MATH1081 Discrete Mathematics

UNSW 2019T1

MATH1081 Discrete Mathematics

UNSW 2019T1

Welcome !

MATH1081 Discrete Mathematics

UNSW 2019T1

Formalities

Me: Thomas Britz

Email: `britz@unsw.edu.au`

Please email me if you have any questions or comments!

My office: Room RC-5111, Red Centre Building; just drop by!

Check Moodle for course material, information and the Help Forum.

Join the Facebook group to easily find and share information.

MATH1081 Discrete Mathematics

UNSW 2019T1

Overview

Topic 1: Sets, functions and sequences

Topic 2: Integers, Modular Arithmetic and Relations

Topic 3: Logic and Proofs

Topic 4: Enumeration and Probability

Topic 5: Graphs

§1 Sets, Functions, and Sequences

§1 Sets, Functions, and Sequences

- A *set* is a well-defined collection of distinct objects.

§1 Sets, Functions, and Sequences

- A *set* is a well-defined collection of distinct objects.
- An *element* of a set is any object in the set.

  $\in$ - "belongs to" or "is an element of"

  $\notin$ - "does not belong to" or "is not an element of"

§1 Sets, Functions, and Sequences

- A *set* is a well-defined collection of distinct objects.
- An *element* of a set is any object in the set.

  $\in$ - "belongs to" or "is an element of"

  $\notin$ - "does not belong to" or "is not an element of"
- The *cardinality* of a set S, denoted by $|S|$, is the number of elements in S.

§1 Sets, Functions, and Sequences

- A *set* is a well-defined collection of distinct objects.
- An *element* of a set is any object in the set.

  $\in$ - "belongs to" or "is an element of"

  $\notin$ - "does not belong to" or "is not an element of"
- The *cardinality* of a set S, denoted by $|S|$, is the number of elements in S.

Example. Some commonly-used sets in our number system:

$\mathbb{N}$ - the set of *natural numbers* $0, 1, 2, 3, \ldots$

§1 Sets, Functions, and Sequences

- A *set* is a well-defined collection of distinct objects.
- An *element* of a set is any object in the set.

  $\in$ - "belongs to" or "is an element of"

  $\notin$ - "does not belong to" or "is not an element of"
- The *cardinality* of a set S, denoted by $|S|$, is the number of elements in S.

Example. Some commonly-used sets in our number system:

$\mathbb{N}$ - the set of *natural numbers* $0, 1, 2, 3, \ldots$

$\mathbb{Z}$ - the set of *integers* (*whole numbers*) $\ldots, -3, -2, -1, 0, 1, 2, 3, \ldots$

§1 Sets, Functions, and Sequences

- A *set* is a well-defined collection of distinct objects.
- An *element* of a set is any object in the set.

  $\in$ - "belongs to" or "is an element of"

  $\notin$ - "does not belong to" or "is not an element of"
- The *cardinality* of a set S, denoted by $|S|$, is the number of elements in S.

Example. Some commonly-used sets in our number system:

$\mathbb{N}$ - the set of *natural numbers* $0, 1, 2, 3, \ldots$

$\mathbb{Z}$ - the set of *integers* (*whole numbers*) $\ldots, -3, -2, -1, 0, 1, 2, 3, \ldots$

$\mathbb{Q}$ - the set of *rational numbers* (*fractions*) $\ldots, -1, 0, 1, 2, \frac{1}{2}, 3, \frac{1}{3}, \frac{2}{3}, \ldots$

§1 Sets, Functions, and Sequences

- A *set* is a well-defined collection of distinct objects.
- An *element* of a set is any object in the set.

  $\in$ - "belongs to" or "is an element of"

  $\notin$ - "does not belong to" or "is not an element of"
- The *cardinality* of a set S, denoted by $|S|$, is the number of elements in S.

Example. Some commonly-used sets in our number system:

$\mathbb{N}$ - the set of *natural numbers* $0, 1, 2, 3, \ldots$

$\mathbb{Z}$ - the set of *integers* (*whole numbers*) $\ldots, -3, -2, -1, 0, 1, 2, 3, \ldots$

$\mathbb{Q}$ - the set of *rational numbers* (*fractions*) $\ldots, -1, 0, 1, 2, \frac{1}{2}, 3, \frac{1}{3}, \frac{2}{3}, \ldots$

$\mathbb{R}$ - the set of *real numbers*, which includes all rational numbers as well as *irrational numbers* such as π, e, and $\sqrt{2}$

§1 Sets, Functions, and Sequences

- A *set* is a well-defined collection of distinct objects.
- An *element* of a set is any object in the set.

