# Nath Connections Worksheek

MAT0028C Developmental Math II

# **Chapter 9**

**Roots and Radicals** 

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# Chapter 9 ROOTS AND RADICALS

# 9.1 Square Roots and Radical Expressions

# KEY PROPERTIES, PROCEDURES, OR STRATEGIES

Rules for Square Roots		

# **GUIDED EXAMPLE**

- 1. Evaluate the square root.
  - a)  $\sqrt{256}$

**Solution** 

$$\sqrt{256} =$$
 because  $\left[ \right]^2 = 256$ .

**b**) 
$$\sqrt{\frac{49}{225}}$$

**Solution** 

c) 
$$-\sqrt{100}$$
  
Solution  $-\sqrt{100} = -1 \cdot \sqrt{100} =$ 

Name:	Date:
Instructor:	Section:

#### **GUIDED EXAMPLE**

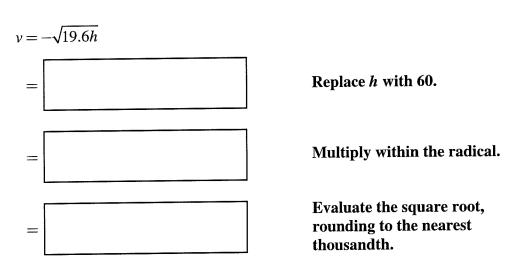
2. Ignoring air resistance, the velocity of an object, v, in meters per second can be found after the object has fallen h meters by using the formula  $v = -\sqrt{19.6h}$ . Find the velocity of a brick that has fallen 60 meters after being dropped from the roof of a construction site. Round to the nearest thousandth.

### Solution

Understand We are to find the velocity of an object after it has fallen 60 meters.

**Plan** Use the formula  $v = -\sqrt{19.6h}$ , replacing h with 60.

Execute



Answer After falling 60 meters, the brick is traveling at a velocity of \_\_\_\_\_\_ meters per second.

*Check* Verify the calculations.

#### **NOTES**

Date: Section:

# PRACTICE PROBLEMS

Find all square roots of the given number.

**1.** 49

1.\_\_\_\_\_

**2.** 144

2.\_\_\_\_\_

Evaluate the square root, if possible.

3.  $\sqrt{484}$ 

3.\_\_\_\_\_

4.  $\sqrt{-9}$ 

4.\_\_\_\_\_

5.  $-\sqrt{\frac{81}{4}}$ 

5.\_\_\_\_\_

Classify each square root as rational or irrational.

6.  $\sqrt{15}$ 

6.\_\_\_\_

7.  $\sqrt{64}$ 

7.\_\_\_\_\_

Use a calculator or the Powers and Roots table to approximate the square root. Round to three decimal places.

8.  $\sqrt{17}$ 

8.\_\_\_\_\_

9.  $-\sqrt{5}$ 

9.\_\_\_\_\_

10.  $\sqrt{68}$ 

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Simplify. Assume that variables represent positive numbers.

11. 
$$\sqrt{25x^{16}y^{34}}$$

11.\_\_\_\_

12. 
$$\sqrt{0.25x^6}$$

12.\_\_\_\_

The speed of a car can be determined by the length of the skid marks after the car brakes by using the formula  $S = \sqrt{30Dfn}$  where D represents the length of the skid mark in feet, f is the drag factor of the surface, n is the braking efficiency as a percent (written as a decimal), and S represents the speed of the car in miles per hour.

13. Find the speed of a car if the skid length measures 400 feet long, the drag factor of the surface is 0.5, and the braking efficiency is 60%.

13.

**14.** Find the speed of a car if the skid length measures 225 feet long, the drag factor of the surface is 0.4, and the braking efficiency is 75%.

