Types of Numbers and the Number Line

Lesson 1

Types of Numbers

There are many different numbers with different names:

- Whole numbers
- Natural numbers
- Integers
- Rational numbers
- Irrational numbers
- Real numbers

Types of Numbers

Whole Numbers

- A number with no fractional or decimal part
- Cannot be negative.
- Examples: **0, 1, 2, 3, 4…**

Natural Numbers

- Whole numbers from 1 and up
- "counting numbers"
- Examples: **1, 2, 3, 4, 5…**

Types of Numbers cont'd

Integers

- All whole numbers
- Include positive and negative whole numbers
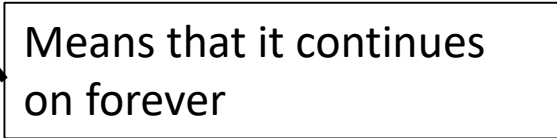- Examples: **…-4, -3, -2, -1, 0, 1, 2, 3, 4…**

Types of Numbers cont'd

Rational Numbers

- Any number that can be written by dividing one integer by another
- Decimal numbers that repeat (e.g. 4.55…), terminate (terminating decimals) or decimals that end [e.g. 5.25)
- Any number that can be written as a fraction or ratio
  - Hint: Think the root word of **RATIO**NAL is **RATIO**
- Examples
  - $3 = {}^3/_1$
  - ½ = 0.5
  - ⅓ = 0.33333…
  - ¼ = 0.25
  - ${}^{-7}/_1$ = -7

Types of Numbers cont'd

Irrational Numbers

- A number that cannot be written as a simple fraction because the decimal goes on forever without repeating

- Examples: **3.14159265…, √2**

Means that it continues on forever

- Every number has a decimal expansion
  - For example, **2** can be written 2.000000… however, an **irrational number's** decimal expansion goes on forever WITHOUT repeating

Types of Numbers cont'd

Real Numbers

- All numbers that can be found on a number line
- Can be large, small, positive, negative , decimals, fractions etc.
- Examples: **5, -17, 0.312, ½, √2, ∏**
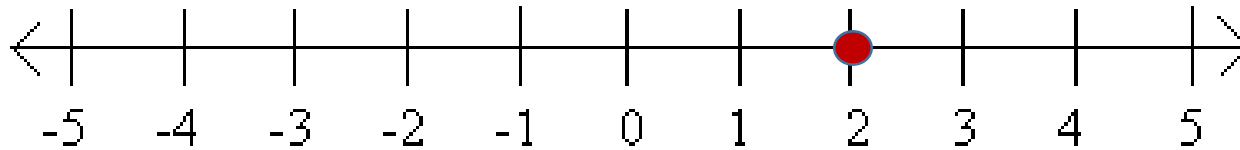
Rational Numbers and the Number Line

- All rational numbers can be placed on a number line.
- What is a number line?
  - A line that orders and compares numbers
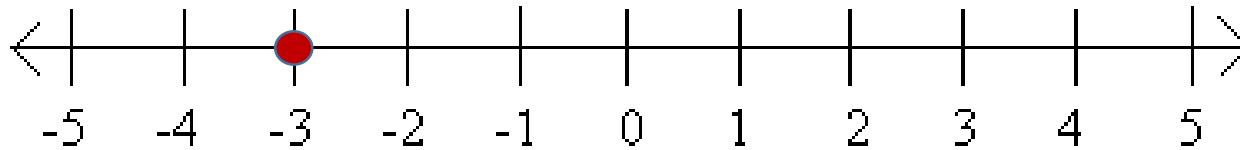 - **Smaller** numbers are on the **left**, and **larger** numbers are on the **right**
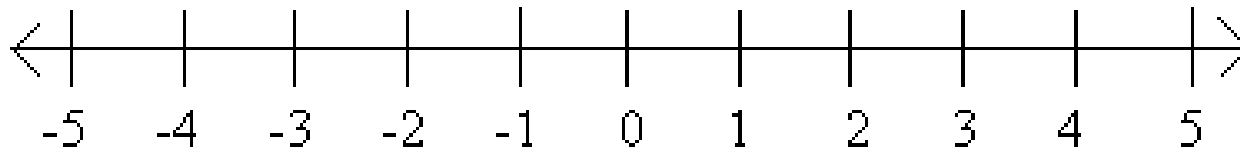
Rational Numbers and the Number Line

