5 is a natural number; *or* the collection of natural numbers contains 5.	$5 \in \mathbb{N}$
Adding 0 to the collection of natural numbers makes the collection of whole numbers.	$\mathbb{N} \cup \{0\} = \mathbb{W}$
Merging the algebraic numbers and the transcendental numbers makes the real numbers.	$\mathbb{A} \cup \mathbb{T} = \mathbb{R}$
Transcendental numbers are those real numbers which are not algebraic numbers.	$\mathbb{T} = \mathbb{R} - \mathbb{A}$
Nothing is both transcendental and algebraic, *or* the collection of things both transcendental and algebraic is empty.	$\mathbb{T} \cap \mathbb{A} = \emptyset$
Negative integers are both negative and integers.	$\mathbb{Z}^- = \mathbb{Z} \cap \mathbb{R}^-$
All integers are rational numbers.	$\mathbb{Z} \in \mathbb{R}$
Since all rational numbers are algebraic numbers and all algebraic numbers are real numbers, it follows that all rational numbers are real numbers.	$\begin{aligned} & \mathbb{Q} \subseteq \mathbb{A} \\ & \mathbb{A} \subseteq \mathbb{R} \\ \therefore\quad & \mathbb{Q} \subseteq \mathbb{R} \end{aligned}$

Axiom (Existence.)

There is a set with no elements.

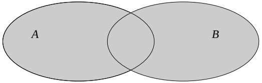
Axiom (Extensionality.)

If every element of a set X is an element of a set Y and every element of Y is an element of X, then $X = Y$.

Union

$A \cup B = \{\ x \mid x \in A \text{ or } x \in B\}$

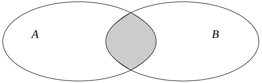
$$\begin{aligned} \{1,2,3\} \cup \{2,3,4\} &= \{1,2,3,4\} \\ \{1,2\} \cup \{3,4\} &= \{1,2,3,4\} \\ \{1,2\} \cup \{1,2,3\} &= \{1,2,3\} \end{aligned}$$



Intersection

$A \cap B = \{\ x \mid x \in A \text{ and } x \in B\}$

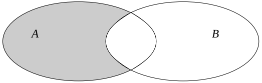
$$\begin{aligned} \{1,2,3\} \cap \{2,3,4\} &= \{2,3\} \\ \{1,2\} \cap \{3,4\} &= \emptyset \\ \{1,2\} \cap \{1,2,3\} &= \{1,2\} \end{aligned}$$



Difference

$A - B = \{\ x \mid x \in A \text{ and } x \notin B\}$

$$\begin{aligned} \{1,2,3\} - \{2,3,4\} &= \{1\} \\ \{1,2\} - \{3,4\} &= \{1,2\} \\ \{1,2\} - \{1,2,3\} &= \emptyset \end{aligned}$$