  $\in$ - "belongs to" or "is an element of"

  $\notin$ - "does not belong to" or "is not an element of"

- The *cardinality* of a set S, denoted by $|S|$, is the number of elements in S.

Example. Some commonly-used sets in our number system:

$\mathbb{N}$ - the set of *natural numbers* $0, 1, 2, 3, \ldots$

$\mathbb{Z}$ - the set of *integers* (*whole numbers*) $\ldots, -3, -2, -1, 0, 1, 2, 3, \ldots$

$\mathbb{Q}$ - the set of *rational numbers* (*fractions*) $\ldots, -1, 0, 1, 2, \frac{1}{2}, 3, \frac{1}{3}, \frac{2}{3}, \ldots$

$\mathbb{R}$ - the set of *real numbers*, which includes all rational numbers as well as *irrational numbers* such as π, e, and $\sqrt{2}$

$\mathbb{C}$ - the set of *complex numbers*, which includes all real numbers as well as numbers like $\sqrt{-1}$.

- A *set* is a well-defined collection of distinct objects.
- An *element* of a set is any object in the set.

  $\in$ - "belongs to" or "is an element of"

  $\notin$ - "does not belong to" or "is not an element of"
- The *cardinality* of a set S, denoted by $|S|$, is the number of elements in S.

Example. We can specify a set by listing its elements between curly brackets, separated by commas:

$$S = \{a, b, c\}.$$

- A *set* is a well-defined collection of distinct objects.
- An *element* of a set is any object in the set.

  $\in$ - "belongs to" or "is an element of"

  $\notin$ - "does not belong to" or "is not an element of"
- The *cardinality* of a set S, denoted by $|S|$, is the number of elements in S.

Example. We can specify a set by listing its elements between curly brackets, separated by commas:

$$S = \{a, b, c\}\,.$$

The elements of S are a, b, and c.

- A *set* is a well-defined collection of distinct objects.
- An *element* of a set is any object in the set.
  - $\in$ - "belongs to" or "is an element of"
  - $\notin$ - "does not belong to" or "is not an element of"
- The *cardinality* of a set S, denoted by $|S|$, is the number of elements in S.

Example. We can specify a set by listing its elements between curly brackets, separated by commas:

$$S = \{a, b, c\}.$$

The elements of S are a, b, and c. Thus $|S| = 3$.

- A *set* is a well-defined collection of distinct objects.
- An *element* of a set is any object in the set.

  $\in$ - "belongs to" or "is an element of"

  $\notin$ - "does not belong to" or "is not an element of"
- The *cardinality* of a set S, denoted by $|S|$, is the number of elements in S.

Example. We can specify a set by listing its elements between curly brackets, separated by commas:

$$S = \{a, b, c\}.$$

The elements of S are a, b, and c. Thus $|S| = 3$.
We can write $a \in S$, $b \in S$, $c \in S$, and $d \notin S$, for instance.

- A *set* is a well-defined collection of distinct objects.
- An *element* of a set is any object in the set.

  $\in$ - "belongs to" or "is an element of"

  $\notin$ - "does not belong to" or "is not an element of"
- The *cardinality* of a set S, denoted by $|S|$, is the number of elements in S.

Example. We can specify a set by listing its elements between curly brackets, separated by commas:

$$S = \{a, b, c\}.$$

The elements of S are a, b, and c. Thus $|S| = 3$.
We can write $a \in S$, $b \in S$, $c \in S$, and $d \notin S$, for instance.

Example. We can specify a set by some property that all elements must have:

$$S = \{x \in \mathbb{Z} | -2 \leq x \leq 1\}$$

- A *set* is a well-defined collection of distinct objects.
- An *element* of a set is any object in the set.

  $\in$ - "belongs to" or "is an element of"

  $\notin$ - "does not belong to" or "is not an element of"
- The *cardinality* of a set S, denoted by $|S|$, is the number of elements in S.

