Exercises 8.7
Set I

Simplify each complex fraction.

1. $\dfrac{\frac{3}{4}}{\frac{5}{6}}$
2. $\dfrac{\frac{3}{5}}{\frac{3}{4}}$
3. $\dfrac{\frac{2}{3}}{\frac{4}{9}}$
4. $\dfrac{\frac{5}{6}}{\frac{5}{9}}$
5. $\dfrac{\frac{3}{4}-\frac{1}{2}}{\frac{5}{8}+\frac{1}{4}}$
6. $\dfrac{\frac{5}{6}-\frac{1}{3}}{\frac{2}{9}+\frac{1}{6}}$
7. $\dfrac{\frac{3}{5}+2}{2-\frac{3}{4}}$
8. $\dfrac{\frac{3}{16}+5}{6-\frac{7}{8}}$
9. $\dfrac{\frac{5x^3}{3y^4}}{\frac{10x}{9y}}$
10. $\dfrac{\frac{8a^4}{5b}}{\frac{4a^3}{15b^2}}$
11. $\dfrac{\frac{18cd^2}{5a^3b}}{\frac{12cd^2}{15ab^2}}$
12. $\dfrac{\frac{8x^2y}{7z^3}}{\frac{12xy^2}{21z^5}}$
13. $\dfrac{\frac{x+3}{5}}{\frac{2x+6}{10}}$
14. $\dfrac{\frac{a-4}{3}}{\frac{2a-8}{9}}$
15. $\dfrac{\frac{x+2}{2x}}{\frac{x+1}{4x^2}}$
16. $\dfrac{\frac{x-3}{3x^2}}{\frac{x-9}{9x}}$
17. $\dfrac{\frac{a}{b}+1}{\frac{a}{b}-1}$
18. $\dfrac{2+\frac{x}{y}}{2-\frac{x}{y}}$
19. $\dfrac{\frac{1}{x}+x}{\frac{1}{x}-x}$
20. $\dfrac{a-\frac{4}{a}}{a+\frac{4}{a}}$
21. $\dfrac{\frac{c}{d}+2}{\frac{c^2}{d^2}-4}$
22. $\dfrac{\frac{x^2}{y^2}-1}{\frac{x}{y}-1}$
23. $\dfrac{x+\frac{x}{y}}{1+\frac{1}{y}}$
24. $\dfrac{1-\frac{1}{b}}{3-\frac{3}{b}}$
25. $\dfrac{\frac{1}{x^2}-\frac{1}{y^2}}{\frac{1}{x}+\frac{1}{y}}$
26. $\dfrac{\frac{1}{a^2}-\frac{1}{4}}{\frac{1}{a}-\frac{1}{2}}$
27. $\dfrac{\frac{2}{x}-\frac{4}{x^2}}{\frac{1}{x}-\frac{2}{x^2}}$
28. $\dfrac{\frac{2}{y^2}+\frac{1}{y}}{\frac{8}{y^2}+\frac{4}{y}}$
29. $\dfrac{\frac{x}{x+1}+\frac{4}{3x}}{\frac{x}{x+1}-\frac{3}{x}}$
30. $\dfrac{\frac{4x}{4x+1}+\frac{1}{2x}}{\frac{2}{4x+1}+\frac{2}{x}}$
31. $\dfrac{\frac{1}{4x}+\frac{x}{x-6}}{\frac{x-1}{x}-\frac{3}{x-6}}$
32. $\dfrac{\frac{x+1}{y}+\frac{1}{x-1}}{\frac{1}{x-1}+\frac{1}{2y}}$

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1. $\dfrac{\frac{3}{4}}{\frac{5}{6}} = \dfrac{3}{4} \div \dfrac{5}{6} = \dfrac{3}{4} \cdot \dfrac{6}{5} = \dfrac{9}{10}$ **2.** $\frac{4}{5}$