Name: Instructor:	Date Section			
Chapter 9	ROOTS AND RADICALS			
9.2 Multiplying	g and Simplifying Square Ro	oots		
KEY PROPER	TIES, PROCEDURES, OR	STRATEGIES		
Product Rule fo	or Square Roots			
In the Language	of Math	In Your Own Words		
:				
6 m				
a. Par G		uare Factor in the Radicand		
Simplifying Squ	nare Roots with a Perfect Sq	uate ratio in the Nautuna		
:				
NOTEC				

**NOTES** 

# **GUIDED EXAMPLES**

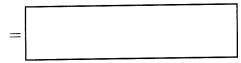
Simplify. Assume that variables represent nonnegative numbers.

a)  $\sqrt{6} \cdot \sqrt{216}$ 

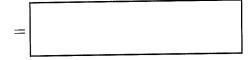
#### **Solution**



Use the product rule for square roots to write the radicands under a common radical.



Multiply the radicands.



Evaluate the square root.

# **b**) $\sqrt{108}$ **Solution**



Write the radicand in factored form so that one of the factors is the greatest perfect square factor.



Use the product rule for square roots to separate the factors into two radicals.

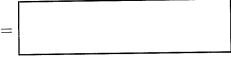
Find the square root of the perfect square factor and leave the other factor in a radical.

c) 
$$\sqrt{288x^7y^4}$$

#### **Solution**



Write the radicand in factored form so that one of the factors is the greatest perfect square factor.



Use the product rule for square roots to separate the factors into two radicals.

Find the square root of the perfect square factor and leave the other factor in a radical.

Date: Section:

# PRACTICE PROBLEMS

Simplify. Assume that variables represent nonnegative numbers.

1.  $\sqrt{5} \cdot \sqrt{125}$ 

1.\_\_\_\_

2.  $\sqrt{14jd^{11}} \cdot \sqrt{14jd}$ 

2.\_\_\_\_

3.  $\sqrt{2m^9} \cdot \sqrt{50m^{11}}$ 

3.\_\_\_\_\_

4.  $\sqrt{6x^3y^2z} \cdot \sqrt{216xy^4z^5}$ 

4.\_\_\_\_\_

5.  $\sqrt{10t} \cdot \sqrt{10t}$ 

5.\_\_\_\_

**6.**  $\sqrt{6n^7} \cdot \sqrt{150n^{13}}$ 

6.\_\_\_\_

7.  $\sqrt{54}$ 

7.\_\_\_\_

8.  $\sqrt{343}$ 

8.\_\_\_\_

9.  $\sqrt{80t^2}$ 

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10.  $\sqrt{45a^2b}$ 

10.\_\_\_\_

11.  $\sqrt{180x^8y^{19}}$ 

11.\_\_\_\_\_

12.  $\sqrt{216x^4}$ 

12.\_\_\_\_

13.  $\sqrt{252x^6y^{15}}$ 

13.\_\_\_\_\_

14.  $\sqrt{448x^{10}y^7}$ 

Name: Instructor:	Date: Section:	
Chapter 9	ROOTS AND RADICALS	
9.4 Addition, Su	btraction, and Mixed Operations with Squ	are Roots
KEY VOCABUI	LARY	
Term	Definition	Example
Like radicals		
KEY PROPERT	TIES, PROCEDURES, OR STRATEGIES	
Rationalizing a	Denominator Containing a Sum or Differe	nce
NOTES		

Date: Section:

# **GUIDED EXAMPLES**

1. Multiply  $(\sqrt{5} + 6)(\sqrt{5} - 2)$ .

**Solution** 

Solution
$$(\sqrt{5}+6)(\sqrt{5}-2)$$

$$=$$

$$=$$

$$=$$

$$=$$

Use FOIL.

Multiply.

Simplify radicals with perfect squares.

Combine like terms and like radicals.

