

Sri Lanka Institute of Information Technology

IT0060 –Essential Mathematics

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Algebraic Fractions

Fractions

- A fraction represents a part of a whole.
- It has two parts:
 - Numerator → number of parts taken
 - Denominator → total number of equal parts
- Example:

$$\frac{3}{5}$$

- 3 = parts taken
- 5 = total equal parts

Equivalent Fractions

- Fractions that look different but have the **same value** are called **equivalent fractions**.
- We get equivalent fractions by **multiplying or dividing both numerator and denominator by the same non-zero number**.
- **Example:**

$$\frac{1}{2} = \frac{2}{4} = \frac{3}{6}$$

Simplifying Numerical Fractions

- Simplifying means reducing a fraction to its **lowest terms**.
- **Steps:**
 - Find the **greatest common factor (GCF)**
 - Divide both numerator and denominator by the GCF

- **Example:**

$$\frac{12}{18}$$

- GCF of 12 and 18 = 6

$$\frac{12 \div 6}{18 \div 6} = \frac{2}{3}$$

Operations with Numerical Fractions: Addition & Subtraction

- Denominators must be the **same**.

- **Example:**

$$\frac{1}{4} + \frac{2}{4} = \frac{3}{4}$$

- If denominators are different:

$$\frac{1}{2} + \frac{1}{3} = \frac{(1 \times 3) + (1 \times 2)}{6} = \frac{5}{6}$$

Operations with Numerical Fractions: Multiplication

- **Multiplication**

- Multiply numerators and denominators directly.

- **Example:**

$$\frac{2}{3} \times \frac{4}{5} = \frac{8}{15}$$

- **Division**

- Multiply by the **reciprocal**.

- **Example:**

$$\frac{3}{4} \div \frac{2}{5} = \frac{3}{4} \times \frac{5}{2} = \frac{15}{8}$$

Algebraic Fractions

- **Algebraic Fractions**

- A fraction where both numerator and denominator are polynomial expressions. $\frac{2x-3}{x+1}$

- **Polynomial Properties**

- **Degree** : The power of the highest term in x
 - **Coefficient** : The number in front of x in each term
- Example: $5x^4 + 6x^3 + 7x + 4$
Degree = 4, Coefficient of $x^4 = 5$

Simplifying Algebraic Fractions

- Cancel common factors from numerator and denominator

Example 1

$$\frac{3x}{6x} = \frac{\cancel{3} \cancel{x}}{\cancel{6} \cancel{x}} = \frac{3}{6} = \frac{1}{2}$$

Example 2

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

Example 3

Solve $x^2 - 2x + 1$ and $x^2 + 2x - 3$

$$\frac{x^2 - 2x + 1}{x^2 + 2x - 3} = \frac{(x-1)\cancel{(x-1)}}{(x+3)\cancel{(x-1)}}$$

$$= \frac{(x-1)}{(x+3)}$$

Adding Algebraic Fractions

- **Example:** $\frac{2}{(x-3)} + \frac{1}{(2x+1)}$
 - Step 1: Find common denominator: $(x-3)(2x+1)$
 - Step 2: Rewrite each fraction

$$\frac{2(2x+1)}{[(x-3)(2x+1)]} + \frac{(x-3)}{[(x-3)(2x+1)]}$$

- Step 3: Combine

$$\frac{4x+2+x-3}{[(x-3)(2x+1)]} = \frac{5x-1}{[(x-3)(2x+1)]}$$

Exercises

- Simplify these algebraic fractions.

$$1. \frac{1}{x+1} + \frac{4}{x-2}$$

$$2. \frac{3x+1}{4} + \frac{2x-1}{3}$$

$$3. \frac{x-2}{4} \times \frac{12}{2c-4}$$

$$4. \frac{v+3}{2} \div \frac{3v+9}{5}$$

$$5. \frac{v+3}{15} \div \frac{v^2+3v}{25}$$

$$6. \frac{4x^2-25}{6x^2-11x-10}$$

7. Given,

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

$$y = \frac{ac}{4}$$

$$z = \frac{a^2}{2c+1}$$

Find an expression for;

(a) $x + y$

(b) $\frac{xy}{z}$