Numbers and Sets

A number is a mathematical object used to count, measure and label. Numbers are classified into sets, called number systems, such as the natural numbers and the real numbers.

> We start with the natural numbers:

 $N = \{0, 1, 2, \ldots\}.$

> To this set we add the negative whole numbers and get the integers:

 $Z = \{\ldots, -3, -2, -1, 0, 1, 2, 3, \ldots\}.$

- > The rational numbers, denoted Q, are ratios of integers. Thus, any rational number r can be expressed as $r = \frac{m}{n}$
- \blacktriangleright where m and n are integers and n \neq 0.

Division by 0 is not allowed, so expressions like $\frac{3}{0}$ are undefined. Some numbers, such as $\sqrt{2}$ and π , can't be expressed as a ratio of integers and are therefore called irrational numbers.



We say a is less than b and write a < b if b – a is positive. Equivalently, we say b is greater than

a and write b > a. When we write $a \le b$ (or $b \ge a$) we mean that either a < b or a = b and we

read it as "a is less than or equal to b".

We use this order property of R to represent real numbers as points on a line, which is called a real number line, or simply a real line.