Fractions

1. **Adding Fractions:** To add two fractions, you must first express both fractions using a common denominator.

$$\frac{1}{5} + \frac{2}{3} = \frac{1 \cdot 3}{5 \cdot 3} + \frac{2 \cdot 5}{3 \cdot 5} = \frac{3}{15} + \frac{10}{15} = \boxed{\frac{13}{15}}$$

   This works for fractions with variables also:

   Example: Add: $\frac{1}{x} + \frac{1}{y}$

   Answer: $\frac{1}{x} + \frac{1}{y} = \frac{1 \cdot y}{x \cdot y} + \frac{1 \cdot x}{y \cdot x} = \frac{y}{xy} + \frac{x}{xy} = \boxed{\frac{y+x}{xy}}$

2. **Multiplying Fractions:** You can multiply two fractions by multiplying the numerators and multiplying the denominators.

   Example: Multiply: $\frac{x}{y} \cdot \frac{x}{z}$.

   Answer: $\frac{x}{y} \cdot \frac{x}{z} = \boxed{\frac{x^2}{yz}}$

3. **Dividing Fractions:** To divide two fractions, switch the numerator and denominator of the divisor (this is called creating the *reciprocal* of the divisor), and then multiply:

$$\frac{4}{3} \div \frac{8}{7} = \frac{4}{3} \cdot \frac{7}{8} = \frac{28}{24} = \boxed{\frac{7}{6}} \quad \text{or} \quad \frac{4/3}{8/7} = \frac{4}{3} \cdot \frac{7}{8} = \frac{28}{24} = \boxed{\frac{7}{6}}$$

   Example: Simplify $\frac{x}{y} \div \frac{y}{z}$.

   Answer: $\frac{x}{y} \div \frac{y}{z} = \frac{x}{y} \cdot \frac{z}{y} = \frac{xz}{y^2}$

   Example: Simplify $\frac{x/3}{y}$.

   Answer: $\frac{x/3}{y} = \frac{x/3}{y/1} = \frac{x}{3} \cdot \frac{1}{y} = \boxed{\frac{x}{3y}}$

Exercises: These exercises do not involve any variables. When you feel comfortable with these, move onto the worksheets "Adding/Subtracting Rational Expressions" and "Complex Fractions".

1. $\frac{1}{3} + \frac{2}{7} =$

2. $\frac{5}{6} - \frac{3}{2} =$

3. $\frac{2}{5} \cdot \frac{10}{3} - \frac{1}{3} \cdot \frac{6}{5} =$

4. $\frac{1}{3} \div \frac{5}{9} =$

5. $\frac{2/5}{3/8} =$

6. $\frac{\frac{2}{5} - \frac{6}{7}}{8} =$

Answers: (1) $\frac{13}{21}$ (2) $-\frac{2}{3}$ (3) $\frac{14}{15}$ (4) $\frac{3}{5}$ (5) $\frac{16}{15}$ (6) $-\frac{2}{35}$