BASIC 9

WEEKLY LESSON PLAN – WEEK 4

Strand:	Algebra	**Sub-Strand:**	Algebraic Expressions		
Content Standard:	B9.2.2.1 Demonstrate an understanding of (i) change of subject (ii) substituting values to evaluate expressions, and (iii) factorize expressions that have simple binomial as a factor.				
Indicator (s)	B9.2.2.1.1 Perform change of subject of a given formula and use it to solve problems.	**Performance Indicator:** Learners can solve change of subject questions.			
Week Ending	02-02-2024				
Class	B.S.9	**Class Size:**		**Duration:**	
Subject	Mathematics				
Reference	Mathematics Curriculum, Teachers Resource Pack, Learners Resource Pack, Textbook.				
Teaching / Learning Resources	Poster, Pictures, video, Charts	**Core Competencies:**	• Critical Thinking and Problem Solving • Communication and Collaboration.		

DAY/DATE	**PHASE 1 : STARTER**	**PHASE 2: MAIN**	**PHASE 3: REFLECTION**
MONDAY	Demonstrate on solving change of subject questions with given formulae.	1. Assist Learners to use change of subject concept to make variables the subjects in equations. 2. Discuss with the Learners on how to use the concept of change of subject to solve problems involving formulae. 3. Leaners in small groups to discuss and solve more examples of using the concept of change of subject to solve word problems. **Make x The Subject** Here we will learn about **making x the subject** of an equation or a formula. There are also rearranging equations worksheets based on Edexcel, AQA and OCR exam questions, along with further guidance on where to go next if you're still stuck.	Through questions and answers, conclude the lesson. **Exercise** Make x the subject of the formula. i. y=6(x+8) ii. 3p=x2−4b iii. 6g=7x−8 iv. y=5x4x−f v. 3y=x+36−2x

What does it mean to make x the subject?

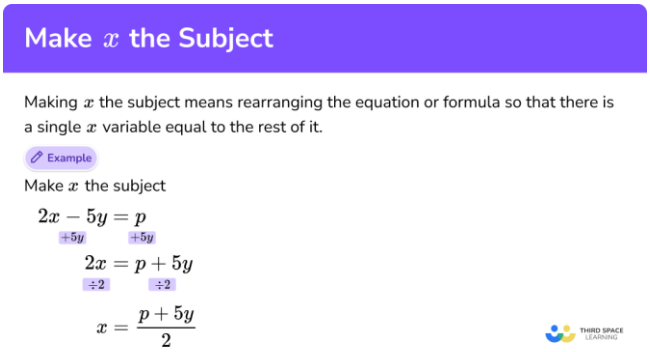
Making x the subject of a formula or equation means rearranging the equation or formula so that we have a single x variable equal to the rest of it.

For example,

Make x the subject.

Step-by-step guide: Rearranging equations

What does it mean to make x the subject?



How to make x the subject

In order to make x the subject:

Isolate the variable by:

– Removing any fractions by multiplying by the denominator(s).

– Dividing by the coefficient of the variable.

– Adding or subtracting terms near to the variable.

– Taking a root or power of both sides of the equation.

Rearrange the equation so each term containing x is

		on the same side of the =. Factorisation may be needed if there are multiple terms containing x. E.g. factorise 2x + 3xy to x(2+3y) ***not always required**** Perform an operation to ensure only a single x variable is left as the subject.	
WEDNESDAY	Through questions and answers, review Learners knowledge on the previous lesson.	1. Demonstrate on making a variable the subject in equations using one or two inverse steps to achieve. 2. Assist Learners to use more than 2 inverse steps to make a variable the subject in equations. 3. Learners brainstorm to solve more examples of making a variable the subject in equations using more than 2 inverse steps. **Change of subject question. Make 'a' the subject of** **the formula v = u + at.** Rule: An equation must be balanced. Therefore, in order to keep the equation balances, what you do to one side you must do to the other side. Change of subject questions require you to isolate the required letter on one side of the equation. In change of subject question such as the one above 'v = u + at', first you need to realise that the equation is the same as +v= +u + ((+a)x(+t)). To begin with to remove the 'u' from the right hand side of the equation we should subtract the 'u' and thus given our rule of balanced equations we should	Assign change of subject questions to Learners in small groups. **Exercise** **1.** Rearrange $2x=y/w$ to make w the subject. 2. Make p the subject of the formula: $m=4x-2p$ **3.** Rearrange $y=x/3+9$ to make x the subject.