Example: The number 2 is larger than 1 and also larger than 0, so it is placed to the **RIGHT** of those numbers

Rational Numbers and the Number Line

Example: -3 is smaller than -2 and also smaller than -1, it is placed to the **LEFT** of those numbers.
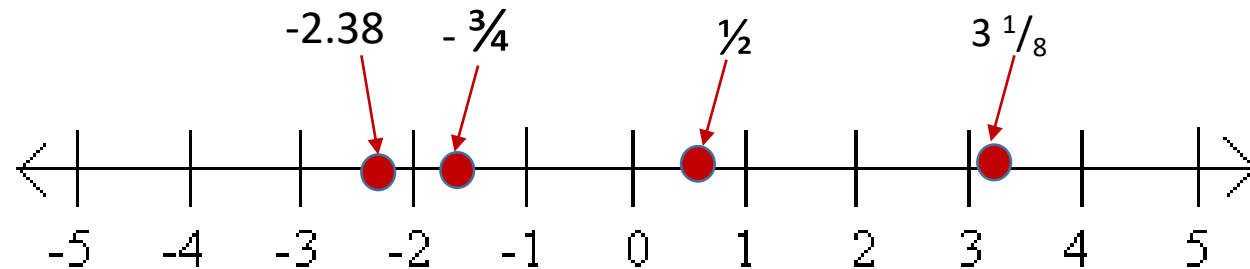
Rational Numbers and the Number Line

Not only can we place integers (+/- #s) on a number line, we can put fractions, decimals, and all other rational numbers on a number line as well.

Where do we place?

- -2.38
- - ¾
- ½
- 3 $\frac{1}{8}$

Positive and Negative Numbers

+/- #s

Positive and Negative Numbers

Positive Numbers

- Used to describe quantities greater than (>) 0

Negative Numbers

- Used to describe quantities less than (<) 0

- Positive and negative numbers are often used together to show quantities that have opposite directions or values
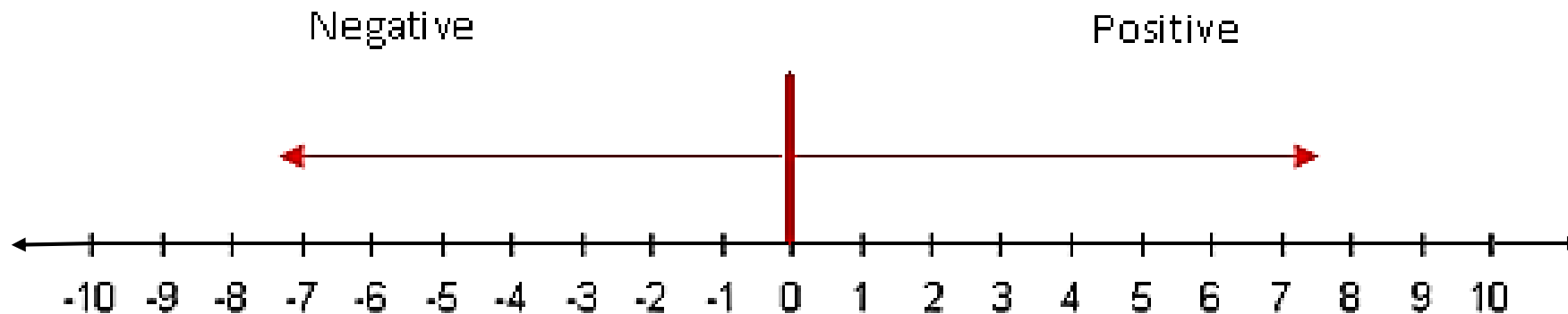
Positive and Negative Numbers

- ALL positive numbers can look like regular numbers
  - +4 and 4 mean the same thing
- ALL negative numbers have a negative sign (-) in front of them
  - -4, -3, -2, -2.5

**Reminder!: All positive and negative WHOLE NUMBERS (without fractions or decimals) are INTEGERS**

Positive and Negative Numbers

- All Integers can be placed on a number line

- If you put all integers on a number line…
  - 0 would be at the exact middle because 0 is neither positive or negative
  - Positive numbers will be to the right of 0
  - Negative numbers will be to the left of 0

