Simple Linear Equations (Ref: Croft & Davison Ch.14)

In this context the word *simple* means 1 variable only. This gives an equation which is satisfied by one value only for the variable.

Eg. $3x = 6 \quad \therefore \; x = 2$

Linear means that the power of the variable in the equation is no greater than 1 in any term

Eg. $3x^1 = 6$ (linear) $3x^2 = 12$ (quadratic)

Any mathematical operation can be carried out on an equation provided the same is done to both sides. In attempting to solve an equation the aim is to end up with the variable on one side of the = sign and everything else on the other.

Eg. 1 $3x + 2 = 8$ subtracting 2 from each side will give

$3x + 2 - 2 = 8 - 2$ tidying up gives

$3x = 6$ dividing each side by 3 gives

$\frac{3x}{3} = \frac{6}{3}$ tidying up gives

$x = 2$

Eg. 2 $\frac{3a}{5} + 4 = 10$ subtracting 4 from each side will give

$\frac{3a}{5} + 4 - 4 = 10 - 4$ tidying up gives

$\frac{3a}{5} = 6$ multiplying both sides by 5 gives

$\frac{3a \times 5}{5} = 6 \times 5$ tidying up gives

$3a = 30$ dividing both sides by 3 gives

$\frac{3a}{3} = \frac{30}{3}$ tidying up gives

$a = 10$

If the variable appears within bracketed terms, the brackets must be multiplied out first

Eg. $3(x + 4) = 2(2x + 5)$ multiplying out brackets gives

$3x + 12 = 4x + 10$ subtracting 12 from each side gives

$3x + 12 - 12 = 4x + 10 - 12$ tidying up gives

$3x = 4x + -2$ subtracting $4x$ from each side gives

$3x - 4x = 4x - 2 - 4x$ tidying up gives

$-x = -2$ changing signs both sides gives

$x = 2$

NB remember the equation is not solved until a numerical value for x (not $-x$) has been determined.

In practice, after working out the brackets, all terms with the variable are needed on one side of the = sign, with everything else on the other side. Instead of subtracting several terms from each side and tidying up, a short cut is to move each individual term from one side of the = sign to the other and changing its sign (positive to negative or visa versa).

Eg. $3x + 2 - 5 + 4x = 5x + 4 + 2x - 5 - 3x + 7$ gives

$3x + 4x - 5x - 2x + 3x = 4 - 5 + 7 - 2 + 5$ tidying up gives

$3x = 9$

$\therefore x = 3$

Eg. $2(3x + 1) - 4(x + 2) = 3(x + 3) - 4(x + 2)$

$6x + 2 - 4x - 8 + = 3x + 9 - 4x - 8$

$6x - 4x - 3x + 4x = 9 - 8 - 2 + 8$

$3x = 7$

$x = \frac{7}{3}$

NB the value of x need not be a whole number!

Simple Linear Equations - Worksheet 1

Find the numerical value of the letter in each of the following equations

1. $3m - 4 + 5m = 2m + 20$
2. $3x - 2 - 5x = 2x - 4$
3. $20x - 3 + 3x = 11x + 5 - 8$
4. $4a + 3a - 6 = 2a + 3a + 4$
5. $16 = 4(x + 2)$
6. $6(x + 3) = 24$
7. $3(4y + 1) = 27$
8. $-3(4a - 2) = -6$

Simple Linear Equations - Worksheet 2

Find the numerical value of the letter in each of the following equations

1. $3(2 - 3y) + 12y = 24$
2. $\frac{1}{4}x + 8 = 16$
3. $\frac{3}{4}x - 2 = 7$
4. $\frac{1}{2}x + 2x = \frac{1}{4}x + 9$
5. $3(x + 1) + 2(x - 4) = 5$
6. $5(x - 2) - 3(2x + 5) + 15 = 0$
7. $5(x + 6) - 3x = 45$
8. $2(x - 1) + 3(2x + 3) = 31$