		do the other side as well. (v - u = u - u + at) and this is equal to (v-u=at). Then to remove the 't' from the right hand side of the equation we should divide the 't'. We divide because to get rid of a 'x t' we need to divide 't' and thus given our rule of balanced equations we should do that to the other side as well. (v - u)/t = (at)/t >>>>>>>>>> t/t =1 ((v - u)/t = 1a (v - u)/t = a	
FRIDAY	Demonstrate on how the change the subject of the formula when the variable you want to isolate is on both sides	1. Leaners brainstorm to solve examples of equations with the variables is on both sides. 2. Assist Learners to change the subject of a formula with squares and square roots. 3. Discuss with the Learners about how to solve equations of change of subject involving multiplications and factorizations. **Factoring in Algebra** **Factors** Numbers have <u>factors</u>: And expressions (like **x^2+4x+3**) also have factors: **Factoring** Factoring (called "**Factorising**" in the UK) is the process of **finding the factors**: Factoring: Finding what to multiply together to get an expression. It is like "splitting" an expression into a multiplication of simpler expressions. Example: factor 2y+6 Both 2y and 6 have a common factor of 2: • 2y is 2×y • 6 is 2×3 So we can factor the whole expression into: 2y+6 = 2(y+3)	Through questions and answers, conclude the lesson. **Exercise;** Expand the following; 1. 3 × (5+2) 2. (x + 2y)(3x − 4y) 3. 9 (y + 2y) 4. 2w x 5(3w + 3) **5.** 2x(1- 4y)

So **2y+6** has been "factored into" **2** and **y+3**

Factoring is also the opposite of Expanding:

Common Factor

In the previous example we saw that 2y and 6 had a common factor of **2**

But to do the job properly we need the **highest common factor**, including any variables

Example: factor $3y^2+12y$

Firstly, 3 and 12 have a common factor of 3.

So we could have:

$$3y^2+12y = 3(y^2+4y)$$

But we can do better!

$3y^2$ and 12y also share the variable y.

Together that makes 3y:

- $3y^2$ is $3y \times y$
- 12y is $3y \times 4$

So we can factor the whole expression into:

$$3y^2+12y = 3y(y+4)$$

Check: **$3y(y+4) = 3y \times y + 3y \times 4 = 3y^2+12y$**

More Complicated Factoring

Factoring Can Be Hard !

The examples have been simple so far, but factoring **can** be very tricky.

Because we have to figure **what got multiplied** to produce the expression we are given!

? x ? = 

It is like trying to find which ingredients
went into a cake to make it so delicious.
It can be hard to figure out!

Experience Helps

With more experience factoring becomes easier.

Example: Factor **$4x^2 - 9$**

Hmmm... there don't seem to be any common factors.

But knowing the Special Binomial Products gives us a clue called the **"difference of squares"**:

Because **$4x^2$** is **$(2x)^2$**, and **9** is **$(3)^2$**,

So we have:

$$4x^2 - 9 = (2x)^2 - (3)^2$$

And that can be produced by the difference of squares formula:

$$(a+b)(a-b) = a^2 - b^2$$

Where **a** is 2x, and **b** is 3.

So let us try doing that:

$$(2x+3)(2x-3) = (2x)^2 - (3)^2 = 4x^2 - 9$$

Yes!

So the factors of **$4x^2 - 9$** are **$(2x+3)$** and **$(2x-3)$**:

Answer: $4x^2 - 9 = (2x+3)(2x-3)$

How can you learn to do that? By getting lots of practice, and knowing "Identities"!

Remember these Identities

Here is a list of common "Identities" (including the **"difference of squares"** used above).

It is worth remembering these, as they can make factoring easier.

$$a^2 - b^2 = (a+b)(a-b)$$

$$a^2 + 2ab + b^2 = (a+b)(a+b)$$

$$a^2 - 2ab + b^2 = (a-b)(a-b)$$

$$a^3 + b^3 = (a+b)(a^2-ab+b^2)$$

$$a^3 - b^3 = (a-b)(a^2+ab+b^2)$$

$$a^3+3a^2b+3ab^2+b^3 = (a+b)^3$$

$$a^3-3a^2b+3ab^2-b^3 = (a-b)^3$$

There are many more like those, but those are the most useful ones.

Advice

The factored form is usually best.

When trying to factor, follow these steps:

- "Factor out" any common terms
- See if it fits any of the identities, plus any more you may know
- Keep going till you can't factor any more

There are also Computer Algebra Systems (called "CAS") such as *Axiom, Derive, Macsyma, Maple, Mathematica, MuPAD, Reduce* and others that can do factoring.

More Examples

Experience does help, so here are more examples to

help you on the way:

Example: $w^4 - 16$

An exponent of 4? Maybe we could try an exponent of 2:

$$w^4 - 16 = (w^2)^2 - 4^2$$

Yes, it is the difference of squares

$$w^4 - 16 = (w^2 + 4)(w^2 - 4)$$

And "$(w^2 - 4)$" is another difference of squares

$$w^4 - 16 = (w^2 + 4)(w + 2)(w - 2)$$

That is as far as I can go (unless I use imaginary numbers)

Example: $3u^4 - 24uv^3$

Remove common factor "3u":

$$3u^4 - 24uv^3 = 3u(u^3 - 8v^3)$$

Then a difference of cubes:

$$3u^4 - 24uv^3 = 3u(u^3 - (2v)^3)$$

$$= 3u(u-2v)(u^2+2uv+4v^2)$$

That is as far as I can go.

Example: $z^3 - z^2 - 9z + 9$

Try factoring the first two and second two separately:

$$z^2(z-1) - 9(z-1)$$

Wow, (z-1) is on both, so let us use that:

$$(z^2-9)(z-1)$$

And z^2-9 is a difference of squares

$$(z-3)(z+3)(z-1)$$

That is as far as I can go.

Name of Teacher: **School:** **District:**