

6-6 Mixed Expressions

Objective: To write mixed expressions as fractions in simplest form.

Vocabulary

Mixed number The sum of an integer and a fraction. For example, $2\frac{1}{3}$.

Mixed expression The sum or difference of a polynomial and a fraction.
For example, $m + \frac{3}{m}$.

Example 1 Write $2\frac{1}{3}$ as a fraction in simplest form.

Solution

$$\begin{aligned} 2\frac{1}{3} &= 2 + \frac{1}{3} \\ &= \frac{2}{1} + \frac{1}{3} && \text{Write 2 as } \frac{2}{1}. \\ &= \frac{6}{3} + \frac{1}{3} && \text{LCD} = 3 \\ &= \frac{7}{3} \end{aligned}$$

Write as a fraction in simplest form.

- | | |
|--------------------|--------------------|
| 1. $3\frac{2}{3}$ | 2. $2\frac{1}{8}$ |
| 3. $-3\frac{3}{5}$ | 4. $-4\frac{5}{7}$ |
| 5. $5\frac{1}{6}$ | 6. $6\frac{1}{5}$ |
| 7. $-2\frac{3}{4}$ | 8. $-1\frac{2}{9}$ |

Example 2 Write each expression as a fraction in simplest form.

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

Solution

a. $x + \frac{2}{x} = \frac{x}{1} + \frac{2}{x}$ Write x as $\frac{x}{1}$.

$$\begin{aligned} &= \frac{x^2}{x} + \frac{2}{x} && \text{LCD} = x \quad \left(\frac{x}{1} = \frac{x \cdot x}{1 \cdot x} = \frac{x^2}{x}\right) \\ &= \frac{x^2 + 2}{x} \end{aligned}$$

b. $3 - \frac{x-1}{x+2} = \frac{3}{1} - \frac{x-1}{x+2}$ Write 3 as $\frac{3}{1}$.

$$\begin{aligned} &= \frac{3(x+2)}{x+2} - \frac{x-1}{x+2} && \text{LCD} = x+2 \quad \left(\frac{3}{1} = \frac{3(x+2)}{x+2}\right) \\ &= \frac{3x+6-x+1}{x+2} \\ &= \frac{2x+7}{x+2} \end{aligned}$$

Write each expression as a fraction in simplest form.

9. $6 + \frac{1}{x}$

10. $2 + \frac{5}{a}$

11. $3 - \frac{2}{x}$

12. $5 - \frac{3}{n}$

13. $5a - \frac{2}{a}$

14. $6n - \frac{4}{n}$

15. $\frac{3}{y} + y$

16. $4 - \frac{m}{n}$

6-6 Mixed Expressions (continued)

Write each expression as a fraction in simplest form.

17. $2 + \frac{x}{y}$

18. $3 - \frac{2}{x+1}$

19. $7 + \frac{y}{y-2}$

20. $\frac{x}{x+3} - 4$

21. $3x + \frac{x}{x-1}$

22. $5x - \frac{x}{x+2}$

23. $3y + \frac{y}{y-2}$

24. $\frac{2n}{2n+3} + 1$

25. $2x + \frac{x-1}{x+2}$

26. $3a + \frac{a-3}{2a+1}$

27. $3a^2 - \frac{a+1}{2a+3}$

28. $x^2 - \frac{2x+1}{x+1}$

Example 3 Write as a fraction in simplest form: $x + \frac{2x-3}{x+1} + \frac{5}{x+1}$

Solution

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

The LCD is $x+1$.

$$= \frac{x^2 + x + 2x - 3 + 5}{x+1}$$

Add the numerators.

$$= \frac{x^2 + 3x + 2}{x+1}$$

Factor.

$$= \frac{(x+2)(x+1)}{x+1}$$

Simplify.

$$= \frac{x+2}{1} = x+2$$

Write each expression as a fraction in simplest form.

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

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

31. $\frac{3}{x+1} + \frac{x}{x+1} - 1$

32. $\frac{x}{x+3} + \frac{x}{x-3} - 3$

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

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

35. $\frac{2a}{a+1} + \frac{3}{a-1} - 1$

36. $2 - \frac{x}{x+3} - \frac{1}{x+3}$

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

Mixed Review Exercises

Simplify.

1. $\frac{3a-3b}{3a+12b}$

2. $\frac{a^2-7a+10}{25-a^2}$

3. $\frac{3x^2}{2y^2} + \frac{9xy}{8}$

4. $\frac{n^2-1}{3} + \frac{n+1}{9}$

5. $\frac{8}{y^4} \cdot \frac{y^7}{2}$

6. $(-3b^3)^2$

Find the least common denominator.

7. $\frac{1}{3xy}, \frac{2}{y^2}$

8. $\frac{3}{a^2}, \frac{2}{ab}$

9. $\frac{1}{x-2}, \frac{3}{x+2}, \frac{5}{x^2-4}$