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PROPERTIES OF REAL NUMBERS

UNIT 1 LESSON 1

OBJECTIVES

STUDENTS WILL BE ABLE TO:

- identify various properties of real numbers.

KEY VOCABULARY:

- Real numbers
- Commutative and Associative Properties of Addition
- The Distributive Property
- The Additive and Multiplicative Inverse Property
- The Multiplicative Property of Zero

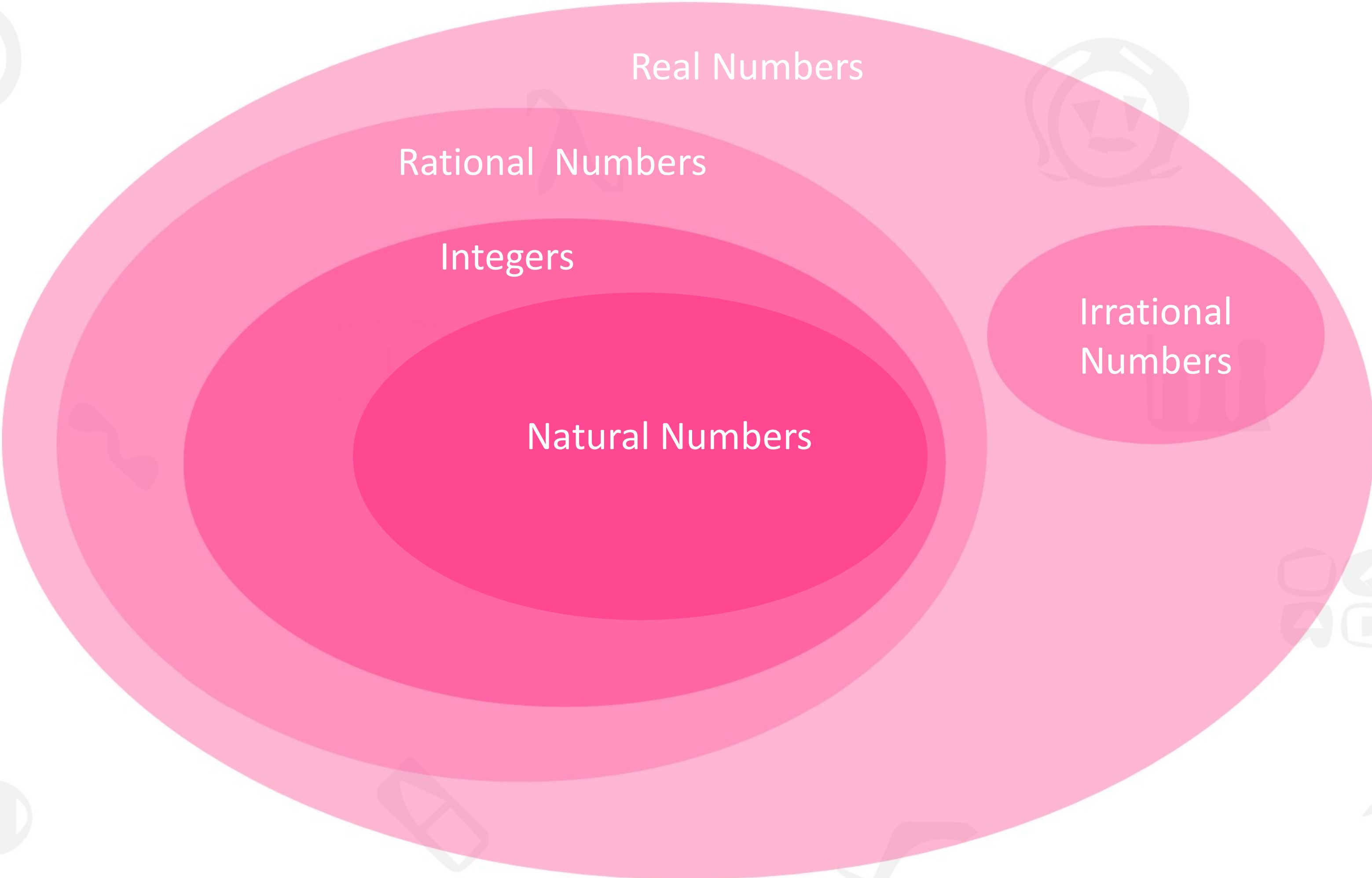
A **Real Number** is a value that represents a quantity along a continuous number line. Real numbers can be ordered. The symbol for the set of real numbers is script $\mathbb{R}$, which is the letter R in the typeface "blackboard bold".

PROPERTIES OF REAL NUMBERS

Real numbers include:

- Counting (Natural) Numbers $\mathbb{N}$ {1, 2, 3, ... }
- Whole Numbers {0, 1, 2, 3, ... }
- Integers $\mathbb{Z}$ {... , -3, -2, -1, 0, 1, 2, 3, ...}
- Rational Numbers $\mathbb{Q}$ (such as -½, 6.25)
- Irrational numbers (such as) 0,121221222........, $\sqrt{3}, \pi$

PROPERTIES OF REAL NUMBERS



PROPERTIES OF REAL NUMBERS

1. In pre-algebra, you learned about the properties of integers. Real numbers have the same types of properties, and you need to be familiar with them in order to solve algebra problems.

