

UNIT 1 Set Theory

Ch 1:

Section 1.1 Types of sets and notation

→ set: A group of "objects" which have something in common

Ex: Natural numbers $1, 2, 3, 4, \dots$

→ elements: the "objects" within a set

→ subset: a set within a set

→ universal set: a set which contains all of the elements being considered.

Ex: The digits

$\{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$

→ complement: all the elements of a universal set that do not belong to a given subset.

→ Empty set: A set with no elements.

Ex: All odd numbers divisible by 2

Empty set: $\{ \}$ OR \emptyset

→ Disjoint sets: two or more sets which have no elements in common.

Ex: The set of odd #'s and the set of even #'s are disjoint.

Notations

Set → represented by a capital letter

Ex: The set of Natural #'s : N

Whole #'s : W

Integers : I

Rational #'s : Q

Irrational #'s : \overline{Q}

Element → represented with a lower case letter.

Ex: All Integers greater than 5

$\{x | x > 5, x \in I\}$

Subset → uses the symbol \subset

Ex: $W \subset I$

The whole #'s is a subset of the integers.

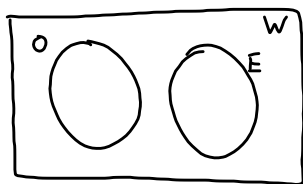
Complement → uses a ' after the set letter

Ex: If O represents the set of odd #'s, then the complement would be written as O'

Symbolic Representations of sets :

We use a Venn diagram

Ex:



$O \subset W$
 $E \subset W$
 O and E are disjoint

$O' = E$
 $E' = O$

Working with set notation and Venn diagrams

Ex: Write the set of multiples of 5 and then 10 from 1 to 500 using set notation.

$$S = \{1, 2, 3, 4, 5, \dots, 500\}$$

$$S = \{x \mid 1 \leq x \leq 500, x \in \mathbb{N}\}$$

$$F = \{5, 10, 15, 20, \dots, 495, 500\}$$

$$F = \{f \mid f = 5x, 1 \leq x \leq 100, x \in \mathbb{N}\}$$

$$F \subset S$$

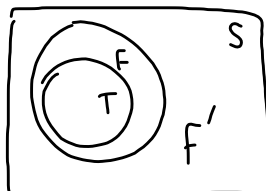
$$T = \{10, 20, 30, \dots, 490, 500\}$$

$$T = \{t \mid t = 10x, 1 \leq x \leq 50, x \in \mathbb{N}\}$$

$$T \subset S$$

$$T \subset F$$

Now represent this situation with a Venn diagram.



Ex: Brothers but no sisters



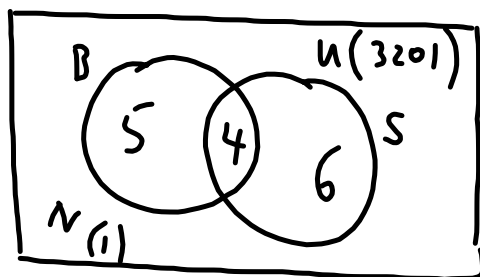
Sisters but no brothers



Both



None



$$n(B) = \# \text{ of elements in } B = 9$$

$$n(S) =$$

$$S = 10$$

$$n(N) = \# \text{ of elements in } N = 1$$

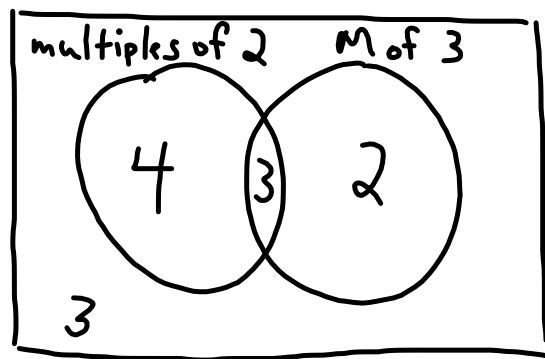
$$n(B)' = 7$$

$$n(B \cap S) = 4$$

$$n(B \cup S) = 15$$

$$n(B \cup S)' = 1$$

Ex: $S = \{4, 5, 6, 8, 9, 11, 15, 17, 20, 24, 30, 32\}$



$T \cap TH \cap F$

