MTH 1W Class Notes
Mr. Kempe Unit 1, Lesson 5

Number Sets

Example 1: There are 24 cookies. How many cookies will each kid get if there are...

a) 2 kids? b) 4 kids? c) 8 kids? d) 10 kids?

24 ÷ 2 = **12 cookies** 24 ÷ 4 = **6 cookies** 24 ÷ 8 = **3 cookies** 24 ÷ 10 = 2.4 **cookies**

With reference to (d)... can you actually give each kid *2.4 cookies*? Technically yes, if you're willing to cut the cookies into pieces, but it's more likely that to be fair you'd give them **2 cookies** each (and keep the rest for yourself).

Different situations can produce limitations on the **type** of number that can be used in a solution. Mathematicians have classified different types of numbers in **Number Sets**. Let's start with what a **set** is.

A **set** is a collection of objects. We note a set with brace brackets: {}. We can define a set by either (a) listing all the elements of a set or (b) describing the properties of the elements.

Example 2:

The set of colours for a traffic light are{red, yellow, green}.
The set of public school grades is {1, 2, 3, ... , 10, 11, 12}.
The set of all numbers bigger than 0 is $\{x \mid x > 0\}$.

A **subset** is set made of elements from another set. If A is a subset of B ($A \subseteq B$), then all the elements in A can be found in B.

Example 3:

{red} is a subset of {red, yellow, green}.

High school grades ({9, 10, 11, 12}) are a subset of public school grades.

"All numbers bigger than 10" is a subset of all numbers bigger than 0.

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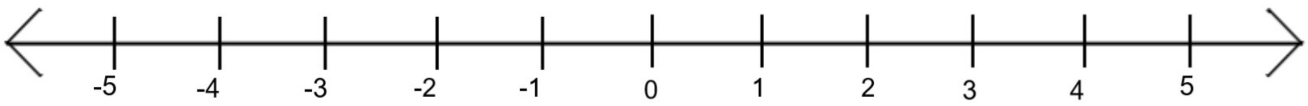
The Real Numbers ($\mathbb{R}$) are the set of all numbers that can be found on the number line. This includes both rational and irrational numbers. Real numbers can be expressed as decimals, which may terminate, repeat, or continue indefinitely without repetition.



The subsets of real numbers are:

Natural Numbers ($\mathbb{N}$): $\{1, 2, 3, \ldots\}$

Whole Numbers ($\mathbb{W}$): $\{0, 1, 2, 3, \ldots\}$

Integers ($\mathbb{Z}$): $\{\ldots, -3, -2, -1, 0, 1, 2, 3, \ldots\}$

Rational Numbers ($\mathbb{Q}$): $\left\{\frac{a}{b} \mid a, b \text{ are integers} \mid b \neq 0\right\}$

Ex: $\frac{3}{5}, \frac{-9}{4}$, 18

Irrational Numbers ($\mathbb{P}$ $\mathbb{Q}$ $\mathbb{R}$ $\mathbb{Q}$ ***oi'or***): {non-repeating, non-terminating decimals}
Ex: π, *e*, $\sqrt{2}$

Example 4: Write the following sets
a) The set of all whole numbers less than 4
{0,1,2,3}

b) The set of all integers that are multiples of 3
{..., -9, -6, -3, 0, 3, 6, 9, ...} **or** $\{x \mid x = 3n, n \in \mathbb{Z}\}$

c) The set of all odd natural numbers
{1, 3, 5, 7, 9, ...} **or** $\{x \mid x = 2n - 1, n \in \mathbb{N}\}$

d) $\{x \mid x = 2n, n \in \mathbb{N}\}$

{2, 4, 6, 8, 10, ...} **or** "the even natural numbers"

Example 4: Which subset does each number belong to?

a) -3; *Z, Q, and R*

b) 0; *W, Z, Q, and R*

c) $\sqrt{3}$; *Q' and R*

d) $0.\overline{45}$; *Q and R*