Example. We can specify a set by listing its elements between curly brackets, separated by commas:

$$S = \{a, b, c\} .$$

The elements of S are a, b, and c. Thus $|S| = 3$.
We can write $a \in S$, $b \in S$, $c \in S$, and $d \notin S$, for instance.

Example. We can specify a set by some property that all elements must have:

$$S = \{x \in \mathbb{Z} \,|\, -2 \leq x \leq 1\}$$

$$(\text{or } S = \{x \in \mathbb{Z} : -2 \leq x \leq 1\}) .$$

- A *set* is a well-defined collection of distinct objects.
- An *element* of a set is any object in the set.
  - $\in$ - "belongs to" or "is an element of"
  - $\notin$ - "does not belong to" or "is not an element of"
- The *cardinality* of a set S, denoted by $|S|$, is the number of elements in S.

Example. We can specify a set by listing its elements between curly brackets, separated by commas:

$$S = \{a, b, c\}\,.$$

The elements of S are a, b, and c. Thus $|S| = 3$.
We can write $a \in S$, $b \in S$, $c \in S$, and $d \notin S$, for instance.

Example. We can specify a set by some property that all elements must have:

$$S = \{x \in \mathbb{Z} \mid -2 \leq x \leq 1\}$$

$$(\text{or } S = \{x \in \mathbb{Z} : -2 \leq x \leq 1\}\,)\,.$$

The elements of S are -2, -1, 0, and 1.

- A *set* is a well-defined collection of distinct objects.
- An *element* of a set is any object in the set.

  $\in$ - "belongs to" or "is an element of"

  $\notin$ - "does not belong to" or "is not an element of"
- The *cardinality* of a set S, denoted by $|S|$, is the number of elements in S.

Example. We can specify a set by listing its elements between curly brackets, separated by commas:

$$S = \{a, b, c\}\,.$$

The elements of S are a, b, and c. Thus $|S| = 3$.
We can write $a \in S$, $b \in S$, $c \in S$, and $d \notin S$, for instance.

Example. We can specify a set by some property that all elements must have:

$$S = \{x \in \mathbb{Z} \mid -2 \leq x \leq 1\}$$

$$(\text{or } S = \{x \in \mathbb{Z} : -2 \leq x \leq 1\}\,)\,.$$

The elements of S are -2, -1, 0, and 1. Thus $|S| = 4$.

- A *set* is a well-defined collection of distinct objects.
- An *element* of a set is any object in the set.
  - $\in$ - "belongs to" or "is an element of"
  - $\notin$ - "does not belong to" or "is not an element of"
- The *cardinality* of a set S, denoted by $|S|$, is the number of elements in S.

Example. We can specify a set by listing its elements between curly brackets, separated by commas:

$$S = \{a, b, c\}.$$

The elements of S are a, b, and c. Thus $|S| = 3$.
We can write $a \in S$, $b \in S$, $c \in S$, and $d \notin S$, for instance.

Example. We can specify a set by some property that all elements must have:

$$S = \{x \in \mathbb{Z} \mid -2 \leq x \leq 1\}$$

$$(\text{or } S = \{x \in \mathbb{Z} : -2 \leq x \leq 1\}).$$

The elements of S are -2, -1, 0, and 1. Thus $|S| = 4$.
We can write $-2 \in S$, $-1 \in S$, $0 \in S$, $1 \in S$, and $2 \notin S$, for instance.

- A *set* is a well-defined collection of distinct objects.
- An *element* of a set is any object in the set.
  - $\in$ - "belongs to" or "is an element of"
  - $\notin$ - "does not belong to" or "is not an element of"
- The *cardinality* of a set S, denoted by $|S|$, is the number of elements in S.

Exercise. Let $A = \{a, \{a\}\}$. What are the elements of A? What is $|A|$?

- A *set* is a well-defined collection of distinct objects.
- An *element* of a set is any object in the set.
  - $\in$ - "belongs to" or "is an element of"
  - $\notin$ - "does not belong to" or "is not an element of"
- The *cardinality* of a set S, denoted by $|S|$, is the number of elements in S.

Exercise. Let $A = \{a, \{a\}\}$. What are the elements of A? What is $|A|$?

