

Lesson 9: Integers and Non-integers

Objectives



- To plot positive and negative values on a number line.
- To apply Order of Operations to expressions and equations using negative values.
- To write and solve equations representing real-world scenarios using positive and negative numbers.

Terms

- Positive
- Negative
- Integers
- Counting Numbers
- Non-Integer
- Evaluate
- Rational Number
- Irrational Number
- Terminating Decimal
- Repeating Decimal
- Like Terms

Consider this: How would you plot the following values on a number line?

Plot the given numbers on the number line. Label your points.

3	
-5	

Discuss: What does a negative sign represent?

Definitions:

- **Positive Numbers:** numbers that are _____ zero. When plotted on a number line, they are to the _____ of zero.
- **Negative Numbers:** numbers that are _____ zero. When plotted on a number line, they are to the _____ of zero.
- **Integers** can be defined as:
 - Counting Numbers (whole numbers), their opposites, and zero.
 - Counting Numbers: _____
 - Opposites: _____
 - Zero: 0
 - Numerical expressions that can be simplified to a counting number, its opposite, or zero.
- **Non-integers:** Numbers that cannot be simplified to an integer.

Circle the numbers below that are either an integer or can be simplified to an integer.

Given								
Can we Simplify?								

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Think about this: How does Order of Operations work with integers?

$$3 - (-5)$$



There are two ways to think about negative numbers and Order of Operations:

1. When you have a negative number, this indicates a **change in sign**. You move in the _____ direction. If you have two negatives, you reverse direction _____.

2. You can also think about it like this:

Positive: Face in the _____ direction.

Negative: Face in the _____ direction.

Addition: Move _____ on the number line.

Subtraction: Move _____ on the number line.

Example:

Use the space provided to evaluate the expression using Order of Operations:

a. $2 - (-3)^2$

b. $2 - (-3)^2 \times \underline{\hspace{2cm}}$

Definition: Evaluate: coming to a _____ number. _____ is also used.

Practice: Evaluate the expressions.

a. $2 - (-4)^2 + \underline{\hspace{2cm}}$

b. $\frac{1 - (-2)^3 - (-1)}{\underline{\hspace{2cm}}}$

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Think about this: How does Order of Operations work with non-integers?

Sort the numbers into the appropriate box.

$-\frac{1}{11}$

$\sqrt{64}$

-20π

$4.\overline{14}$

$-\sqrt{2}$

1.75

Rational	Irrational

Definitions:

- **Rational Numbers:** Numbers that can be written as a _____.
 - This included terminating decimals and repeating decimals.
 - **Terminating Decimals:** decimals that have a finite number of _____ after the decimal point.
 - **Repeating Decimals:** decimals that have a _____ that repeat. Written as decimal with a _____ above the _____.
 - Examples:
- **Irrational Numbers:** Numbers that cannot be written as a rational number.
 - Examples:

Practice Problems: Simplify the following expressions. Show your steps.

Definition: Like Terms: Terms where the variable or the _____ is the same.

Use the word problem to complete the following.

In the year 2000, a city had a population of 21,750 people. In 2005, the population grew by 1,800 people, but in 2010 it dropped by 750 people. The population decreased again in 2015 by 430 people.

- Write an equation that represents this situation. Use ***p*** for population.
- What was the population of the city by 2015?
- What is the total population change from 2000 to 2015?

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Practice: Evaluating a linear expression. Use the space provided to show your work.

1. Evaluate the expression when $a = -4$ and $y = \underline{\hspace{2cm}}$.

Expression: $y - 4a$

2. Evaluate the expression when $a = \frac{4}{5}$ and $c = \underline{\hspace{2cm}}$.

Expression: $-3c + a$

3. Evaluate the expression when $c = -7.3$ and $d = \underline{\hspace{2cm}}$.

Expression: $-3d + c$

4. Evaluate the expression when $n = \underline{\hspace{2cm}}$.

Expression: $n^2 + 9n - 6$

Properties of Exponents		
Property	Definition	Example
Product Property:	When multiplying exponents with the same base:	
Quotient Property:	When dividing exponents with the same base:	
Power Property:	When raising a power to a power:	
Negative Exponent:	To rewrite as a positive exponent:	
Zero Exponent:	Almost anything to the power of 0 is:	

Where will you see this in upcoming material?	What are the calculator skills you needed?
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