2. **Commutative Property of Addition**
   The commutative property of addition says we can swap **added numbers** over and still get the same answer ...

$$a + b = b + a$$

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Associative Property of Addition

The associative property addition says that it doesn't matter how we group the added numbers (i.e. which we calculate first)

$$(a + b) + c = a + (b + c)$$

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Commutative Property of Multiplication

The commutative property of multiplication is similar to that of addition. We can **swap multiplied numbers** over and still get the same answer ...

$$a \times b = b \times a$$

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Associative Property of Multiplication

The associative property of multiplication is similar to that of addition.
We can group the multiplied numbers (i.e. which we calculate first)

$$(a \times b) \times c = a \times (b \times c)$$

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Distributive Property

This property tells us that we get the same result when we multiply a number by a **group of numbers added together** or **multiply** each separately then **add** them.

$$a \times (b + c) = a \times b + a \times c$$

Here we get the same result when we multiply a by the sum of b and c or when we multiply a by b and multiply a by c then add the two products.

7 **Additive Identity Property**

Adding zero leaves the real number unchanged

$$a + 0 = a$$

8 **Multiplicative Identity Property**

Multiplying a real number by 1 leaves the real number unchanged.

$$a \times 1 = a$$

PROPERTIES OF REAL NUMBERS

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Additive Inverse Property

Adding a real number to its negative gives zero

$$a + (-a) = 0$$

10

Multiplicative Inverse Property

Multiplying a real number by its reciprocal gives 1

$$a \times 1/a = 1$$

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Zero Property

Multiplying any real number by zero gives zero

$$a \times 0 = a$$

PROBLEM 1:

Take each example and first decide if the left and right sides of the equal signs are equivalent. That would mean the equals sign makes the statement true. Then, decide if the commutative property was used in the example.

Example	Are the sides equivalent?	Does it use the Commutative Property?
$2 + 4 = 4 + 2$		
$2 \times 5 = 5 \times 2$		
$4 - 2 = 2 - 4$		
$2 \div 6 = 6 \div 2$		
$2 \times \frac{1}{4} = \frac{1}{4} \times 2$		

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Example	Are the sides equivalent?	Does it use the Commutative Property?
$2 + 4 = 4 + 2$	YES	YES
$2 \times 5 = 5 \times 2$	YES	YES
$4 - 2 = 2 - 4$	NO	NO
$2 \div 6 = 6 \div 2$	NO	NO
$2 \times \frac{1}{4} = \frac{1}{4} \times 2$	YES	YES

PROBLEM 2:

Take each example and first decide if the left and right sides of the equal signs are equivalent. That would mean the equals sign makes the statement true. Then, decide if the associative property was used in the example.

Example	Are the sides equivalent?	Does it use the associative Property?
$(2 + 3) - 7 = 2 + (3 - 7)$		
$3(2 \times 5) = (3 \times 2) \times 5$		
$6 - (7 - 2) = (6 - 7) - 2$		
$10 + [4 + (2 + 5)] = [10 + (4 + 2)] + 5$		
$2[4(5 \times 3)] = [2(4 \times 5)] \times 3$		

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Take each example and first decide if the left and right sides of the equal signs are equivalent. That would mean the equals sign makes the statement true. Then, decide if the associative property was used in the example.

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$3(2 \times 5) = (3 \times 2) \times 5$	YES	YES
$6 - (7 - 2) = (6 - 7) - 2$	NO	NO
$10 + [4 + (2 + 5)] = [10 + (4 + 2)] + 5$	YES	YES
$2[4(5 \times 3)] = [2(4 \times 5)] \times 3$	YES	YES

PROBLEM 3:

Take each example and first decide if the left and right sides of the equal signs are equivalent. That would mean the equals sign makes the statement true. Then, decide if the distributive property was used in the example.

Example	Are the sides equivalent?	Does it use the distributive Property?
$2 \times (3 + 5) = 2 \times 3 + 2 \times 5$		
$4 + (2 + 6) = (4 + 2) + 6$		
$7\times [2 \times (4+5)] = 2 \times [7 \times 4 + 7 \times 5]$		

PROBLEM 3:

Take each example and first decide if the left and right sides of the equal signs are equivalent. That would mean the equals sign makes the statement true. Then, decide if the distributive property was used in the example.

Example	Are the sides equivalent?	Does it use the distributive Property?
$2 \times (3 + 5) = 2 \times 3 + 2 \times 5$	YES	YES
$4 + (2 + 6) = (4 + 2) + 6$	YES	NO
$7\times [2 \times (4+5)] = 2 \times [7 \times 4 + 7 \times 5]$	YES	YES