Negative   Positive

-10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10

Positive and Negative Numbers

- Positive (+) and negative (-) signs are called **opposites**
  - So +3 and -3 are opposites
  - They are both the same number of spaces or the same distance from 0 on the number line , BUT on "**opposite**" sides
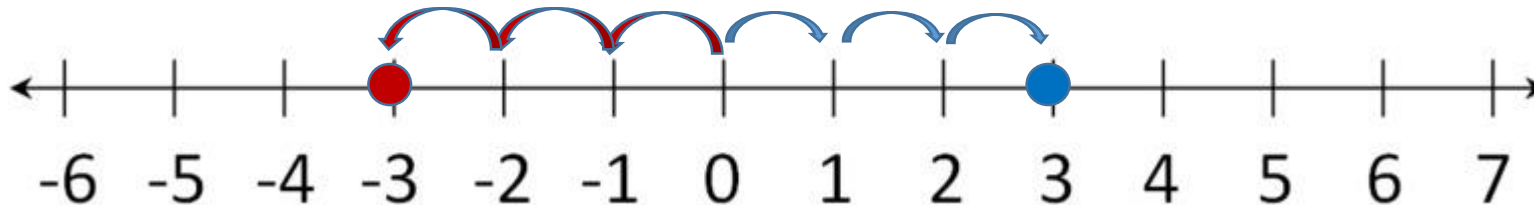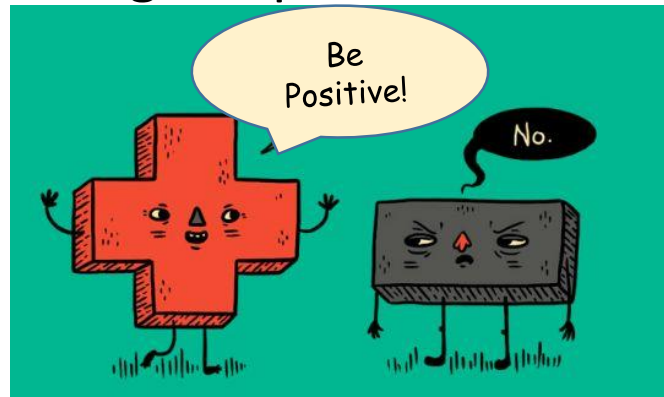
Positive and Negative Numbers

+ and – numbers have lots of uses in our world such as:

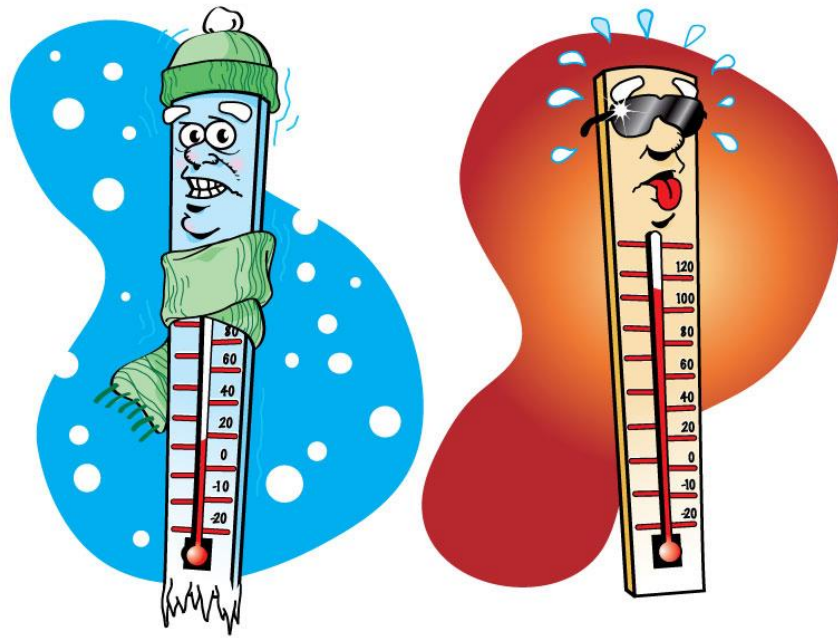- Savings (money that you keep) vs Debt (money that you owe)

