

**LESSON**  
**11-6**

# Review for Mastery

## Radical Expressions

A **radical expression** is an expression that contains a radical sign.

$$\sqrt{14x}$$

The expression under the radical sign is the **radicand**.

A square-root expression is in simplest form if:

- the radicand has no perfect square factors other than 1
- the radicand has no fractions
- there are no square roots in the denominator

**Product Property of Square Roots**

$$\sqrt{ab} = \sqrt{a} \cdot \sqrt{b}; \text{ where } a \geq 0 \text{ and } b \geq 0$$

**Simplify**  $\sqrt{50}$ .

$$\sqrt{50} = \sqrt{25 \cdot 2}$$

*Write the radicand as a product.*

$$= \sqrt{25} \cdot \sqrt{2}$$

*Use Product Property of Square Roots*

$$= 5\sqrt{2}$$

*Simplify.*

**Simplify**  $\sqrt{x^2y}$ .

$$\sqrt{x^2y} = \sqrt{x^2} \sqrt{y}$$

$$= x\sqrt{y}$$

**Quotient Property of Square Roots**

$$\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}; \text{ where } a \geq 0 \text{ and } b > 0$$

**Simplify**  $\sqrt{\frac{3}{49}}$ .

$$\sqrt{\frac{3}{49}} = \frac{\sqrt{3}}{\sqrt{49}}$$

*Use Quotient Property of Square Roots.*

$$= \frac{\sqrt{3}}{7}$$

*Simplify.*

**Simplify**  $\sqrt{\frac{x^6}{16}}$ .

$$\sqrt{\frac{x^6}{16}} = \sqrt{\frac{x^6}{16}}$$

$$= \frac{x^3}{4}$$

**Simplify. All variables represent nonnegative numbers.**

1.  $\sqrt{20}$

2.  $\sqrt{300}$

3.  $\sqrt{54x^4}$

4.  $\sqrt{\frac{7}{81}}$

5.  $\sqrt{\frac{10}{9}}$

6.  $\sqrt{\frac{9x^8}{25y^6}}$

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**11-6**

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**Radical Expressions** *continued*

The Product and Quotient Properties can be used together to simplify radical expressions.

Simplify  $\sqrt{\frac{28}{25}}$ .

$$\sqrt{\frac{28}{25}} = \frac{\sqrt{28}}{\sqrt{25}} \quad \text{Quotient Property}$$

$$= \frac{\sqrt{4 \cdot 7}}{\sqrt{25}} \quad \text{Write 28 as } 4 \times 7.$$

$$= \frac{\sqrt{4} \cdot \sqrt{7}}{\sqrt{25}} \quad \text{Product Property}$$

$$= \frac{2\sqrt{7}}{5} \quad \text{Simplify.}$$

Simplify  $\sqrt{\frac{9x^3}{49}}$ . All variables represent

nonnegative numbers.

$$\sqrt{\frac{9x^3}{49}} = \frac{\sqrt{9x^3}}{\sqrt{49}} \quad \text{Quotient Property}$$

$$= \frac{\sqrt{9 \cdot x^2 \cdot x}}{\sqrt{49}} \quad \text{Write } x^3 \text{ as } x^2 \cdot x.$$

$$= \frac{\sqrt{9} \sqrt{x^2} \sqrt{x}}{\sqrt{49}} \quad \text{Product Property}$$