3. $\dfrac{\frac{2}{3}}{\frac{4}{9}} = \dfrac{2}{3} \div \dfrac{4}{9} = \dfrac{2}{3} \cdot \dfrac{9}{4} = \dfrac{3}{2}$, or $1\frac{1}{2}$ **4.** $1\frac{1}{2}$

5. LCD of secondary denominators is 8. **6.** $\frac{9}{7} = 1\frac{2}{7}$

$$\frac{8}{8} \cdot \frac{\frac{3}{4} - \frac{1}{2}}{\frac{5}{8} + \frac{1}{4}} = \frac{\frac{8}{1}\left(\frac{3}{4}\right) + \frac{8}{1}\left(-\frac{1}{2}\right)}{\frac{8}{1}\left(\frac{5}{8}\right) + \frac{8}{1}\left(\frac{1}{4}\right)} = \frac{6 - 4}{5 + 2} = \frac{2}{7}$$

7. LCD of secondary denominators is 20.

$$\frac{20}{20} \cdot \frac{\frac{3}{5} + \frac{2}{1}}{\frac{2}{1} - \frac{3}{4}} = \frac{20\left(\frac{3}{5}\right) + 20\left(\frac{2}{1}\right)}{20\left(\frac{2}{1}\right) + 20\left(-\frac{3}{4}\right)} = \frac{12 + 40}{40 - 15} = \frac{52}{25} = 2\frac{2}{25}$$

8. $1\frac{1}{82}$ **9.** $\dfrac{\frac{5x^3}{3y^4}}{\frac{10x}{9y}} = \dfrac{5x^3}{3y^4} \div \dfrac{10x}{9y} = \dfrac{5x^3}{3y^4} \cdot \dfrac{9y}{10x} = \dfrac{3x^2}{2y^3}$ **10.** $6ab$

11. $\dfrac{\frac{18cd^2}{5a^3b}}{\frac{12cd^2}{15ab^2}} = \dfrac{18cd^2}{5a^3b} \div \dfrac{12cd^2}{15ab^2} = \dfrac{18cd^2}{5a^3b} \cdot \dfrac{15ab^2}{12cd^2} = \dfrac{9b}{2a^2}$ **12.** $\dfrac{2xz^2}{y}$

13. $\dfrac{\frac{x+3}{5}}{\frac{2x+6}{10}} = \dfrac{x+3}{5} \div \dfrac{2x+6}{10} = \dfrac{x+3}{5} \cdot \dfrac{10}{2(x+3)} = 1$

14. $1\frac{1}{2}$

15. $\dfrac{\frac{x+2}{2x}}{\frac{x+1}{4x^2}} = \dfrac{x+2}{2x} \div \dfrac{x+1}{4x^2} = \dfrac{x+2}{2x} \cdot \dfrac{4x^2}{x+1} = \dfrac{2x^2+4x}{x+1}$

16. $\dfrac{3x-9}{x^2-9x}$ **17.** LCD $= b$

$$\frac{b}{b} \cdot \frac{\frac{a}{b} + 1}{\frac{a}{b} - 1} = \frac{b\left(\frac{a}{b}\right) + b(1)}{b\left(\frac{a}{b}\right) - b(1)} = \frac{a+b}{a-b}$$

18. $\dfrac{2y+x}{2y-x}$ **19.** LCD $= x$

$$\frac{x}{x} \cdot \frac{\frac{1}{x} + x}{\frac{1}{x} - x} = \frac{x\left(\frac{1}{x}\right) + x(x)}{x\left(\frac{1}{x}\right) - x(x)} = \frac{1 + x^2}{1 - x^2}$$

20. $\dfrac{a^2-4}{a^2+4}$ **21.** LCD $= d^2$

$$\frac{d^2}{d^2} \cdot \frac{\frac{c}{d} + 2}{\frac{c^2}{d^2} - 4} = \frac{d^2\left(\frac{c}{d}\right) + d^2(2)}{d^2\left(\frac{c^2}{d^2}\right) - d^2(4)} = \frac{cd + 2d^2}{c^2 - 4d^2}$$
$$= \frac{d(c+2d)}{(c-2d)(c+2d)} = \frac{d}{c-2d}$$

