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. \[ \mathbb{Q} \subseteq \mathbb{A} \]
\[ \mathbb{A} \subseteq \mathbb{R} \]
\[ \therefore \mathbb{Q} \subseteq \mathbb{R} \]
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
\[ A \cup B = \{ x \mid x \in A \text{ or } x \in B \} \]
\[ \{1, 2, 3\} \cup \{2, 3, 4\} = \{1, 2, 3, 4\} \]
\[ \{1, 2\} \cup \{3, 4\} = \{1, 2, 3, 4\} \]
\[ \{1, 2\} \cup \{1, 2, 3\} = \{1, 2, 3\} \]

Intersection
\[ A \cap B = \{ x \mid x \in A \text{ and } x \in B \} \]
\[ \{1, 2, 3\} \cap \{2, 3, 4\} = \{2, 3\} \]
\[ \{1, 2\} \cap \{3, 4\} = \emptyset \]
\[ \{1, 2\} \cap \{1, 2, 3\} = \{1, 2\} \]

Difference
\[ A - B = \{ x \mid x \in A \text{ and } x \notin B \} \]
\[ \{1, 2, 3\} - \{2, 3, 4\} = \{1\} \]
\[ \{1, 2\} - \{3, 4\} = \{1, 2\} \]
\[ \{1, 2\} - \{1, 2, 3\} = \emptyset \]
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. \( \{1, 2, 3, 4, 5\} - \{3, 4, 5, 6, 7\} = \)
(Exercises 1.4.(11–18).)

\[-12 \in \mathbb{R}^-.
\]

\[Q \cap T = \emptyset.
\]

\[A \subseteq \mathbb{C}.
\]

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

\[\mathbb{R} \subseteq \mathbb{C} \cap \mathbb{R}^-\]

\[Z - \mathbb{R}^- = \mathbb{W}.
\]

\[4 \in \mathbb{C}.
\]

\[T \cup Z \subseteq A.
\]