Simplify algebraic fractions

Factorise the numerator and denominator if possible, divide by the common factors.

Eg. $\dfrac{x^2 + 5x + 4}{2x + 8}$

$= \dfrac{\cancel{(x+4)}(x+1)}{2\cancel{(x+4)}}$

What careers would use these skills?

Surds are used when calculations need to be precise eg. Engineers.

Simplify surds

Split the surd into two factors, one must be a square number to be able to simplify. Eg.

$$\sqrt{50} = \sqrt{25 \times 2}$$
$$= \sqrt{25} \times \sqrt{2}$$
$$= 5 \times \sqrt{2}$$
$$= 5\sqrt{2}$$

Rationalise the denominator

Means remove the surd from the denominator, do this by multiplying.

$$\frac{1}{\sqrt{7}} = \frac{1}{\sqrt{7}} \times \frac{\sqrt{7}}{\sqrt{7}} = \frac{\sqrt{7}}{7}$$

$$\frac{1}{5 + \sqrt{2}} = \frac{1}{5 + \sqrt{2}} \times \frac{5 - \sqrt{2}}{5 - \sqrt{2}}$$
$$= \frac{5 - \sqrt{2}}{3}$$

Add or subtract algebraic fractions

You need to have a common denominator to be able to add or subtract fractions.

$$\frac{a}{b} \pm \frac{c}{d} = \frac{ad}{bd} \pm \frac{bc}{bd}$$
$$= \frac{ad \pm bc}{bd}$$

Divide algebraic fractions

Multiply the first fraction by the reciprocal of the second fraction.

$$\frac{a}{b} \div \frac{c}{d} = \frac{a}{b} \times \frac{d}{c}$$
$$= \frac{ad}{bc}$$

Multiply algebraic fractions

Multiply the numerators together and then the denominators.

$$\frac{a}{b} \times \frac{c}{d} = \frac{ac}{bd}$$

Composite functions

A combination of two or more functions to create a new function.

fg (x) is a composite function that substitutes the function g (x) into the function f (x).

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Change subject of the formula

Use inverse operations on both sides of the formula (balancing method) until you find the expression for the letter.

Eg. Make x the subject of $y = \frac{2x-1}{z}$

Multiply both sides by z
$$yz = 2x - 1$$
Add 1 to both sides
$$yz + 1 = 2x$$
Divide by 2 on both sides
$$\frac{yz + 1}{2} = x$$
We now have x as the subject.

Inverse functions

A function that performs the opposite process of the original function, it is written as f^{-1} (x)

1. Write the function as y = f (x)

2. Rearrange to make x the subject

3. Replace the y with x and the x with f^{-1} (x)

Eg. $f(x) = (1 - 2x)^5$
Find the inverse.

$$y = (1 - 2x)^5$$
$$\sqrt[5]{y} = 1 - 2x$$
$$1 - \sqrt[5]{y} = 2x$$
$$\frac{1 - \sqrt[5]{y}}{2} = x$$

$$f^{-1}(x) = \frac{1 - \sqrt[5]{x}}{2}$$