22. $\dfrac{x+y}{y}$

23. LCD $= y$

$$\frac{y}{y} \cdot \frac{x + \frac{x}{y}}{1 + \frac{1}{y}} = \frac{y(x) + y\left(\frac{x}{y}\right)}{y(1) + y\left(\frac{1}{y}\right)} = \frac{yx + x}{y + 1} = \frac{x(y+1)}{y+1} = x$$

24. $\frac{1}{3}$ **25.** LCD $= x^2y^2$

$$\frac{x^2y^2}{x^2y^2} \cdot \frac{\frac{1}{x^2} - \frac{1}{y^2}}{\frac{1}{x} + \frac{1}{y}} = \frac{x^2y^2\left(\frac{1}{x^2}\right) - x^2y^2\left(\frac{1}{y^2}\right)}{x^2y^2\left(\frac{1}{x}\right) + x^2y^2\left(\frac{1}{y}\right)}$$
$$= \frac{y^2 - x^2}{xy^2 + x^2y} = \frac{(y+x)(y-x)}{xy(y+x)} = \frac{y-x}{xy}$$

26. $\dfrac{a+2}{2a}$

27. LCD $= x^2$

$$\frac{x^2}{x^2} \cdot \frac{\frac{2}{x} - \frac{4}{x^2}}{\frac{1}{x} - \frac{2}{x^2}} = \frac{x^2\left(\frac{2}{x}\right) - x^2\left(\frac{4}{x^2}\right)}{x^2\left(\frac{1}{x}\right) - x^2\left(\frac{2}{x^2}\right)} = \frac{2x-4}{x-2} = \frac{2(x-2)}{x-2}$$
$$= 2$$

28. $\frac{1}{4}$ **29.** LCD $= 3x(x+1)$

$$\frac{3x(x+1)}{3x(x+1)} \cdot \frac{\frac{x}{x+1} + \frac{4}{3x}}{\frac{x}{x+1} - \frac{3}{x}}$$
$$= \frac{\left(\frac{3x(x+1)}{1}\right)\left(\frac{x}{x+1}\right) + \left(\frac{3x(x+1)}{1}\right)\left(\frac{4}{3x}\right)}{\left(\frac{3x(x+1)}{1}\right)\left(\frac{x}{x+1}\right) - \left(\frac{3x(x+1)}{1}\right)\left(\frac{3}{x}\right)}$$
$$= \frac{3x^2 + 4(x+1)}{3x^2 - 9(x+1)} = \frac{3x^2 + 4x + 4}{3x^2 - 9x - 9}$$

30. $\dfrac{8x^2+4x+1}{20x+4}$

31. LCD $= 4x(x-6)$

$$\frac{4x(x-6)}{4x(x-6)} \cdot \frac{\frac{1}{4x} + \frac{x}{x-6}}{\frac{x-1}{x} - \frac{3}{x-6}}$$
$$= \frac{\left(\frac{4x(x-6)}{1}\right)\left(\frac{1}{4x}\right) + \left(\frac{4x(x-6)}{1}\right)\left(\frac{x}{x-6}\right)}{\left(\frac{4x(x-6)}{1}\right)\left(\frac{x-1}{x}\right) - \left(\frac{4x(x-6)}{1}\right)\left(\frac{3}{x-6}\right)}$$
$$= \frac{x - 6 + 4x^2}{4(x^2 - 7x + 6) - 12x} = \frac{4x^2 + x - 6}{4x^2 - 28x + 24 - 12x}$$
$$= \frac{4x^2 + x - 6}{4x^2 - 40x + 24}$$

32. $\dfrac{2x^2 - 2 + 2y}{2y + x - 1}$

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