

## 21 - Algebraic Fractions and functions

$$\frac{m}{m} = 1$$

$$\frac{10x^2y^2}{5x^{-4}y} = 2x^{-2}y$$

$$\frac{x^2}{x} = x$$

$$\frac{3x - x^2}{6 - 2x} = \frac{x(3 - x)}{2(3 - x)} = \frac{x}{2}$$

In order to simplify some algebraic fractions, we must factorise and then cancel the brackets, as you can cancel multiplied values, but not addition/subtraction.

$\frac{6x+36}{x-6}$  — Because it is a +, we cannot cancel the x across the fraction, unless both the numerator values had an x, so the fraction cannot simplify further.

- +/- fractions — make denominator the same/cross multiply
- x fractions — direct across:  $\frac{\text{numerator} \times \text{numerator}}{\text{denominator} \times \text{denominator}}$
- ÷ fractions — Keep, change flip

### Inverse Functions

$$f(x) = \frac{x+9}{4}$$

1. Replace f(x) with y
2. Make x the subject
3. Replace x with **f<sup>-1</sup>(x)**
4. Replace y with x

$$y = \frac{x+9}{4}$$

$$x = 4y - 9$$

$$f^{-1}(x) = 4x - 9$$

### Composite functions

Fg(x) or gf(x)

$$f(x) = x^2 \quad g(x) = x + 3$$

fg(2):

1.  $g(2) = 2 + 3 = 5$
2.  $f(5) = 5^2 = 25$

- Function on right comes **first** (closest to x) — right to left (like Chinese)
- Then use the product of the first function in the second function
- Or — replace x in second function with first function

e.g. — fg(x)

$$g(x) = x^4 \quad f(x) = -9x+3$$

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

### Iteration

1. Re-arrange to make an x the subject
2. Make subject x x<sub>n+1</sub> — make other x x<sub>n</sub>
3. Substitute in given value of x (either x<sub>0</sub> or x<sub>1</sub>) in x<sub>n</sub> to produce first result— depends on what question gives you
4. This is your first answer — now replace x<sub>n</sub> to find the next value
5. replace x<sub>n</sub> with ans to find each next value quickly

$$x_{n+1} = 18 - 7x_n$$

$$x_1 = 2$$

$$x_2 = 18 - 7(2) = 4$$

$$x_3 = 18 - 7(4) = -10$$