

The Real Number System

Type of Number	Definition	Examples	Counter Examples
Real Numbers	All the numbers that can be associated with points on a number line: $R \begin{array}{c} \text{---} \text{---} \text{---} \text{---} \text{---} \text{---} \\ \leftarrow \qquad \qquad \qquad \rightarrow \\ 0 \end{array}$	$\sqrt[3]{-8}, -1, -1/2, 0, 1/2, 1, \sqrt{3}, 5$	$5 + 3i, -i$
Rational Numbers	The subset of real numbers which can be written as a quotient p/q of two integers, where $q \neq 0$. $Q = \{p/q \mid p, q \in \mathbf{Z}, q \neq 0\}$	$2/3, -3/4, 7/8,$ $9 = 9/1,$ $0.125 = 1/8$	$\sqrt{2}$
Irrational Numbers	The subset of real numbers whose decimal representation neither repeats nor terminates or the subset of real numbers that are not rational. $I = \{i \in R \mid i \notin Q\}$	$\sqrt{2}$ or (1.41413562...), e or (2.718281828...), π or (3.141592654...)	$2/3$
Natural Numbers	The set of counting numbers: $N = 1, 2, 3, 4, 5, \dots$	$1, 2, 3, 4, 5, \dots; \sqrt{9} = 3, 14/2 = 7$	$-2, 1/8, \sqrt{3}$
Whole Numbers	The set of natural numbers including "0": $W = 0, 1, 2, 3, 4, 5, \dots$	$0, 1, 2, 3, 4, 5, \dots; \sqrt{4} = 2, 0/10 = 0$	$\sqrt{5}, -1/2, 2/3, -7$
Integers	The set of natural numbers, their negatives and zero: $\mathbf{Z} = \dots, -3, -2, -1, 0, 1, 2, 3, \dots$	$\dots, -3, -2, -1, 0, 1, 2, 3, \dots;$ $-9/3 = -3, \sqrt{25} = 5$	$4/5, -6/13$
Prime Numbers	All natural numbers greater than one which have no divisors except themselves and one.	5 is a prime number since its only divisors are itself and one: (5 x 1)	8 is not prime since it has divisors other than itself and one: (2 x 4) and (8 x 1)
Composite Numbers	All natural numbers greater than one which are not prime numbers.	4, 6, 8, 9, 10, 12, ...	3, 5, 7, 11, ...