# Ch 9 Notes KEY

Monday, October 2, 2023

1:42 PM

## 9.1 Notes: Simplifying Radicals

Lesson Objectives

Simplify square root expressions with numbers and variables

WARM UP Complete the table with a calculator for as many values as you can. Use a calculator to find the ones you don't already know.	n	n² (Perfect Squares)	n	n² (Perfect Squares)	n	n² (Perfect Squares)
	1	1	6	36	11	121
	2	4	7	49	12	144
	3	9	8	64	13	169
	4	16	9	81	14	196
Put a star next to the ones you need	5	25	10	100	15	225

Exploration: Work with your group or a partner.

- a) Simplify:  $\sqrt{49} = 7$
- b) Simplify:  $\sqrt{64}$   $= \frac{9}{8}$

c) A square television set has an area of 144 square inches. Find the length of one side.

Square Roots	Tradicand	18			
and Radicals	what # , times	itsek is	equal	to the	radicand 2

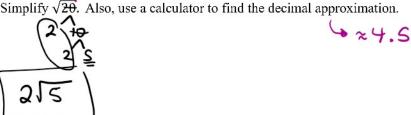
**Examples** #1 - 8: Simplify each expression.

Goal: find any perfect

- 1)  $\sqrt{49} = 7$  2)  $\sqrt{64} = 8$  3)  $\sqrt{81} = 9$  4)  $\sqrt{1} = 1$  5)  $6\sqrt{4} = 6 \cdot 2 = 12$  6)  $3\sqrt{16}$  3  $\cdot 4 = 12$  7)  $-7\sqrt{25}$  7  $\cdot 5 = 35$  8)  $5\sqrt{36}$  5  $\cdot 6$

Simplifying Square Roots	Dynake a factor tree  Deck for factors that repeat  11 pairs	7^^

**Example 9)** Simplify  $\sqrt{20}$ . Also, use a calculator to find the decimal approximation.

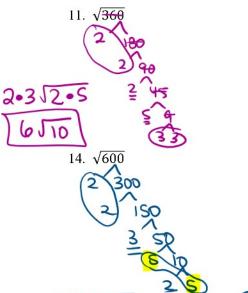


Examples #10 - 15: Simplify each of the following radical expressions.

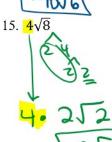


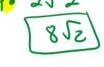
You Try #13 - 15!





12.  $-5\sqrt{24}$ 





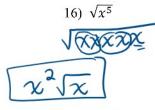
Simplifying Square Roots with Variables:

\* looking for pairs

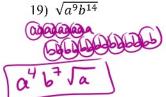
x power tells us how many of each variables we have

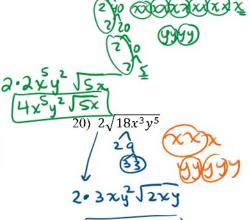
17)  $\sqrt{40x^{11}v^4}$ 

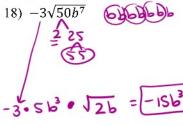
Examples 16-21: Simplify each radical expression. Assume all variables are positive.



You Try #19 - 21!











pairs Teft overs

## 9.2 Notes: Multiplying and Dividing Radicals

#### **Lesson Objectives**

- · Multiply square root expressions
- Square radical expressions
- · Divide simply square root expressions

Multiplying **Square Roots**  coefficient Tradicand · coefficient Tradicand

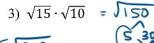
mult vaduand

For Examples #1 - 6, simplify each expression.

1) 
$$\sqrt{3} \cdot \sqrt{6} = \sqrt{6}$$





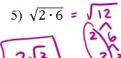






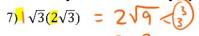
You Try #4 - 6!

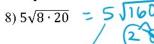
4) 
$$\sqrt{21} \cdot \sqrt{3} = \sqrt{63}$$

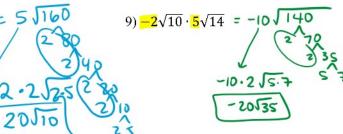




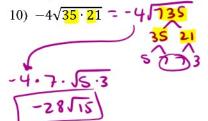
For Examples #7 - 12: Simplify each expression.

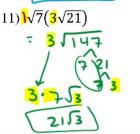


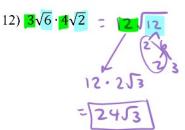




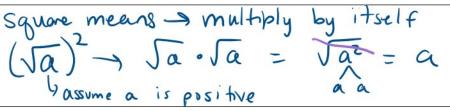
You try!







