Manipulation of Algebraic Expressions

Manipulating Formula

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- A formula is a statement that two quantities are equal. E.g.

$$S = \frac{a}{1-r}$$

- **Transposing formula** involves the manipulation of the formula when a value other than the subject is required. For example if the value ***'a'*** is required in the above formula it would read as follows:

$$a = S(1-r)$$

Manipulating Formula

Basic Rule of Manipulating of Formula:

1. **That the equality of an equation must be maintained**
2. **Whatever is done on the left hand side must be done on the right hand side**

Manipulating Formula

Problem 1:

Manipulate $k=x+y+z$ to make y the subject.

Firstly, change the equation around so that y is on the LHS:

$$x+y+z=k$$

Subtract x+z from both sides to get the y isolated

$$x-x+y+z-z=k-x-z$$

$$y=k-x-z$$

This proves that a quantity can be moved from one side of an equation to the other with a simple change of sign.

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Problem 2:

If $a+b = p-q-s$ express q as the subject.

Rearrange: $p-q-s = a+b$

Multiply both sides by -1:

$$(-1)p-q-s=(-1)\ a+b$$

$$-p+q+s=-a-b$$

$$q=p-s-a-b$$

Multiplying across the equation by -1 resulted in all signs changing.

The reason for multiplying by -1 was to change the –q to +q as we generally express answers with a positive quantity first i.e. in this case q.

Manipulating Formula

Problem 3:

Make d the subject matter of the formula: p = $\frac{\pi d}{2}$

Rewrite as $\frac{\pi d}{2}$ = p

Multiply both sides by 2:πd = 2p

Divide both sides by π to obtain d = $\frac{2p}{\pi}$

Multiplication is used to change a formula, which includes a fraction, to whole numbers (also called integers). To remove π from the d in the above example, we divide both sides by π.

Manipulating Formula

Problem 4:

The formula for calculating the surface area of a sphere is: $A = 4\pi r^2$

Make r (radius) the subject matter of this formula.

$4\pi r^2 = A$

$r^2 = \frac{A}{4\pi}$ Divide by 4π both sides to isolate r^2

$r = \sqrt{\frac{A}{4\pi}}$ To obtain r, square root both sides

If you have an element which is cubed, you would cube root it and so on.