NAME _____ DATE _____

Practice A

For use with pages 554–560

If possible, simplify the rational expression.

1. $\dfrac{4x^2}{2x^2 + 3x}$

2. $\dfrac{x^2 - 2x - 15}{x^2 - 4x - 5}$

3. $\dfrac{x^2 - 16}{x^2 + x - 12}$

4. $\dfrac{x^2 - 8x + 12}{x^2 + 3x - 10}$

5. $\dfrac{x^2 - 2x - 8}{x^2 + 3x - 4}$

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

Multiply the rational expressions. Simplify the result.

7. $\dfrac{12x^2y}{5y^2} \cdot \dfrac{2xy}{3x^2}$

8. $\dfrac{4y^2}{9x} \cdot \dfrac{27}{16xy^2}$

9. $\dfrac{x^2 - 2x}{x^2 + 2x + 1} \cdot \dfrac{x^2 + 4x + 3}{x^2 + 3x}$

10. $\dfrac{x^2 + 2x - 3}{x + 2} \cdot \dfrac{x^2 + 2x}{x^2 - 1}$

Divide the rational expressions. Simplify the result.

11. $\dfrac{5x^5}{8} \div \dfrac{15x^2}{12}$

12. $\dfrac{48x^2}{y} \div \dfrac{36xy^2}{5}$

13. $\dfrac{x^2}{x^2 - 1} \div \dfrac{3x}{x + 1}$

14. $\dfrac{x^2 - 9x - 22}{x^2 + 5x - 24} \div \dfrac{x + 2}{x - 3}$

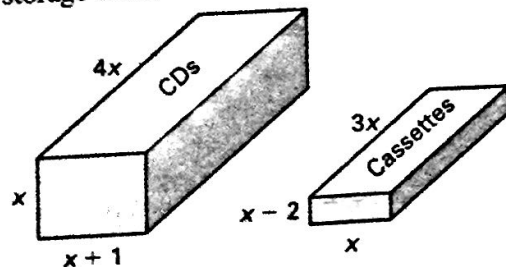**Perform the indicated operations. Simplify the result.**

15. $\dfrac{5x^2y}{2xy} \cdot \dfrac{6x^3y^5}{10y} \cdot \dfrac{3x}{y^3}$

16. $\dfrac{x - 11}{2x + 10} \div \dfrac{x^2 - 8x - 33}{x + 5} \cdot \dfrac{x + 3}{x^2}$

17. $(x^2 + x - 30) \div \dfrac{x^2 - 11x + 30}{x^2 + 7x + 12} \cdot \dfrac{x - 6}{x + 6}$

18. $\dfrac{x^2 - 5x - 14}{x^2 - 6x - 7} \cdot (x^2 - 4x - 5) \div \dfrac{x^2 + x - 30}{2}$

19. **CDs and Cassettes** Use the diagrams below to find the ratio of the volume of the compact disc storage crate to the volume of the cassette storage crate.

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Practice B

For use with pages 554–560

If possible, simplify the rational expression.

1. $\dfrac{x^2 - 8x - 9}{x^2 - 1}$

2. $\dfrac{x + 3}{x^2 + 5x + 6}$

3. $\dfrac{x^2 - 4}{x^2 + 4}$

Multiply the rational expressions. Simplify the result.

4. $\dfrac{4x^2y^3}{x^5y^6} \cdot \dfrac{xy}{20x^3}$

5. $\dfrac{81x^9}{y^4} \cdot \dfrac{x^2}{36x^5y}$

6. $\dfrac{x^2 + 4x - 12}{x^4 + 9x^3 + 18x^2} \cdot 6x^2$

7. $\dfrac{3x^2 - 12}{5x - 10} \cdot \dfrac{1}{2x + 4}$

Divide the rational expressions. Simplify the result.

8. $\dfrac{12x^2y}{5y^2} \div \dfrac{3x^2}{2xy}$

9. $\dfrac{x^2 - 3x + 2}{25x} \div \dfrac{x - 1}{5x^2}$

10. $\dfrac{5x^2 - 20}{25x^2} \div \dfrac{x^2 + 6x + 8}{x^2 + 10x + 24}$

11. $(x + 7) \div \dfrac{x^2 + 9x + 14}{x^2 + 5x + 6}$

Perform the indicated operations. Simplify the result.

12. $(x^2 + x - 30) \div \dfrac{x^2 - 2x - 15}{x^2 + 7x + 12} \cdot \dfrac{x - 5}{x + 6}$
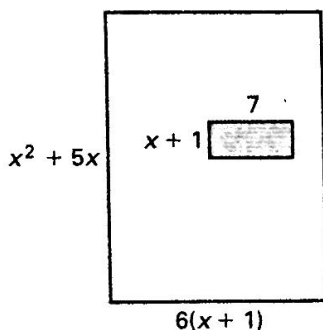
13. $\dfrac{x^2 + x - 20}{x + 1} \div \dfrac{33x^2 - 132x}{16x + 16} \div \dfrac{8x + 40}{11x + 44}$

14. $\dfrac{x^2 + 6x - 7}{3x^2} \cdot \dfrac{6x}{x + 7} \div \dfrac{x - 1}{4}$
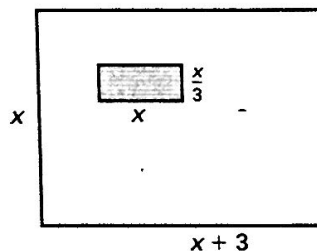
15. $\dfrac{3xy^3}{x^3y} \cdot \dfrac{y}{6x} \div \dfrac{9y^2}{xy}$

Geometry   Find the ratio of the area of the shaded region to the total area.
Write your result in simplified form.

