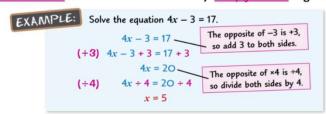## Solving Equations

You're not done with solving equations yet — not by a long shot. This is where it gets really fun*.

Two-Step Equations (3)

If you come across an equation like $4x + 3 = 19$ (where there's an x-term and a number on the same side), use the methods from the previous page to solve it — just do it in two steps:

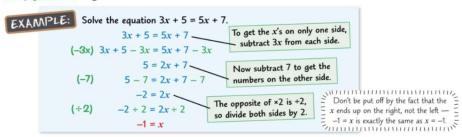1) Add or subtract the number first.   2) Multiply or divide to get 'x = '.

EXAMPLE: Solve the equation $4x - 3 = 17$.

$$4x - 3 = 17$$

The opposite of -3 is $+3$, so add 3 to both sides.

$$(+3) \quad 4x - 3 + 3 = 17 + 3$$
$$4x = 20$$

The opposite of $\times 4$ is $\div 4$, so divide both sides by 4.

$$(\div 4) \quad 4x \div 4 = 20 \div 4$$
$$x = 5$$

Equations with an 'x' on Both Sides (3)

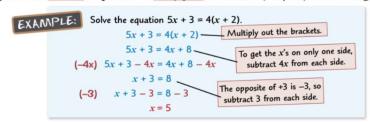For equations like $2x + 3 = x + 7$ (where there's an x-term on each side), you have to:

1) Get all the x's on one side and all the numbers on the other.
2) Multiply or divide to get 'x = '.

EXAMPLE: Solve the equation $3x + 5 = 5x + 7$.

$$3x + 5 = 5x + 7$$

To get the x's on only one side, subtract 3x from each side.

$$(-3x) \quad 3x + 5 - 3x = 5x + 7 - 3x$$
$$5 = 2x + 7$$

Now subtract 7 to get the numbers on the other side.

$$(-7) \quad 5 - 7 = 2x + 7 - 7$$
$$-2 = 2x$$

The opposite of $\times 2$ is $\div 2$, so divide both sides by 2.

$$(\div 2) \quad -2 \div 2 = 2x \div 2$$
$$-1 = x$$

Don't be put off by the fact that the x ends up on the right, not the left — $-1 = x$ is exactly the same as $x = -1$.

Equations with Brackets (4)

If the equation has brackets in, you have to multiply out the brackets (see p.26) before solving it as above.

EXAMPLE: Solve the equation $5x + 3 = 4(x + 2)$.

$$5x + 3 = 4(x + 2)$$

Multiply out the brackets.

$$5x + 3 = 4x + 8$$

To get the x's on only one side, subtract 4x from each side.

$$(-4x) \quad 5x + 3 - 4x = 4x + 8 - 4x$$
$$x + 3 = 8$$

The opposite of $+3$ is -3, so subtract 3 from each side.

$$(-3) \quad x + 3 - 3 = 8 - 3$$
$$x = 5$$

Simultaneous Equations

Simultaneous equations might sound a bit scary, but they're just a pair of equations that you have to solve at the same time. You have to find values of x and y that work in both equations.

Six Steps for Simultaneous Equations (5)

EXAMPLE: Solve the simultaneous equations $2x + 4y = 6$
$$4x + 3y = -3$$

Both your equations should be in the form $ax + by = c$, where a, b and c are numbers.

1. **Label** your equations ① and ②.

$$2x + 4y = 6 \quad - \quad ①$$
$$4x + 3y = -3 \quad - \quad ②$$

2. **Match up the numbers in front** of either the x's or y's in both equations. You may need to multiply one or both equations by a suitable number. Relabel the equations ③ and ④ if you need to change them.

$$① \times 2: \quad 4x + 8y = 12 \quad - \quad ③$$
$$4x + 3y = -3 \quad - \quad ②$$

You don't need to change equation 2 for this example.

3. **Add or subtract the two equations** to eliminate the terms with the same number in front.

$$③ - ②: \quad 4x + 8y = 12$$
$$- \quad 4x + 3y = -3$$
$$0x + 5y = 15$$

If the numbers have the same sign (both +ve or both −ve) then subtract. If the numbers have opposite signs (one +ve and one −ve) then add.

4. **Solve** the resulting equation.

$$5y = 15 \quad \Rightarrow \quad y = 3$$

5. **Substitute** the value you've found back into equation ① and solve it.

Sub $y = 3$ into ①: $\quad 2x + (4 \times 3) = 6 \quad \Rightarrow \quad 2x + 12 = 6 \quad \Rightarrow \quad 2x = -6 \quad \Rightarrow \quad x = -3$

6. **Substitute** both these values into equation ② to make sure it works. If it doesn't then you've done something wrong and you'll have to do it all again.

Sub x and y into ②: $\quad (4 \times -3) + (3 \times 3) = -12 + 9 = -3$, which is right, so it's worked.

So the solutions are: $\quad x = -3, \quad y = 3$

How do we use Knowledge Organisers in Mathematics?

How can you use knowledge organisers at home to help us?

- **Retrieval Practice**: Read over a section of the knowledge organiser, cover it up and then write down everything you can remember. Repeat until you remember everything.
- **Flash Cards**: Using the Knowledge Organisers to help on one side of a piece of paper write a question, on the other side write an answer. Ask someone to test you by asking a question and seeing if you know the answer.
- **Mind Maps**: Turn the information from the knowledge organiser into a mind map. Then reread the mind map and on a piece of paper half the size try and recreate the key phrases of the mind map from memory.
- **Sketch it**: Draw an image to represent each fact; this can be done in isolation or as part of the mind map/flash card.
- **Teach it**: Teach someone the information on your knowledge organiser, let them ask you questions and see if you know the answers.

How will we use knowledge organisers in Mathematics?

Knowledge organisers will be used before I complete a Learning Check or Common Assessment. I will spend part of the lesson looking over each of the key topics of the half term before completing the Learning Check or Common Assessment.

I will also use these at home to complete my own independent learning and revision of these key topics.

GLUE HERE