In this worksheet you will learn to perform addition, subtraction, multiplication, and division with algebraic fractions confidently. Work through each question and simplify your answers where possible.

Easy Questions

1. Multiply the fractions $\dfrac{3x}{4}$ and $\dfrac{8}{9x}$ and simplify your answer.

2. Divide $\dfrac{5}{6x}$ by $\dfrac{10}{3x}$ and simplify your answer.

3. Add $\dfrac{x}{3}$ and $\dfrac{2x}{3}$ and simplify your answer.

4. Subtract $\dfrac{3}{4x}$ from $\dfrac{7}{4x}$ and simplify your answer.

5. Multiply $\dfrac{2x}{5}$ by 3 and simplify your answer.

Intermediate Questions

6. Add $\dfrac{1}{x}$ and $\dfrac{1}{y}$ and simplify your answer.

7. Subtract $\dfrac{1}{x-2}$ from $\dfrac{2}{x+2}$ and simplify your answer.

8. Multiply $\dfrac{x+1}{x-1}$ by $\dfrac{x-1}{x+2}$ and simplify your answer.

9. Divide $\dfrac{2x}{x+3}$ by $\dfrac{4}{x+3}$ and simplify your answer.

10. Evaluate and simplify $\dfrac{x}{2} \cdot \dfrac{4}{3x} \cdot \dfrac{3x}{8}$.

11. Divide $\dfrac{3x}{4y}$ by $\dfrac{9}{8y}$ and simplify your answer.

12. Add $\dfrac{2}{x}$ and $\dfrac{3}{x^2}$ by expressing them with a common denominator.

13. Subtract $\dfrac{1}{x}$ from $\dfrac{4}{x+1}$ by writing both fractions with the common denominator $x(x+1)$.

14. Multiply $\dfrac{x+2}{3}$ by $\dfrac{3}{x-2}$ and simplify your answer.

15. Divide $\dfrac{5x}{6}$ by $\dfrac{10}{3x}$ and simplify your answer.

16. Add $\dfrac{2}{x}$ and $\dfrac{3}{2x}$ and simplify your answer.

17. Multiply $\dfrac{4}{x+1}$ by $\dfrac{x+1}{2}$ and simplify your answer.

18. Divide $\dfrac{x+5}{7}$ by $\dfrac{x-5}{14}$ and simplify your answer.

19. Add $\dfrac{1}{2x}$ and $\dfrac{3}{4x}$ by expressing both with the common denominator.

20. Subtract $\dfrac{x}{4}$ from $\dfrac{3x}{2}$ and simplify your answer.

Hard Questions

21. Simplify the complex fraction
$$\frac{\frac{x}{2}+\frac{3}{4}}{\frac{x}{3}-\frac{1}{6}}$$
by combining terms and cancelling common factors.

22. Simplify
$$\frac{1}{\frac{1}{x}+\frac{1}{y}}$$
and express your answer in simplest form.

23. Simplify
$$\frac{\frac{2}{x}-\frac{3}{y}}{\frac{4}{x}+\frac{5}{y}}$$
and state your answer in simplest form.

24. Simplify
$$\frac{x^2-1}{x^2}\cdot\frac{x+1}{x-1}$$
by recognising common factors.

25. Simplify
$$\frac{\frac{x+2}{x-2}}{\frac{x^2-4}{x+2}}$$
by factoring and cancelling common terms.

26. Simplify
$$\frac{x}{x+1}+\frac{2}{x-1}-\frac{3x}{x^2-1}$$
by writing all terms with the common denominator x^2-1.

27. Simplify

$$\frac{\frac{x+1}{2x} \cdot \frac{4x}{x^2-1}}{\frac{2}{x-1}}$$

by factoring $x^2 - 1$ as $(x+1)(x-1)$ and cancelling common factors.

28. Simplify

$$\left(\frac{1}{x} - \frac{1}{x+2}\right) \div \left(\frac{1}{x} + \frac{1}{x+2}\right)$$

by finding common denominators in both the numerator and denominator.

29. Simplify

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

by combining numerators and denominators and cancelling the common factor.

30. The time taken by a machine is given by

$$T = \frac{A}{B},$$

where

$$A = \frac{3}{x} + \frac{4}{y} \quad \text{and} \quad B = \frac{2}{x} - \frac{1}{y}.$$

Express T as a single simplified fraction in terms of x and y.