This course uses the set of **real numbers** as the universal set. We can represent the real numbers along a line called the **real number line.** This number line is a picture, or graph, of the real numbers. Each point on the real number line corresponds to exactly one real number, and each real number can be located at exactly one point on the real number line. Thus, two real numbers are said to be equal whenever they are represented by the same point on the real number line. The equation a=b (*a* equals *b*) means that the symbols *a* and *b* represent the same real number. Thus, 3+4=7 means that 3+4 and 7 represent the same number. The table below lists special subsets of the real numbers.

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| Number | Definition and example |
| 1. Natural numbers | The counting numbers, e.g. 1, 2, 3, 4… |
| 1. Integers | The natural numbers, 0, and the negatives of the natural numbers.  Example; ……, -2,-1, 0, 1, 2 …  Note, we have the negative integers, positive integers, and zero (which is neither positive or negative) |
| 1. Rational numbers | All numbers that can be written as the ratio of two integers, a/b, with b≠0. These numbers have decimal representations that either terminate or repeat. Note that all natural numbers and integers belong here. Examples include, 1.1111……, 1.121212….., +2, -5, 1.5 and so on. |
| 1. Irrational numbers | Those real numbers that *cannot* be written as the ratio of two integers. Irrational numbers have decimal representations that neither terminate nor repeat. Examples include, √2, √3, e.t.c. |
| 1. Real numbers, | The set containing all rational and irrational numbers (the entire number line). |

The properties of the real numbers are fundamental to the study of algebra. These properties follow. Let *a*, *b*, and *c* denotes real numbers.

1. Addition and multiplication are commutative. Subtraction is not.

*a* +*b* = *b + a, and ab=ba*

*2.* Addition and multiplication are associative. That is;

(a+b)+c = a+ (b+c) and (ab) c= a (bc)

3. The additive identity is 0.

a+0=0+a=a

4. The multiplicative identity is 1.

a.1=1.a=1

5. Each element *a* has an additive inverse, denoted by –α, such that;

a+ (–α) = –α+a= 0

1. Each nonzero element *a* has a multiplicative inverse, denoted by α-1

a..α-1 = α-1.a =1

α

Rational numbers

Irrational numbers

Real Numbers

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Integers

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