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7–3 Equations with Fractional Coefficients

Objective: To solve equations with fractional coefficients.

Example 1 Solve: **a.** $\frac{x}{2} + \frac{x}{3} = 5$ **b.** $\frac{2a}{5} - \frac{a}{4} = \frac{9}{20}$

Solution Multiply both sides of the equation by the LCD of *all* of the fractions in the equations. You will get a new equation with no fractions in it that will be easier to solve than the original equation.

a. $6\left(\frac{x}{2} + \frac{x}{3}\right) = 6(5)$ The LCD of the fractions is 6.

$6\left(\frac{x}{2}\right) + 6\left(\frac{x}{3}\right) = 30$

$3x + 2x = 30$ ← New equation with no fractions

$5x = 30$

$x = 6$

The solution set is $\{6\}$.

b. $20\left(\frac{2a}{5} - \frac{a}{4}\right) = 20\left(\frac{9}{20}\right)$ The LCD of the fractions is 20.

$20\left(\frac{2a}{5}\right) - 20\left(\frac{a}{4}\right) = 9$

$8a - 5a = 9$ ← New equation with no fractions

$3a = 9$

$a = 3$

The solution set is $\{3\}$.

Solve.

1. $\frac{w}{2} + \frac{w}{3} = \frac{5}{3}$ **2.** $\frac{x}{3} - \frac{x}{4} = \frac{1}{12}$ **3.** $\frac{2y}{3} + \frac{y}{4} = \frac{11}{6}$

4. $\frac{3a}{4} - \frac{4a}{3} = -\frac{7}{6}$ **5.** $\frac{x}{3} + \frac{x}{4} = 7$ **6.** $\frac{2x}{3} - \frac{x}{2} = 12$

7. $\frac{x}{4} + \frac{x}{5} = \frac{9}{5}$ **8.** $\frac{3y}{4} - \frac{y}{6} = \frac{7}{3}$ **9.** $\frac{a}{3} + \frac{a}{4} = -\frac{7}{4}$

10. $\frac{2x}{3} - \frac{5x}{9} = -1$ **11.** $\frac{a}{3} - \frac{a}{9} = 2$ **12.** $\frac{2a}{3} - \frac{3a}{2} = \frac{5}{6}$

13. $\frac{2a}{5} - \frac{a}{2} = \frac{3}{10}$ **14.** $\frac{6b}{7} - \frac{b}{2} = 5$ **15.** $\frac{3n}{8} + \frac{n}{2} = 7$

16. $\frac{3n}{10} + \frac{n}{5} = \frac{3}{2}$ **17.** $\frac{7m}{8} - \frac{m}{4} = -\frac{5}{2}$ **18.** $\frac{5x}{6} - \frac{3x}{8} = \frac{11}{2}$

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7–3 Equations with Fractional Coefficients *(continued)*

Example 2 Solve: **a.** $\frac{x}{3} + \frac{x-2}{4} = 0$ **b.** $3n + \frac{n}{2} = \frac{n}{3} + 19$

Solution

a. The LCD of the fractions is 12.

$$12\left(\frac{x}{3} + \frac{x-2}{4}\right) = 12(0)$$
$$12\left(\frac{x}{3}\right) + 12\left(\frac{x-2}{4}\right) = 0$$
$$4x + 3(x-2) = 0$$
$$4x + 3x - 6 = 0$$
$$7x - 6 = 0$$
$$7x = 6$$
$$x = \frac{6}{7}$$

The solution set is $\left\{\frac{6}{7}\right\}$.

b. The LCD of the fractions is 6.

$$6\left(3n + \frac{n}{2}\right) = 6\left(\frac{n}{3} + 19\right)$$
$$6(3n) + 6\left(\frac{n}{2}\right) = 6\left(\frac{n}{3}\right) + 6(19)$$
$$18n + 3n = 2n + 114$$
$$21n = 2n + 114$$
$$19n = 114$$
$$n = 6$$

The solution set is $\{6\}$.

Solve.

19. $\frac{x}{2} - \frac{x-1}{3} = 5$

20. $\frac{x}{8} - \frac{x+3}{5} = \frac{3}{4}$

21. $\frac{n}{3} - \frac{n+5}{2} = 0$

22. $\frac{x}{2} - \frac{x+3}{5} = 3$

23. $\frac{x+2}{2} = \frac{2x}{3}$

24. $x + \frac{x-2}{8} = 20$

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

26. $x + \frac{x}{2} = 7 - \frac{x}{4}$

27. $\frac{x-1}{6} + \frac{x+2}{3} = 5$

28. $0 = 2m - \frac{3m+18}{6}$

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

30. $\frac{x-3}{5} + \frac{2}{3} = \frac{x+2}{15}$

31. $\frac{x+1}{5} = \frac{3x-6}{10} + \frac{3}{2}$

32. $\frac{x+5}{2} - \frac{x+6}{3} = \frac{x}{4}$

33. $\frac{3n-1}{7} - \frac{2n-1}{3} = -6$

34. $\frac{x+6}{6} - \frac{x}{9} = \frac{2}{3}$

Mixed Review Exercises

Write each ratio in simplest form.

1. 6 feet : 3 yards

2. $12x : 72x$

3. 15 : 10

4. $\frac{12m^2n}{30mn}$

5. $\frac{36xy^2}{24x^2y}$

6. $\frac{14a^3}{35ab^2}$

Solve.

7. $\frac{5}{2n} = \frac{3}{6}$

8. $\frac{x+1}{3} = \frac{5}{2}$

9. $\frac{3a+2}{4} = \frac{a+9}{3}$

10. $3x - 1 = 14$

11. $|x| = 6$

12. $6x + 5 = 7x + 3$