + 6 = 28$

$4x + 4 = 28$

$4x = 24$

$x = 6$

Width = 6

Length = 9