Formula – Y11 Foundation – Unit 3

What do I need to be able to do?

By the end of this unit you should be able to:

- Writing a formula
- Substituting into a formula (positive numbers)
- Substitute negative and fractional numbers into formulae
- Change the subject of a formula when one step is required
- Change the subject of a formula when a two steps are required

Vocabulary

Substitution: Replace the letter with a given value
Formula: expresses the relationship between two or more unknown values
Subject: The variable of a formula that is being worked out.
Re-arrange: To change the position or order of
Fractional: Expressed as or contains a fraction
Positive: A number greater than zero
Negative: A number less than zero

Substitution

This is the next level of function machines, where expressions and formulae replace the machine

If $t = 7$, find $4t$

Remember 4t means 4 'lots of' t, therefore the question is asking us for 4 'lots of' 7

So $4t = 4 \times 7$
$= 28$

If $a = 2$ and $b = 4$, find $3a - 2b$

So $3a - 2b$
$= 3 \times 2 - 2 \times 4$
$= 6 - 8$
$= -2$

Remember to keep the values in the right order

Writing a formula

A plumber has a call out fee of £40, plus an hourly rate of £18

With this information, we can write a formula to calculate the price of any job.

$T = 40 + 18h$

- T: Total price of the job
- 40: Represents the £40 which is a fixed price
- 18: The hourly rate of £18
- h: The number of hours worked. (We substitute here)

£18 is multiplied by the number of hours worked. We then add this to £40 to give the total cost

Changing the subject of a formula (1-step)

We can re-arrange the formula to make 'a' the subject
(This means having 'a' on it's own on one side)

$a + 5 = c$

$-5 \quad -5$

$a = c - 5$

The +5 and -5 cancel to leave 'a' on its own

To get rid of the +5 we do the inverse operation which is -5. We must do this to both sides to balance the formula

We MUST do the same thing to both sides

Changing the subject of a formula (2-steps)

We can re-arrange the formula to make 'a' the subject

$2a + 5 = c$

STEP 1
Take 5 from both sides - *We do this first*

$-5 \quad -5$

$2a = c - 5$

STEP 2
Divide both sides by 2 – *This will mean 'a' is on its own as the subject of the formula*

$\div 2 \quad \div 2$

$a = \frac{c - 5}{2}$

We **MUST** do the **SAME** thing to both sides

Substituting into a formula (positive numbers)

The total cost of a plumbing job is given by the formula below.

$T = 40 + 18h$

T = total cost of the job
h = hours worked

If a job took 2 hours.....

We can substitute into this formula to find the cost of any job

$T = 40 + 18h$
$T = 40 + (18 \times 2)$ — We substitute (swap) h for 2
$T = 40 + 36$
$T = 76$ — The total cost of the job is £76

Substituting into a formula (fractions)

The total cost of a plumbing job is given by the formula below.

$T = 40 + 18h$

T = total cost of the job
h = hours worked

If a job took ½ an hour.....

Multiplying by ½ is the same as dividing by 2

$T = 40 + 18h$
$T = 40 + (18 \times \frac{1}{2})$ — We substitute (swap) h for ½
$T = 40 + 9$
$T = 49$ — The total cost of the job is £49

Substituting into a formula (negatives)

The formula converts temperature from centigrade to Fahrenheit

$F = \frac{9}{5}C + 32$

F = temperature in Fahrenheit
C = temperature in centigrade

If the temperature is -10°C we substitute C for -10

$F = (\frac{9}{5} \times -10) + 32$

We divide -10 by 5 and multiply by 9

$F = -18 + 32$
$F = 14°$

$-10 \div 5 = -2$
$-2 \times 9 = -18$

Negative ÷ positive
OR
Negative x positive
= negative answer

Notes