The elements of A are a and $\{a\}$ (a and a set containing a).

- A *set* is a well-defined collection of distinct objects.
- An *element* of a set is any object in the set.

  $\in$ - "belongs to" or "is an element of"

  $\notin$ - "does not belong to" or "is not an element of"
- The *cardinality* of a set S, denoted by $|S|$, is the number of elements in S.

Exercise. Let $A = \{a, \{a\}\}$. What are the elements of A? What is $|A|$?

The elements of A are a and $\{a\}$ (a and a set containing a).

We can write $a \in A$ and $\{a\} \in A$.

- A *set* is a well-defined collection of distinct objects.
- An *element* of a set is any object in the set.
  - $\in$ - "belongs to" or "is an element of"
  - $\notin$ - "does not belong to" or "is not an element of"
- The *cardinality* of a set S, denoted by $|S|$, is the number of elements in S.

Exercise. Let $A = \{a, \{a\}\}$. What are the elements of A? What is $|A|$?

The elements of A are a and $\{a\}$ (a and a set containing a).

We can write $a \in A$ and $\{a\} \in A$.

$|A| = 2$.

- Two sets S and T are *equal*, denoted by $S = T$, if
  (i) every element of S is also an element of T, and
  (ii) every element of T is also an element of S.

  i.e., when they have precisely the same elements.

- Two sets S and T are *equal*, denoted by $S = T$, if

  (i) every element of S is also an element of T, and

  (ii) every element of T is also an element of S.

  i.e., when they have precisely the same elements.

- The *empty set*, denoted by $\varnothing$, is a set which has no elements.

- Two sets S and T are *equal*, denoted by $S = T$, if

  (i) every element of S is also an element of T, and

  (ii) every element of T is also an element of S.

  i.e., when they have precisely the same elements.

- The *empty set*, denoted by $\varnothing$, is a set which has no elements.

Exercise. Are any of the following sets equal?

$$A = \{2,3,4,5\}, \qquad C = \{2,2,3,3,4,5\},$$
$$B = \{5,4,3,2\}, \qquad D = \{x \in \mathbb{N} \mid 2 \le x \le 5\}.$$

- Two sets S and T are *equal*, denoted by $S = T$, if

  (i) every element of S is also an element of T, and

  (ii) every element of T is also an element of S.

  i.e., when they have precisely the same elements.

- The *empty set*, denoted by $\varnothing$, is a set which has no elements.

Exercise. Are any of the following sets equal?

$$A = \{2, 3, 4, 5\}, \qquad C = \{2, 2, 3, 3, 4, 5\},$$
$$B = \{5, 4, 3, 2\}, \qquad D = \{x \in \mathbb{N} \mid 2 \le x \le 5\}.$$

They are all equal.

- Two sets S and T are *equal*, denoted by $S = T$, if

  (i) every element of S is also an element of T, and

  (ii) every element of T is also an element of S.

  i.e., when they have precisely the same elements.

- The *empty set*, denoted by $\varnothing$, is a set which has no elements.

Exercise. Are any of the following sets equal?

$$A = \{2, 3, 4, 5\}, \qquad C = \{2, 2, 3, 3, 4, 5\},$$
$$B = \{5, 4, 3, 2\}, \qquad D = \{x \in \mathbb{N} \,|\, 2 \leq x \leq 5\}.$$

They are all equal.

Exercise. What is the difference between the sets $\varnothing$, $\{\varnothing\}$, and $\{\varnothing, \{\varnothing\}\}$?

- Two sets S and T are *equal*, denoted by $S = T$, if

  (i) every element of S is also an element of T, and

  (ii) every element of T is also an element of S.

  i.e., when they have precisely the same elements.

- The *empty set*, denoted by $\varnothing$, is a set which has no elements.

Exercise. Are any of the following sets equal?

$$A = \{2, 3, 4, 5\}, \qquad C = \{2, 2, 3, 3, 4, 5\},$$
$$B = \{5, 4, 3, 2\}, \qquad D = \{x \in \mathbb{N} \mid 2 \leq x \leq 5\}.$$

They are all equal.

Exercise. What is the difference between the sets $\varnothing$, $\{\varnothing\}$, and $\{\varnothing, \{\varnothing\}\}$?

