Warm Up:

Order the following from least to greatest:

.37, .33, 1/3, .32

Write the following using interval and setbuilder notation:

x>6

 $(6,\infty)$   $\{X \mid X > 6, X \in \mathbb{R}^3\}$ 

# 1-2 Properties of Real Numbers

### **Objective**

Identify and use properties of real numbers.

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**Properties Real Numbers Identities and Inverses** 

For all real numbers n,

WORDS	The sum of a number and 0, the additive identity, is the original number.
NUMBERS	3 + 0 = X 3
ALGEBRA	n + 0 = 0 + n = n

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# Properties of Real Numbers Properties Real Numbers Identities and Inverses For all real numbers n, WORDS Multiplicative Identity Property The product of a number and 1, the multiplicative identity, is the original number. NUMBERS $\frac{2}{3} \cdot 1 = \frac{2}{3}$ ALGEBRA $n \cdot 1 = 1 \cdot n = n$ Field Algebra 2 Copyright © by Holt, Rinehart and Winston, All Rights Reserved.

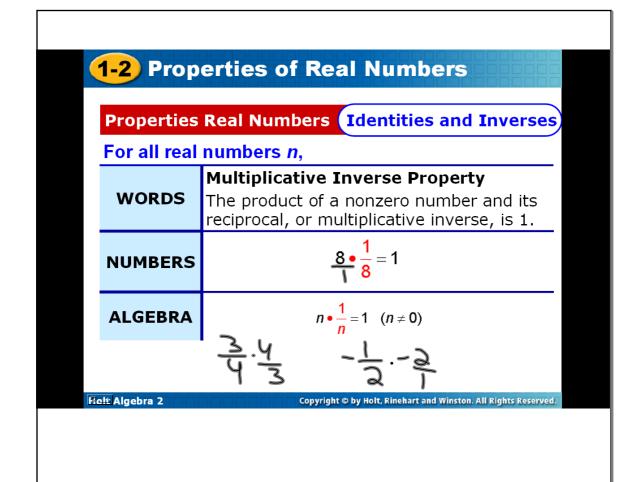


### **Properties Real Numbers Identities and Inverses**

For all real numbers n,

WORDS	Additive Inverse Property The sum of a number and its opposite, or additive inverse, is 0.	
NUMBERS	5 + (- <del>5</del> ) = 0	
ALGEBRA	n + (-n) = 0	
3+4		

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Find the additive and multiplicative identity of each number:

# 1-2 Properties of Real Numbers

### **Properties Real Numbers** Addition and Multiplication

### For all real numbers a and b,

		Closure Property
	WORDS	The sum or product of any two real numbers is a real number
	NUMBERS	2 + 3 = 5
		2(3) = 6
A	ALGEBRA	$a + b \in \mathcal{R}$
	ALGEBRA	$ab\in\mathscr{R}$

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### Properties Real Numbers Addition and Multiplication

For all real numbers a and b,

		Commutative Property
	WORDS	Commutative Property You can add or multiply real numbers in any order without changing the result.
ı	NUMBERS	7 + 11 = 11 + 7
		7(11) = 11(7)
	ALGEBRA	a + b = b + a
		ab = ba

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1-2 Prop	erties of Real Numbers	
Properties Real Numbers Addition and Multiplication		
For all real numbers a and b, Palanthesec		
WORDS	Associative Property The sum or product of three or more real numbers is the same regardless of the way the numbers are grouped.	
NUMBERS	(5+3)+7=5+(3+7) $(5 \cdot 3)7=5(3 \cdot 7)$	
ALGEBRA	a + (b + c) = a + (b + c) $(ab)c = a(bc)$	
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### Properties Real Numbers Addition and Multiplication

For all real numbers a and b,

	Distributive Property
WORDS	When you multiply a sum by a number, the result is the same whether you add and then multiply or whether you multiply each term by the number and add the products.
NUMBERG	5(2+8) = 5(2) + 5(8)
NUMBERS	(2 + 8)5 = (2)5 + (8)5
ALGEBRA	a(b+c)=ab+ac
ALGEDRA	(b + c)a = ba + ca

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# 1-2 Properties of Real Numbers

### **Example 2: Identifying Properties of Real Numbers**

Identify the property demonstrated by each question.

$$A. 2 \cdot 3.9 = 3.9 \cdot 2$$

Comm.

B. 
$$3(2\sqrt{8})=(3\cdot2)\sqrt{8}$$
ASSOC.

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### **Check It Out! Example 2**

Identify the property demonstrated by each equation.

2a. 
$$9\sqrt{2} = (\sqrt{2})9$$

2b. 
$$9(12\pi) = (9 \cdot 12)\pi$$

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# **Properties of Real Numbers**

**Example 4A: Classifying Statements as Sometimes, Always, or Never True** 

Classifying each statement as sometimes, always, or never true. Give examples or properties to support your answers.

$$a \cdot b = a$$
, where  $b = 3$ 



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Example 4B: Classifying Statements as Sometimes, Always, or Never True

Classifying each statement as sometimes, always, or never true. Give examples or properties to support your answers.