Squaring Radical **Expressions** 



For Examples #13 – 18, simplify each expression:

13) (
$$\sqrt{5}$$
)<sup>2</sup> = 5

$$14) (3\sqrt{2})^2 = 3\sqrt{2} \cdot 3\sqrt{2}$$

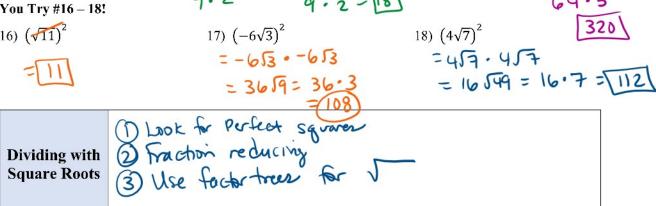
13) 
$$(\sqrt{5})^2 = 5$$
 14)  $(3\sqrt{2})^2 = 3\sqrt{2} \cdot 3\sqrt{2}$  15)  $(-8\sqrt{5})^2 = -8\sqrt{5} \cdot -8\sqrt{5}$ 

You Try #16 - 18! 16)  $(\sqrt{11})^2$ 



17) 
$$\left(-6\sqrt{3}\right)^2$$

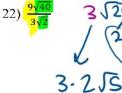
18) 
$$(4\sqrt{7})^2$$



For #19 - 26, simplify each expression.

19) 
$$\sqrt{\frac{49}{25}} = \sqrt{\frac{190}{25}} = \frac{3}{5}$$
 20)  $\frac{\sqrt{25}}{\sqrt{9}} = \frac{5}{3}$  21)  $\frac{\sqrt{48}}{\sqrt{12}} = \sqrt{4}$ 

21) 
$$\frac{\sqrt{48}}{\sqrt{12}} \sim \sqrt{4}$$



You Try #23 - 26!

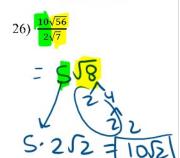
23) 
$$\sqrt{\frac{4}{121}} = \sqrt{\frac{5}{12}} = \sqrt{\frac{2}{11}}$$
 24)  $\sqrt{\frac{49}{36}} = \sqrt{\frac{7}{12}}$  divide

24) 
$$\frac{\sqrt{49}}{\sqrt{36}} = \boxed{\frac{7}{6}}$$

$$25) \sqrt{\frac{27}{\sqrt{3}}} divide$$

$$= \sqrt{9}$$

$$= \sqrt{3}$$



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## 9.3 Notes: Cube Roots and Rational Exponents

#### **Lesson Objectives**

- Simplify cube root expressions
- Simplify expressions with rational exponents

WARM UP Complete table without a calculator.	n	n <sup>2</sup> (Perfect Squares)	n	n <sup>2</sup> (Perfect Squares)	n	n² (Perfect Squares)
	1	١	6	36	11	121
	2	4	7	49	12	194
	3	9	8	64	13	169
	4	16	9	81	14	196
	5	25	10	100	15	225
	n	$n^3$ (Perfect Cubes)	n	n³ (Perfect Cubes)		
	1	1	4	64		
	2	8	5	125		
	3	27	6	216		

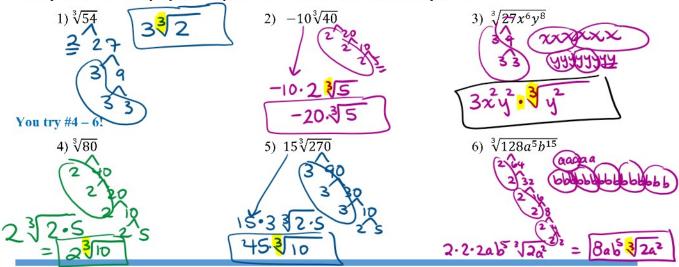
Simplifying index

X look for sets of 3 of
a Kind Irrake a factor tree

Cube Roots

Outside 3 left-over

Examples #1 - 6: Simplify each expression. Assume all variables are positive.



#### Rational **Powers**

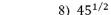


$$x^{1/3} = \sqrt[3]{x}$$

For Examples #7 - 12, simplify each expression.



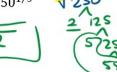












You Try #10 - 12!





11)  $216^{1/3}$ 

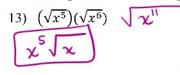


12)  $48^{1/3}$ 

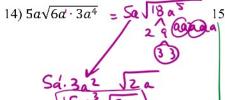


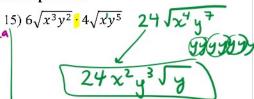
We can also multiply (and divide square roots with variables. Below are some examples with multiplication with variables and radicals.

For Examples #13 – 18: Simplify each expression. Assume all variables are positive.



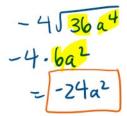




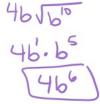


You try #16 - 18!