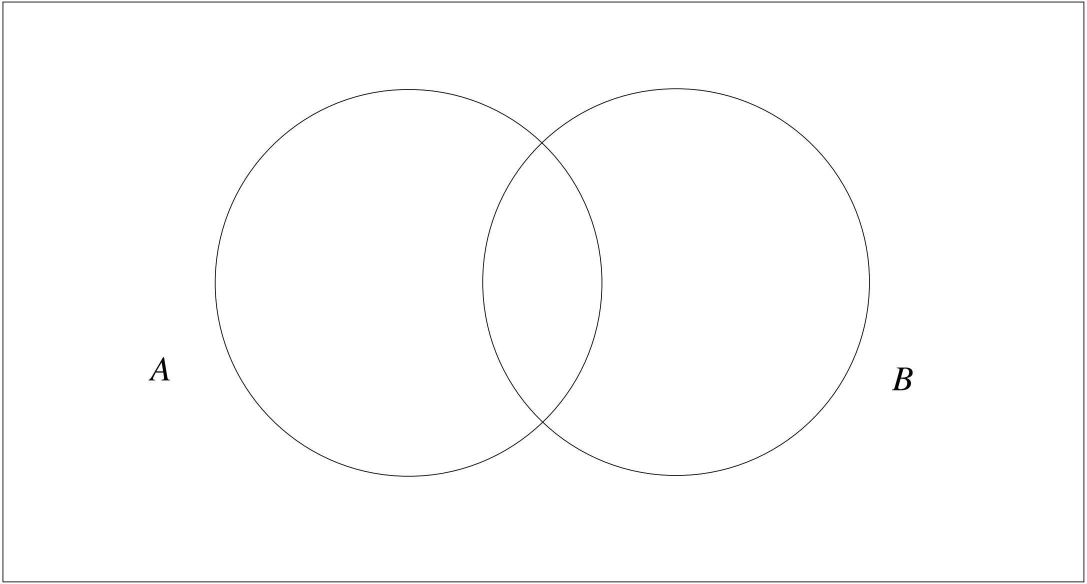


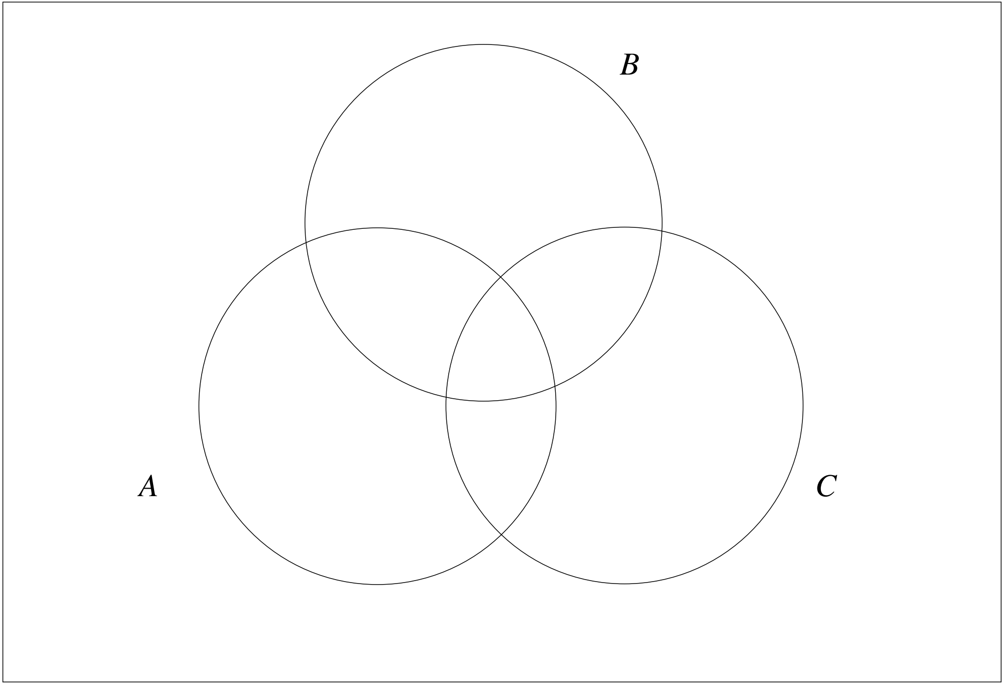
1. $\{1,2,3,4,5\} \cup \{5,6,7\} =$

2. $\{1,2,3,4,5\} \cap \{2,4,6,8,10\} =$

3. $\{1,2,3,4,5\} - \{2,3,4\} =$

4. $\{1,2,3,4,5\} - \{3,4,5,6,7\} =$


A
B



B
A
C

(Exercises 1.4.(11–18).)

$-12 \in \mathbb{R}^-$.

$\mathbb{Q} \cap \mathbb{T} = \emptyset$.

$\mathbb{A} \subseteq \mathbb{C}$.

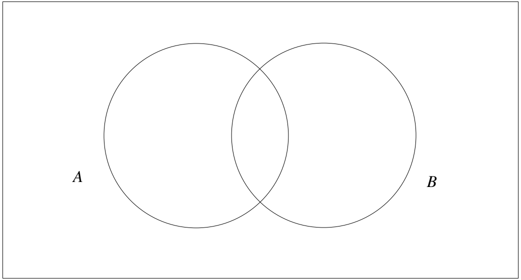
$\frac{1}{63} \in \mathbb{Q} - \mathbb{R}$.

$\mathbb{R} \subseteq \mathbb{C} \cap \mathbb{R}^-$

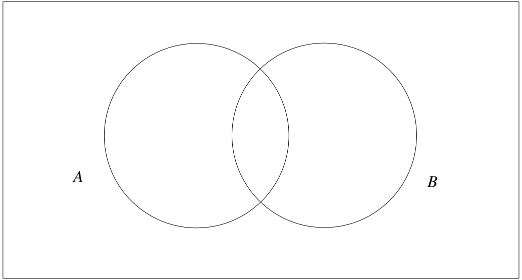
$\mathbb{Z} - \mathbb{R}^- = \mathbb{W}$.

$4 \in \mathbb{C}$.

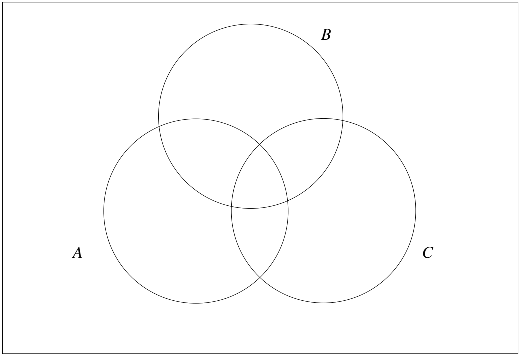
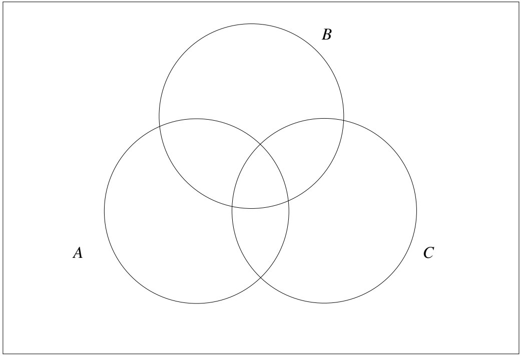
$\mathbb{T} \cup \mathbb{Z} \subseteq \mathbb{A}$.



A
B



A
B


B
A
C

B
A
C