Algebaric Simplification

1 Substitution

In algebra, the operation of substitution is applied in contexts involving variables; the operation consists of replacing occurrences of some symbol by given values.

1.1 Example

It is given that $f(x, y) = \dfrac{x}{2x + y} - \dfrac{y}{x}$, compute $f(5, -2)$.

$$\begin{aligned} f(5, -2) &= \frac{5}{2(5) + (-2)} - \frac{5}{-2} \\ &= \frac{5}{10 - 2} - \frac{5}{2} \\ &= \frac{5}{8} + \frac{20}{8} \\ &= \boxed{\frac{25}{8}} \end{aligned}$$

2 Multiplication and Division

Simplify each of the following.

$$3a \times 5a$$

$$27a \div 9b \times 3c$$

3 Expansion

Expand and Simplify $2(a+b) - 3(2a-b)$.

$$\begin{aligned} 2(a+b) - 3(2a-b) &= 2a + 2b - (6a - 3b) \\ &= 2a + 2b - 6a + 3b \\ &= 2a - 6a + 2b + 3b \\ &= \boxed{-4a + 5b} \end{aligned}$$

4 Fraction

Express $\dfrac{x-2}{4} + \dfrac{2x-2}{6}$ as a single fraction in its simplest form.

$$\begin{aligned} \frac{x-2}{4} + \frac{2x-2}{6} &= \frac{3(x-2)}{12} + \frac{2(2x-2)}{12} \\ &= \frac{3x - 6 + 4x - 4}{12} \\ &= \boxed{\frac{7x - 10}{12}} \end{aligned}$$

5 Factorisation

Identify the HCF of each of the following and factorise the expressions.

$$12xy - 36yz$$

$$4x - 8x^2$$