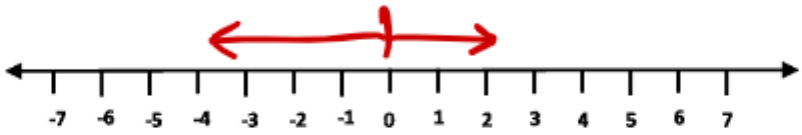
Numbers – Number Line and Classification of numbers:

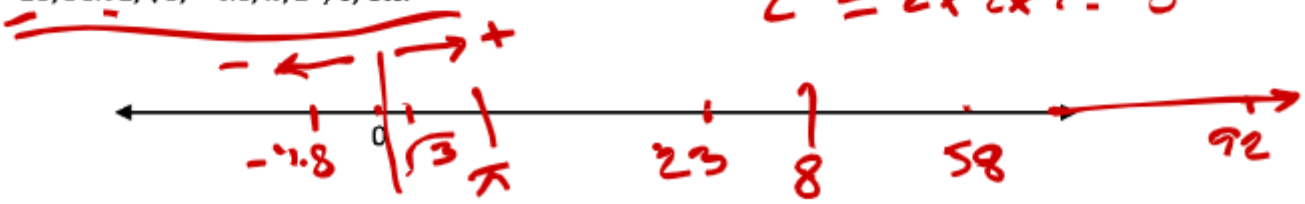
A Number Line is a horizontal line that conventionally has all positive numbers on the right hand side of the middle zero and the negative numbers on the left hand side.



Numbers can be classified into many types. The most common is a Real number. Real numbers are those that can be placed on a number line.

Examples:

$23, 58.92, \sqrt{3}, -4.8, \pi, 2^3, 0$, etc.



On the other hand, those numbers that cannot be placed on a number line are called Imaginary numbers or Complex numbers such as $\sqrt{-1}$ and $3 - \sqrt{7i}$ respectively.

Real numbers can be divided into two groups:

1. **Rational numbers:**
   As the name suggests, rational numbers are those that can be expressed as a ratio. Most numbers we use in our daily lives are rational numbers. Rational numbers can further be sub-divided into:
   A. *Integers:* Integers are whole numbers. $-2, 4, 0$ are all integers. The integers can be both negative integers ($e.g. -4, -7, -11$) and positive integers ($e.g. 3, 7, 13, 0, 5$). Note that 0 is a positive integer. All these can be written as a ratio.
   B. *Decimals:* When an integer is divided into parts of ten or multiples of 10, then we can have decimals. Such as 3.4 is $\frac{34}{10}$ and 4.586 is $\frac{4586}{1000}$.
   Terminating Decimals: Decimals that terminate at a certain number such as 5.85 ($= \frac{117}{20}$)
   Recurring Decimals: Decimals that have one or a set of numbers repeating such as $2.\overline{3} = 2.33333\ldots. (= \frac{7}{3})$ or $11.\overline{285714} = 11.28571428\ldots (= \frac{79}{7})$
   C. *Fractions:* In addition to decimals, any part of an integer divided into some parts can be expressed as a fraction. Such as $\frac{1}{4}, -\frac{7}{8}, or\ \frac{3}{5}$.
2. **Irrational numbers:** Although real numbers, these are those that cannot be expressed as a ratio. These include special numbers such as a π (=3.1416...) or an e (= 2.718..), or square roots of non-perfect squares such as $\sqrt{5}$, or cube roots of non-perfect cubes such as $\sqrt[3]{110}$