2. Rationalize the denominator and simplify.

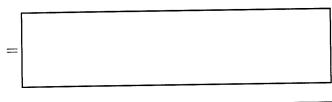
$$\frac{\sqrt{6}}{\sqrt{6}-7}$$

**Solution** 

<i>[</i>			
$\frac{\sqrt{6}}{\sqrt{6}-7} =$			
$\sqrt{6}$ 7			
<b>V</b> 0 - 7			

Multiply the numerator and denominator by the conjugate of the denominator.

Multiply the numerators and denominators.



Evaluate the square roots.

Simplify.

Date: Section:

# PRACTICE PROBLEMS

Simplify. Assume that variables represent nonnegative numbers.

1. 
$$3\sqrt{3} + 6\sqrt{3}$$

2. 
$$7\sqrt{7} - 4\sqrt{7}$$

3. 
$$10\sqrt{3} + 7\sqrt{3} + 8\sqrt{3}$$

4. 
$$\sqrt{80} - \sqrt{45}$$

5. 
$$\sqrt{175} - 4\sqrt{7}$$

6. 
$$-8\sqrt{3} + 6\sqrt{12}$$

7. 
$$4\sqrt{8} + 2\sqrt{18}$$

Multiply. Assume that variables represent nonnegative numbers.

**8.** 
$$\sqrt{10} \left( \sqrt{11} - \sqrt{7} \right)$$

9. 
$$\sqrt{2}(7\sqrt{5}-2\sqrt{9})$$

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**10.** 
$$(\sqrt{3}-5)(\sqrt{3}-4)$$

10.\_\_\_\_

11. 
$$(\sqrt{8} - \sqrt{2})(\sqrt{8} + \sqrt{2})$$

11.\_\_\_\_

**12.** 
$$(\sqrt{7} + 5\sqrt{3})(\sqrt{7} - 5\sqrt{3})$$

# Chapter 9 ROOTS AND RADICALS

# 9.1 Square Roots and Radical Expressions

 $\pm 7$ 

 $2. \pm 12$ 

3. 22 4. not a real number 5.  $-\frac{9}{2}$ 

6. irrational 7. rational 8. 4.123

9. -2.236

10. 8.246

11.  $5x^8y^{17}$ 

12.  $0.5x^3$  13. 60 mph 14. 45 mph

# 9.2 Multiplying and Simplifying Square Roots

1. 25

2.  $14jd^6$  3.  $10m^{10}$  4.  $36x^2y^3z^3$  5. 10t

6.  $30n^{10}$  7.  $3\sqrt{6}$  8.  $7\sqrt{7}$  9.  $4t\sqrt{5}$  10.  $3a\sqrt{5b}$ 

11.  $6x^4y^9\sqrt{5y}$  12.  $6x^2\sqrt{6}$  13.  $6x^3y^7\sqrt{7y}$  14.  $8x^5y^3\sqrt{7y}$ 

# 9.3 Dividing and Simplifying Square Roots

2. 6 3.  $4t^3$  4.  $\frac{3}{7}$  5.  $-\frac{3}{2}$  6.  $\frac{8}{9}$  7.  $\frac{2}{x^3}$ 

8.  $\frac{5a}{b^3}$  9.  $\frac{\sqrt{7}}{7}$  10.  $\frac{3\sqrt{5}}{5}$  11.  $\frac{\sqrt{30}}{2}$  12.  $\frac{\sqrt{xy}}{y}$  13.  $\frac{y\sqrt{10}}{14}$ 

14. 
$$\frac{\sqrt{cd}}{d^3}$$

# 9.4 Addition, Subtraction, and Mixed Operations with Square Roots

1.  $9\sqrt{3}$ 

2.  $3\sqrt{7}$  3.  $25\sqrt{3}$  4.  $\sqrt{5}$  5.  $\sqrt{7}$  6.  $4\sqrt{3}$ 

7.  $14\sqrt{2}$  8.  $\sqrt{110} - \sqrt{70}$  9.  $7\sqrt{10} - 6\sqrt{2}$  10.  $23 - 9\sqrt{3}$ 

11. 6

12. -68