$$= \frac{3x\sqrt{x}}{7} \quad \text{Simplify.}$$

**Simplify by filling in the blanks below. All variables represent nonnegative numbers.**

7. 
$$\sqrt{\frac{75}{4}} = \frac{\sqrt{\square}}{\sqrt{\square}}$$

$$= \frac{\sqrt{\square} \sqrt{\square}}{\sqrt{\square}}$$

$$\frac{\square \sqrt{\square}}{\square}$$

8. 
$$\sqrt{\frac{288}{25}} = \frac{\sqrt{\square}}{\sqrt{\square}}$$

$$= \frac{\sqrt{\square} \sqrt{\square}}{\sqrt{\square}}$$

$$\frac{\square \sqrt{\square}}{\square}$$

**Simplify. All variables represent nonnegative numbers.**

9.  $\sqrt{\frac{8}{81}}$

10.  $\sqrt{\frac{18}{49}}$

11.  $\sqrt{\frac{500}{36}}$

12.  $\sqrt{\frac{242x^2}{9}}$

13.  $\sqrt{\frac{m^7}{16n^2}}$

14.  $\sqrt{\frac{200x^2}{49y^2}}$

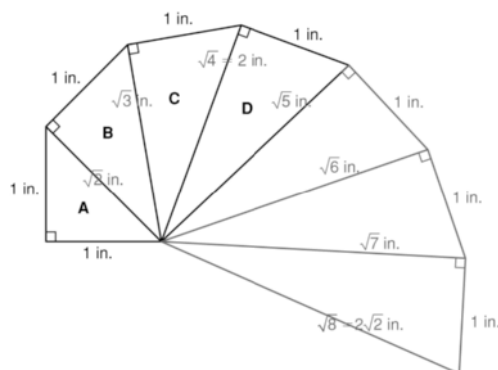
7.  $st\sqrt{s}$                       8.  $7xt^2$
9.  $7x\sqrt{2y}$                     10.  $\frac{\sqrt{21}}{5}$
11.  $\frac{3\sqrt{5}}{4}$                             12.  $\frac{5\sqrt{5}}{4}$
13.  $\frac{5\sqrt{6}}{s}$                             14.  $\frac{5b^2}{14c^3}$
15.  $\frac{3x\sqrt{2}}{5y^2}$                         16.  $\frac{5y\sqrt{2}}{7x}$
17.  $\frac{f\sqrt{g}}{h}$                         18.  $-\frac{\sqrt{b}}{10}$
19.  $-9n^2$                         20.  $-\frac{9}{40}$
21.  $\frac{9x^2\sqrt{2}}{2}$
22. *Prince Theodore*:  $4\sqrt{130}$  mi,  $\approx 45.6$  mi;  
*King Frank*:  $12\sqrt{13}$  mi,  $\approx 43.3$  mi

### Review for Mastery

1.  $2\sqrt{5}$                             2.  $10\sqrt{3}$
3.  $3x^2\sqrt{6}$                       4.  $\frac{\sqrt{7}}{9}$
5.  $\frac{\sqrt{10}}{3}$                                 6.  $\frac{3x^4}{5y^3}$
7.  $\frac{\sqrt{75}}{\sqrt{4}}$ ;  $\frac{\sqrt{25}\sqrt{3}}{\sqrt{4}}$ ;  $\frac{5\sqrt{3}}{2}$
8.  $\frac{\sqrt{288}}{\sqrt{25}}$ ;  $\frac{\sqrt{144}\sqrt{2}}{\sqrt{25}}$ ;  $\frac{12\sqrt{2}}{5}$
9.  $\frac{2\sqrt{2}}{9}$                                 10.  $\frac{3\sqrt{2}}{7}$
11.  $\frac{5\sqrt{5}}{3}$                                 12.  $\frac{11x\sqrt{2}}{3}$
13.  $\frac{m^3\sqrt{m}}{4n}$                             14.  $\frac{10x\sqrt{2}}{7y}$

### Challenge

1–5



- $\sqrt{2}$  in.
  - $\sqrt{3}$  in.
  - $\sqrt{4} = 2$  in.
  - $\sqrt{5}$  in.
- The length of each hypotenuse is a square root expression in which the radicand increases by 1 from the previous hypotenuse.
- 
- Continue the spiral until you have 12 triangles; the length of the hypotenuse of the 12<sup>th</sup> triangle will be  $\sqrt{13}$  in.
- $\sqrt{n+1}$  in.

### Problem Solving

- $100\sqrt{5}$  m; 76 m
- time:  $2\sqrt{3}$  s, 3s;  
speed:  $64\sqrt{3}$  ft/s, 111 ft/s
- C                                      4. G
- C                                      6. J

### Reading Strategies

- Quotient Property of Square Roots
- Product Property of Square Roots
- When multiplying powers with the same base, add the exponents. So  $x^3 \cdot x^3 = x^6$ .
- $6xy^2\sqrt{y}$                             5.  $\frac{x^3\sqrt{2}}{3}$
- $\frac{3\sqrt{2x}}{7x^4}$                                     7.  $2\sqrt{11}x^2y^2$
- $\frac{4x^2\sqrt{2x}}{3y^4}$                                     9.  $\sqrt{2}x^5$