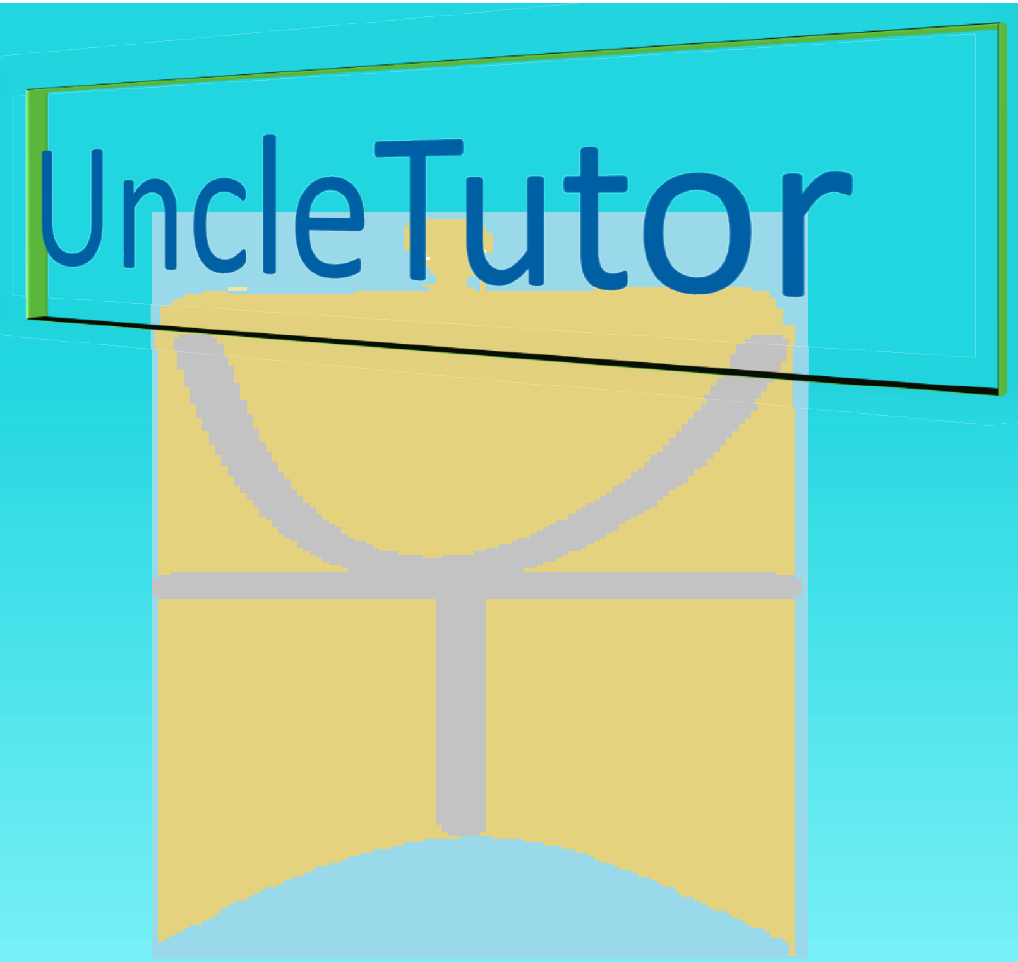

Algebra Leccture 1

Change Of Formula

What Is a Formula?

A formula is a mathematical equation containing two or more letters.

e.g

$$2x = 3a$$

We could write this formula as

$$x = \frac{3a}{2}$$

in this case we would say that x is the subject of the formula
or that x is given/written in terms of a .

Alternatively we could have written the formula as

$$a = \frac{2x}{3}$$

in this case we would say that a is the subject of the formula
or that a is given/written in terms of x .

Changing the Subject of a Formula

The rules are the same as when we solved equations except we do not end up with a solution but with another formula.

Example
make x the subject of the formula in

$$a+3x=b+c$$

Solution

$$a+3x=b+c$$

$$3x=b+c-a$$

subtracting a from both side

$$\frac{3x}{3}=\frac{b+c-a}{3}$$

dividing both side by 3

$$x=\frac{b+c-a}{3}$$

Formulae with Brackets and fractions

If the letter you are rearranging for is in a bracket, then you can approach the rearranging in one of two ways.

either expand the bracket and rearrange or, divide and rearrange

Example: Make x the subject of the formula

$$a(x+b)=c$$

1st approach

$$a(x+b)=c$$

$$ax+ab=c \quad \text{Expand the bracket}$$

$$ax=c-ab \quad \text{rearrange}$$

$$\frac{ax}{a}=\frac{c}{a}-\frac{ab}{a} \quad \text{Divide through by a}$$

$$x=\frac{c}{a}-b$$

2nd Approach

$$a(x+b)=c$$

$$\frac{a}{a}(x+b)=\frac{c}{a} \quad \text{Divide through by a}$$

$$x+b=\frac{c}{a}$$

$$x=\frac{c}{a}-b \quad \text{rearrange}$$

To remove fractions in formulae, first multiply by the appropriate number or letters,

remember that the fraction bar acts as a bracket,

put the brackets in when appropriate.

Example : make x subject of the formula

$$\frac{x}{a}=1+\frac{1}{b}$$

Solution

$$\frac{x}{a} = 1 + \frac{1}{b}$$

$$x = a\left(1 + \frac{1}{b}\right)$$

$$x = a\left(1 + \frac{1}{b}\right)$$

$$x = a + \frac{a}{b}$$

Need For Factorization

If there is more than one term then there is need to factorize.

Example: make x Subject of the formula

$$ax + b = cx + d$$

Solution

$$ax + b = cx + d$$

$$ax - cx = d - b$$ Collection of like terms

$$(a - c)x = d - b$$ factorization

$$x = \frac{(d - b)}{(a - c)}$$ Divide through by (a-c)

Formulae Involving Roots and Powers

If $x^2 = a$ Then, $x = \pm\sqrt{a}$

when rearranging an equation or a formula you will often need to 'undo' a square or a cube
In order to do this you will need to square root or cube root

To 'undo' square roots or cube roots, you need to square or cube.

Example: Make x the subject of the formula

$$\sqrt{x} - 3 = a$$

Solution

$$\sqrt{x} - 3 = a$$

$$\sqrt{x} = a + 3 \qquad \textit{Rearranging}$$

$$(\sqrt{x})^2 = (a+3)^2 \qquad \textit{Undoing the square roots by taking the square of both side}$$

$$x = (a+3)^2$$

Make r the subject of the formula in

$$A = 4\pi r^2$$

Solution

$$A = 4\pi r^2$$

$$\frac{A}{4\pi} = \frac{\cancel{4\pi} r^2}{\cancel{4\pi}}$$ *Divide through by* 4π

$$\frac{A}{4\pi} = r^2$$

$$\sqrt{\frac{A}{4\pi}} = \sqrt{r^2}$$ *Undo the squares by taking square roots of both side*

$$r = \sqrt{\frac{A}{4\pi}}$$