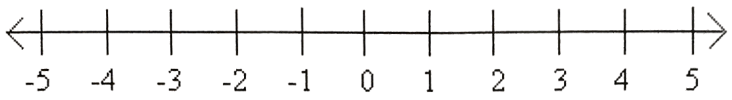
Name: _____ Date: _____

Aim: How can we review the properties of numbers?

DO NOW:

Place the following numbers on the number line.

-2 1.5 0.3 $\sqrt{16}$ π $\sqrt{11}$



Squares and Square Roots

Perfect square numbers represent the product of a rational number multiplied by itself.

How would we take the square root of a "non-perfect" square number?

SQUARES	SQUARE ROOTS
$1^2 = 1$	$\sqrt{1} = 1$
$2^2 = 4$	$\sqrt{4} = 2$
$3^2 = 9$	$\sqrt{9} = 3$
$4^2 = 16$	$\sqrt{16} = 4$
$5^2 = 25$	$\sqrt{25} = 5$
$6^2 = 36$	$\sqrt{36} = 6$
$7^2 = 49$	$\sqrt{49} = 7$
$8^2 = 64$	$\sqrt{64} = 8$
$9^2 = 81$	$\sqrt{81} = 9$
$10^2 = 100$	$\sqrt{100} = 10$
$11^2 = 121$	$\sqrt{121} = 11$
$12^2 = 144$	$\sqrt{144} = 12$

Estimating Square Roots

Let's consider $\sqrt{11}$ from the Do Now.

1) Between which two perfect squares is $\sqrt{11}$ located?

2) Evaluate each of those perfect squares.

3) Which one is $\sqrt{11}$ closer to?

Evaluate each of the following square roots (*estimate when necessary*). Treat square roots like parentheses in the order of operations – always evaluate them first!

1) $\sqrt{100}$ 2) $-\sqrt{100}$ 3) $\pm\sqrt{49}$ 4) $\sqrt{81} \times \sqrt{121}$

5) $\left(\sqrt{25}\right)^2$ 6) $\sqrt{16} + \sqrt{9}$ 7) $\sqrt{16+9}$ 8) $\sqrt{5}$

9) $\sqrt{\frac{9}{16}}$

Properties of Real Numbers

Property	Addition	Multiplication	Definition
Commutative			Changing the order of the numbers will not change the result.
Associative			Changing the grouping symbols will not change the result.
Identity			Any number plus 0 is equal to itself. Any number times 1 is equal to itself.
Inverse			For each real number (*except 0*), there exists an opposite number (*additive inverse*) and a reciprocal (*multiplicative inverse*).

Distributive		Multiplication can be distributed over addition or subtraction (*combines two operations*).
Zero Product		Any number times 0 is always equal to zero.

Name the property shown by each statement. ***Remember to use the full name of the property.***
Ex: *5 + 4 = 4 + 5 is an example of the Commutative Property of Addition*

Statement	Property
-5 + 0 = -5	
6(4 + 2) = 6(4) + 6(2)	
$\sqrt{10} + (-\sqrt{10}) = 0$	
-3(7) = 7(-3)	
(2 + 10) + 7 = 2 + (10 + 7)	
¼ (4) = 1	
½ • 1 = ½	

Connections

1) Does the associative property work under division? Explain.

2) Does the associative property work under subtraction? Explain and give an example.

3) Which shows the Commutative Property of Multiplication?

A) $15 \times 19 = 51 \times 91$ B) $71 + 63 = 63 + 71$ C) $54 \times 81 = 81 \times 54$ D) $37 \times 26 = 26 + 37$

4) Which expression is equivalent to $(5 \times 3) \times 7$?

A) $5 \times (3 + 7)$ B) $5 \times (3 \times 7)$ C) $5 + (3 \times 7)$ D) $(5 + 3) \times 7$

5) What property is demonstrated in #4?

6) Which shows the Zero Product Property?

A) $64 \times 0 = 64$ B) $12.8 + 0 = 12.8$ C) $1 \times 765 = 765$ D) $0 \times 32 = 0$

7) Alice claimed that $14(23 - 3) = 14 \times 23 - 14 \times 3$

a) Is Alice correct?

b) Which property justifies Alice's equation?

The TAKEAWAY

The _____ lay the mathematical foundation we need to work with expressions, equations, formulas, and more.