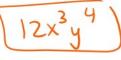
16) 
$$-4\sqrt{3a^3 \cdot 12a}$$



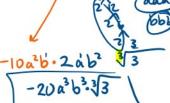
17) 
$$4b\sqrt{b^3}\cdot\sqrt{b^7}$$



8) 
$$(3\sqrt{x^5y^2})(4\sqrt{x^5y^6})$$



Challenge! Assume all variables are positive. Simplify:  $-10a^2b \cdot \sqrt[3]{24a^3b^6}$ 



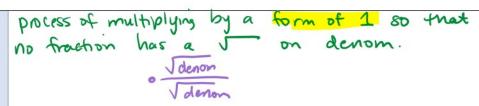
### 9.4 Notes: Rationalizing Expressions

#### **Lesson Objectives**

- Rationalize numerical expressions with square roots
- Rationalize variable expressions with square roots



Rationalizing with Square Roots



Examples #1 - 8: Simplify each expression. Rationalize as needed. Hint: look for a pattern!

$$1)\frac{1}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} \cdot \frac{\sqrt{3}}{3}$$

2) 
$$\frac{1}{\sqrt{2}} \cdot \sqrt{2} = \sqrt{2}$$

$$1)\frac{1}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{\sqrt{3}}{3}$$

$$2) \frac{1}{\sqrt{2}} \cdot \frac{1}{\sqrt{2}} = \frac{\sqrt{2}}{2}$$

$$3) \frac{1}{\sqrt{15}} \cdot \frac{1}{\sqrt{15}} = \frac{1}{\sqrt{11}} \cdot \frac{1}{\sqrt{11}} = \frac{1}{\sqrt{11}}$$





You Try #5 - 8!

5) 
$$\frac{1}{\sqrt{23}}$$

$$\frac{\sqrt{23}}{23}$$

6) 
$$\frac{1}{\sqrt{5}} \cdot \frac{5}{\sqrt{5}}$$



7) 
$$\frac{1}{\sqrt{17}}$$





Examples #9 - 16: Simplify each expression. Rationalize as needed. Hint: look for a pattern!

$$9)\frac{5}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \boxed{\frac{5}{3}} 10) \frac{-7}{\sqrt{2}} \cdot \frac{12}{\sqrt{2}}$$



11) 
$$\frac{15}{\sqrt{3}} \cdot \frac{13}{\sqrt{3}}$$











You Try #13 - 16!

13) 
$$\frac{-4}{\sqrt{23}}$$
  $\frac{\sqrt{5}}{\sqrt{5}}$  14)  $\frac{2}{\sqrt{5}}$   $\frac{\sqrt{5}}{\sqrt{5}}$  15)  $\frac{4}{\sqrt{2}}$   $\frac{16}{\sqrt{2}}$  16)  $\frac{10}{\sqrt{5}}$   $\frac{1}{\sqrt{5}}$ 



$$14) \frac{2}{\sqrt{5}} \cdot \frac{\sqrt{5}}{\sqrt{5}}$$



15) 
$$\frac{4}{\sqrt{2}}$$



16) 
$$\frac{10}{\sqrt{5}}$$



Simplifying 71) Look for Fraction Reducing

Radical

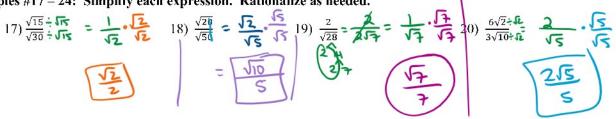
2) Simplify Radicals (factor tree)

Expressions with Ratios (Fractions)

3) Rationalize, if needed

4) Check for steps 1 and 2 one more time!

Examples #17 - 24: Simplify each expression. Rationalize as needed.



You Try #21 - 24!

$$21) \frac{\sqrt{20} \div 50}{\sqrt{60} \div 50} = \frac{1}{\sqrt{3}} \cdot \frac{3}{\sqrt{3}}$$

$$= \frac{\sqrt{4}}{\sqrt{5}} = \frac{2}{\sqrt{5}} \cdot \frac{3}{\sqrt{5}}$$

Rationalizing with Variables



Examples #25 – 28: Simplify each expression. Rationalize as needed. Assume all variables are positive.

$$25)\,\frac{3}{\sqrt{x}}\cdot\frac{\sqrt{x}}{\sqrt{x}}$$

$$27) \ \frac{2}{\sqrt{b}} \cdot \frac{5}{\sqrt{b}}$$

$$28) \frac{7}{3\sqrt{y}} \cdot \frac{\sqrt{y}}{\sqrt{y}} = \frac{7\sqrt{y}}{3y}$$