16.

17.

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Lesson 9.4 continued

Practice A

1. $\dfrac{4x}{2x+3}$ 2. $\dfrac{x+3}{x+1}$ 3. $\dfrac{x-4}{x-3}$ 4. $\dfrac{x-6}{x+5}$

5. not possible 6. $\dfrac{x-1}{x+1}$ 7. $\dfrac{8x}{5}$ 8. $\dfrac{3}{4x^2}$

9. $\dfrac{x-2}{x+1}$ 10. $\dfrac{x(x+3)}{x+1}$ 11. $\dfrac{x^3}{2}$ 12. $\dfrac{20x}{3y^3}$

13. $\dfrac{x}{3(x-1)}$ 14. $\dfrac{x-11}{x+8}$ 15. $\dfrac{9x^5y}{2}$ 16. $\dfrac{1}{2x^2}$

17. $(x+4)(x+3)$ 18. $\dfrac{2(x+2)}{x+6}$ 19. $\dfrac{4(x+1)}{3(x-2)}$

Practice B

1. $\dfrac{x-9}{x-1}$ 2. $\dfrac{1}{x+2}$ 3. not possible

4. $\dfrac{1}{5x^5y^2}$ 5. $\dfrac{9x^6}{4y^5}$ 6. $\dfrac{6(x-2)}{x+3}$ 7. $\dfrac{3}{10}$ 8. $\dfrac{8x}{5}$

9. $\dfrac{x(x-2)}{5}$ 10. $\dfrac{(x-2)(x+6)}{5x^2}$ 11. $x+3$

12. $(x-5)(x+4)$ 13. $\dfrac{2(x+4)}{3x}$ 14. $\dfrac{8}{x}$

15. $\dfrac{y^2}{18x^2}$ 16. $\dfrac{7}{6x(x+5)}$ 17. $\dfrac{x}{3(x+3)}$

Practice C

1. $\dfrac{3x+1}{x+2}$ 2. not possible 3. $\dfrac{x+5}{x^2+5x+25}$

4. $x-6$ 5. $\dfrac{x-2}{x+1}$ 6. $\dfrac{3}{10}$ 7. $\dfrac{3x^{11}y}{25}$

8. $3(x-2)$ 9. $\dfrac{7(x-3)}{x(x+5)}$ 10. $\dfrac{x(x^2+2x+4)}{4(x+1)}$

11. $\dfrac{x+6}{4(x+2)}$ 12. $\dfrac{6}{5}$ 13. $\dfrac{5(x+5)}{4x^3}$

14. $\dfrac{(x+10)(x+2)}{(x+8)(x+1)}$

15. $\dfrac{1}{x^2(x+3)(x-3)(x+4)}$ 16. $\dfrac{\pi}{1}$

17. about 60,769 gallons

Reteaching with Practice

1. $\dfrac{y+9}{2}$ 2. $\dfrac{1}{2}$ 3. $\dfrac{1}{x+3}$ 4. $\dfrac{y}{y-1}$

5. $\dfrac{x(x+3)}{x+1}$ 6. 2 7. -1 8. $\dfrac{20x}{3y^3}$

9. $\dfrac{x}{3(x-1)}$

Interdisciplinary Application

1. Percent of trumpet players $=$
$$\dfrac{-953.05y^2 + 22{,}360.5y + 55{,}000}{-2355.64y^2 + 120{,}167.27y + 638{,}700}$$

2. about 11% 3. 5, 6, 7 4. about 320 members, about 37 trumpet players 5. about 11.4%

Challenge: Skills and Applications

1. a. $\dfrac{(x-3)(x-5)}{(x+1)(x-2)}$; $x=-1, x=2$

   b. $x=a$ is a vertical asymptote of the product if and only if it is a vertical asymptote of one of the factors and is not a zero of either factor.

2. $(x-3)(x+4)$ 3. $\dfrac{1}{x^2+5x+25}$

4. a. $(x+a)^3 = x^3 + 3ax^2 + 3a^2x + a^3$

   b. (i) $x-2$ (ii) $\dfrac{x+3}{x(x+2)}$

5. a. $(x-a)(x^{n-1} + ax^{n-2} + \cdots + a^{n-2}x + a^{n-1}) = x(x^{n-1} + ax^{n-2} + \cdots + a^{n-2}x + a^{n-1}) - a(x^{n-1} + ax^{n-2} + \cdots + (a^{n-2}x + a^{n-1}) = (x^n + ax^{n-1} + \cdots + (a^{n-2}x^2 + a^{n-1}x) - (ax^{n-1} + a^2x^{n-2} + \cdots + a^{n-1}x + a^n) = x^n - a^n$

   b. (i) $\dfrac{1}{x+5}$ (ii) $\dfrac{1}{(x-2)^2}$

Lesson 9.5

Warm-Up Exercises

1. $\dfrac{4}{5}$ 2. $\dfrac{5}{4}$ 3. $\dfrac{1}{6}$ 4. $\dfrac{2}{3}$ 5. $\dfrac{6}{5}$

Daily Homework Quiz

1. a. $\dfrac{x-3}{x+4}$ b. $\dfrac{x-4}{x+4}$

2. a. $\dfrac{x-1}{3x^2(x+2)}$ b. $\dfrac{x+2}{x-1}$