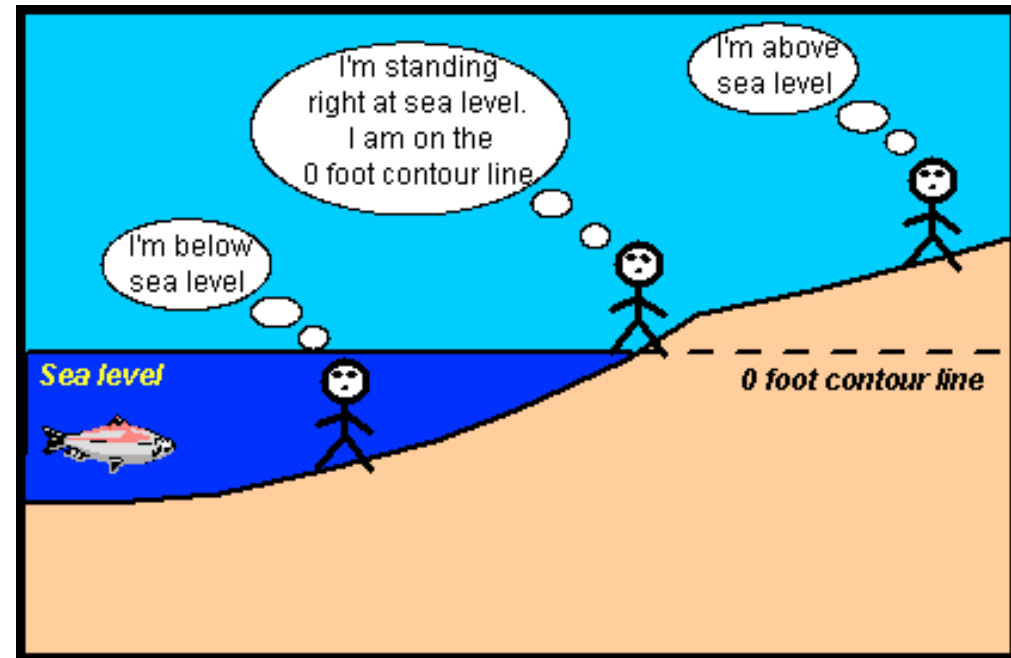- Negative electric charge vs positive electric charge

+ and – numbers have lots of uses in our world such as:

Below zero temperatures vs Above zero temperatures

Below sea level vs Above sea level

Horizontal vs Vertical Number Line

Horizontal number line:

- Numbers to the **left** of zero are **negative** and numbers to the **right** of zero are **positive**

- Numbers get **larger** as we move to the **right** and **smaller** as we move to the **left**

- Arrows are drawn on each end to show that the numbers keep going to infinity (positive and negative ∞)
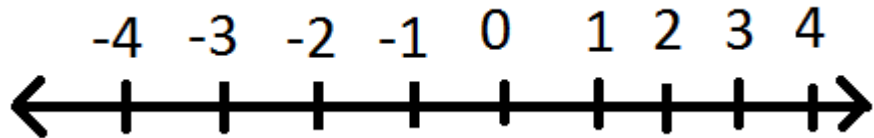
Vertical number line:

- Numbers **above** zero are **positive** and numbers **below** zero are **negative**

- Numbers get **larger** as we move **up** and **smaller** as we move **down**
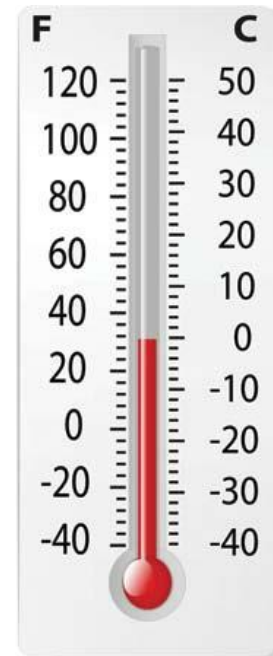
So… What is…?

Q: What is the opposite of 8?

A: -8

Q: George borrows $3 from his friend Stanley. What is the amount that George owes in an integer?

A: -3

The opposites of opposites property

- The opposite of the opposite of a number is the number itself!

Q: What is the opposite of the opposite of -16?

A:
- The opposite of -16 is 16
- The opposite of 16 is -16
- So the opposite of the opposite of -16 is -16 (which is the same as itself!)