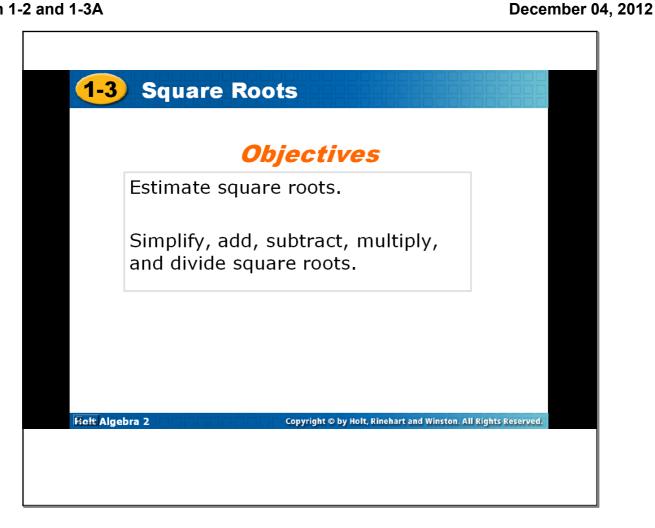
$$3(a+1)=3a+3$$

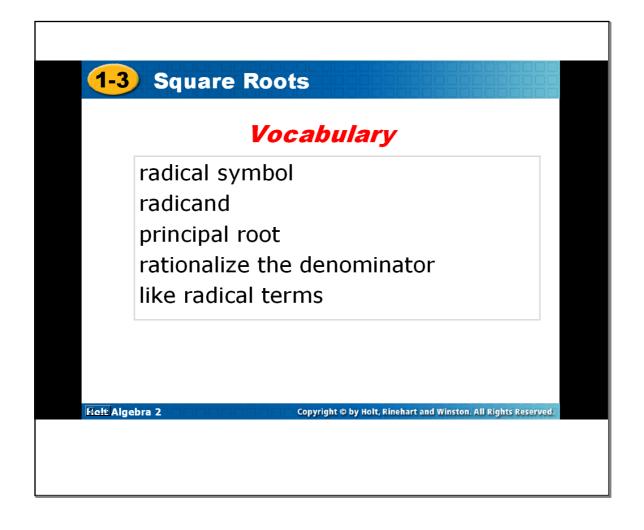
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Write your own equation and decide if it is always, sometimes, or never true. Justify your answer.

Then, classify your partner's equation and justify your answer.





### 1-3 Square Roots

The side length of a square is the square root of its area. This relationship is shown by a **radical symbol**  $(\sqrt{\ })$ . The number or expression under the radical symbol is called the **radicand**. The radical symbol indicates only the positive square root of a number, called the **principal root**. To indicate both the positive and negative square roots of a number, use the plus or minus sign  $(\pm)$ .

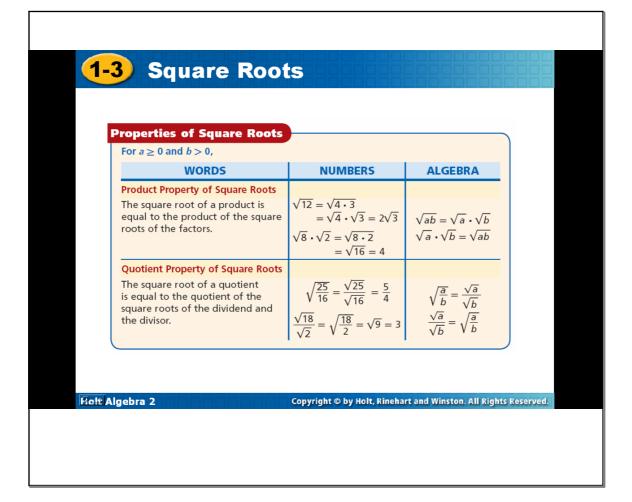
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# 1-3 Square Roots

Numbers such as 25 that have integer square roots are called *perfect squares*. Square roots of integers that are not perfect squares are irrational numbers. You can estimate the value of these square roots by comparing them with perfect squares. For example,  $\sqrt{5}$  lies between  $\sqrt{4}$  and  $\sqrt{9}$ , so it lies between 2 and 3.

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More often than not you will be given a square root that does not have a "nice" answer. As mathematicians we like our work to be as exact as possible so estimating on a calculator can become pointless and menial because it makes our work less exact. This is where these properties come in to play. By simplifying the number under the radical symbol into multiplication or division with a perfect square we can end up with much more precise answers.

# 1-3 Square Roots

**Example 2: Simplifying Square–Root Expressions Simplify each expression.** 

**A.** 
$$\sqrt{32}$$

$$\sqrt{\frac{25}{36}}$$

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# 1-3 Square Roots

**Example 2: Simplifying Square-Root Expressions** 

Simplify each expression.

**C.** 
$$\sqrt{3} \cdot \sqrt{12}$$

**D.** 
$$\sqrt{500}$$

$$\sqrt{\frac{500}{5}} = \sqrt{100} = 10$$

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Now attempt these with your partner. Give them a "mean" square root and have them apply these properties to get the most precise simplified answer.

### Homework

- p. 16 #15-23,35-40
- p. 24 #18-26