

# Types of Numbers



**T**here are important sets of numbers you should know:

## Types of Numbers

**Natural numbers:** the numbers that occur ‘naturally’ in the world.  $\{1, 2, 3, \dots\}$

**Whole numbers:** the natural numbers, and 0.  $\{0, 1, 2, 3, \dots\}$

**Integers:** positive and negative natural numbers, and 0.  $\{\dots-3, -2, -1, 0, 1, 2, 3, \dots\}$

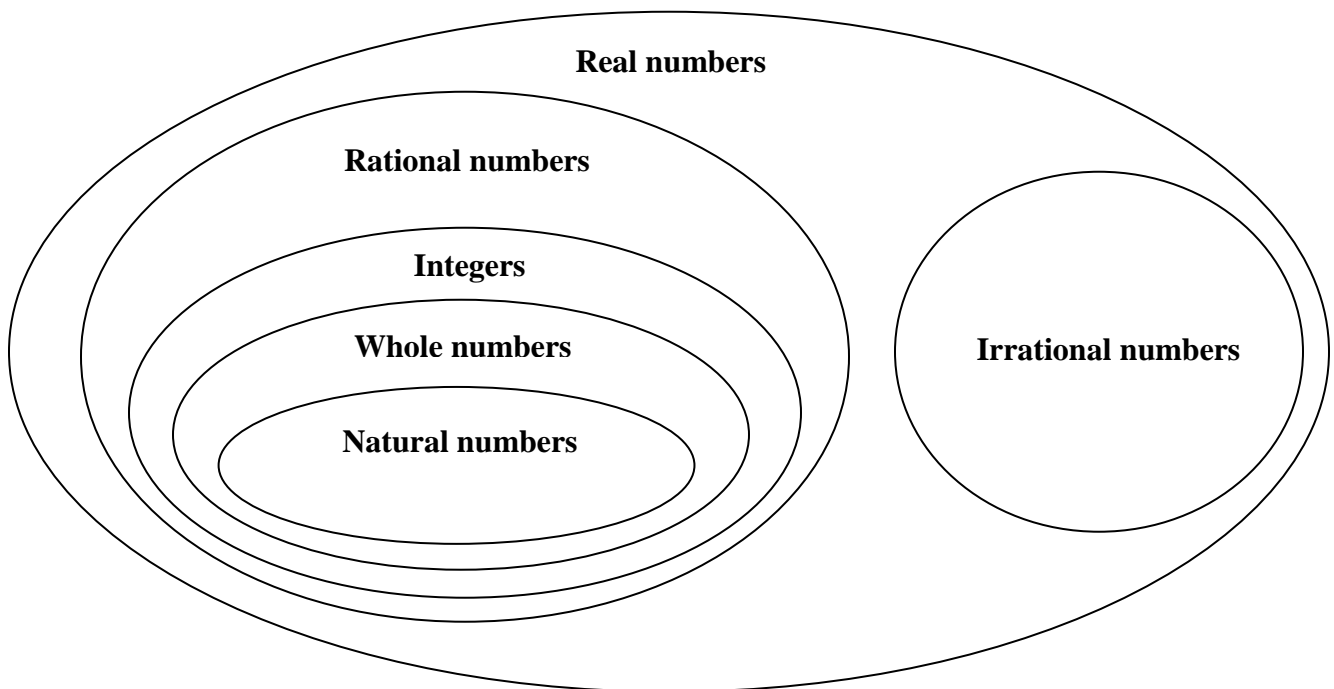
**Rational numbers:** any number that can be written as a ratio  $\frac{a}{b}$  where  $a$  and  $b$  are integers,  $b \neq 0$ .

Examples:  $\frac{2}{3}$ ; 7 because it equals  $\frac{7}{1}$ ; 0 because it equals  $\frac{0}{1}$ ;  $0.33\bar{3}$  because it equals  $\frac{1}{3}$ ; and 5.667 because it equals  $\frac{5667}{1000}$ .

**Irrational numbers:** any number that can not be written as a ratio  $\frac{a}{b}$  where  $a$  and  $b$  are integers.

Examples: any non-repeating, non-terminating decimals;  $\sqrt{2}$ ,  $\pi$  and the special number  $e$ .

All of these are examples of what we call **real numbers**. The diagram below shows the relationship between all these types of numbers.



Notice that  $\frac{1}{0}$  does not fit any of these definitions. It is said to be an *undefined* expression.

Use the information from the previous page to answer the questions below.

Name all of the sets of numbers to which each number belongs:

1. -1                      2.  $\frac{1}{3}$                       3. 7                      4. 0

Which is the most reasonable for each situation, *whole numbers, integers, or rational numbers*?

5. Your shoe size.                      6. The number of siblings you have
7. The number of quarts of paint you need to buy to paint a room.
8. The number of quarts of paint you use when you paint a room.

Is each statement *true or false*? If false, give a counterexample.

9. All integers are rational numbers.
10. All negative numbers are integers.
11. Every multiple of 3 is odd.