

AQA Computer Science A-Level
4.5.1 Number Systems
Intermediate Notes



Specification:

4.5.1.1 Natural numbers:

Be familiar with the concept of a natural number and the set \mathbb{N} of natural numbers (including zero).

4.5.1.2 Integer numbers:

Be familiar with the concept of an integer and the set \mathbb{Z} of integers.

4.5.1.3 Rational numbers:

Be familiar with the concept of a rational number and the set \mathbb{Q} of rational numbers, and that this set includes the integers.

4.5.1.4 Irrational numbers:

Be familiar with the concept of an irrational number.

4.5.1.5 Real numbers :

Be familiar with the concept of a real number and the set \mathbb{R} of real numbers, which includes the natural numbers, the rational numbers and the irrational numbers.

4.5.1.6 Ordinal numbers:

Be familiar with the concept of ordinal numbers and their use to describe the numerical positions of objects.

4.5.1.7 Counting and measurement:

Be familiar with the use of:

- natural numbers for counting
- real numbers for measurement



Natural numbers

$$\{0, 1, 2, 3, \dots\}$$

The natural numbers are a group of numbers containing **all positive whole numbers and zero**. They can be used to **count** how many of a certain item you have. For example, **three** keyboards, **seven** printers or **two** servers.

Integer numbers

$$\{\dots -2, -1, 0, 1, 2, \dots\}$$

The integers are a set of **whole numbers**, both **positive and negative**, including zero.

Rational numbers

Rational numbers can (but do not necessarily) have a **fractional part**. They can be **positive or negative** and include zero.

If a number can be written **exactly** as one number **over** another, then the number is rational.

Examples of rational numbers include:

$$4.5 \quad 74 \quad \frac{13}{27} \quad 6.4525 \quad -33.1 \quad \frac{-55}{4}$$

Note

74 could be written in fraction form as 74 over 1 so is a rational number.

Irrational numbers

In contrast to a rational numbers, irrational numbers **cannot be written exactly as a fraction**.

Examples of irrational numbers include:

$$\pi \quad \sqrt{2} \quad e \quad \sqrt{3}$$



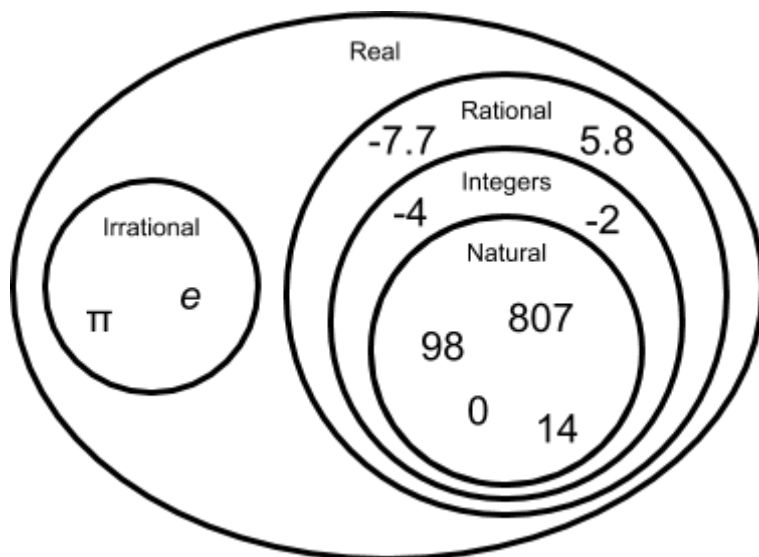
(pi)

(Euler's number)

Real numbers

The set of real numbers includes **all possible real word quantities**.

It includes all of the members of the irrational numbers, the rational numbers and hence the integers and natural numbers too.



Ordinal numbers

Ordinal numbers are **integers** used to describe the **numerical positions** of objects in relation to others. For example: 1st, 2nd or 3rd in a race. They're used in Computer Science to give items an **index** within a group of other items.

Counting and measuring

If you need to **count** how many of a certain object you have, **natural numbers** should be used. However, if you're **measuring** a quantity like a **length** or a **temperature**, you may not be using **whole numbers**. In this situation, **real numbers** should be used.

Counting	Measuring
Natural	Real