$\varnothing$ is the empty set which does not contain anything.

- Two sets S and T are *equal*, denoted by $S = T$, if
  - (i) every element of S is also an element of T, and
  - (ii) every element of T is also an element of S.

  i.e., when they have precisely the same elements.

- The *empty set*, denoted by $\varnothing$, is a set which has no elements.

Exercise. Are any of the following sets equal?

$$A = \{2,3,4,5\}, \qquad C = \{2,2,3,3,4,5\},$$
$$B = \{5,4,3,2\}, \qquad D = \{x \in \mathbb{N} \,|\, 2 \leq x \leq 5\}.$$

They are all equal.

Exercise. What is the difference between the sets $\varnothing$, $\{\varnothing\}$, and $\{\varnothing, \{\varnothing\}\}$?

$\varnothing$ is the empty set which does not contain anything.

$\{\varnothing\}$ is a set containing just one element, namely, the empty set $\varnothing$.

- Two sets S and T are *equal*, denoted by $S = T$, if
  (i) every element of S is also an element of T, and
  (ii) every element of T is also an element of S.

  i.e., when they have precisely the same elements.

- The *empty set*, denoted by $\varnothing$, is a set which has no elements.

Exercise. Are any of the following sets equal?

$$A = \{2, 3, 4, 5\}, \qquad C = \{2, 2, 3, 3, 4, 5\},$$
$$B = \{5, 4, 3, 2\}, \qquad D = \{x \in \mathbb{N} \,|\, 2 \leq x \leq 5\}.$$

They are all equal.

Exercise. What is the difference between the sets $\varnothing$, $\{\varnothing\}$, and $\{\varnothing, \{\varnothing\}\}$?

$\varnothing$ is the empty set which does not contain anything.

$\{\varnothing\}$ is a set containing just one element, namely, the empty set $\varnothing$.

$\{\varnothing, \{\varnothing\}\}$ is a set containing two elements, namely, $\varnothing$ and $\{\varnothing\}$.

- Two sets S and T are *equal*, denoted by $S = T$, if

  (i) every element of S is also an element of T, and

  (ii) every element of T is also an element of S.

  i.e., when they have precisely the same elements.

- The *empty set*, denoted by $\varnothing$, is a set which has no elements.

Exercise. Are any of the following sets equal?

$$A = \{2,3,4,5\}, \qquad C = \{2,2,3,3,4,5\},$$
$$B = \{5,4,3,2\}, \qquad D = \{x \in \mathbb{N} \,|\, 2 \leq x \leq 5\}.$$

They are all equal.

Exercise. What is the difference between the sets $\varnothing$, $\{\varnothing\}$, and $\{\varnothing, \{\varnothing\}\}$?

$\varnothing$ is the empty set which does not contain anything.

$\{\varnothing\}$ is a set containing just one element, namely, the empty set $\varnothing$.

$\{\varnothing, \{\varnothing\}\}$ is a set containing two elements, namely, $\varnothing$ and $\{\varnothing\}$.

We can write $\varnothing \in \{\varnothing\}$, $\varnothing \in \{\varnothing, \{\varnothing\}\}$, $\{\varnothing\} \in \{\varnothing, \{\varnothing\}\}$.

- A *subset* of a set is a part of the set.
  - $\subseteq$ - "is a subset of"
  - $\not\subseteq$ - "is not a subset of"

- A *subset* of a set is a part of the set.
  - $\subseteq$ - "is a subset of"
  - $\not\subseteq$ - "is not a subset of"

Example. $\mathbb{N} \subseteq \mathbb{Z} \subseteq \mathbb{Q} \subseteq \mathbb{R} \subseteq \mathbb{C}$,

- A *subset* of a set is a part of the set.

  $\subseteq$ - "is a subset of"

  $\not\subseteq$ - "is not a subset of"

Example. $\mathbb{N} \subseteq \mathbb{Z} \subseteq \mathbb{Q} \subseteq \mathbb{R} \subseteq \mathbb{C}$, $\quad \{\frac{1}{2}, \pi\} \not\subseteq \mathbb{N}$

- A *subset* of a set is a part of the set.

  $\subseteq$ - "is a subset of"

  $\not\subseteq$ - "is not a subset of"

  - A set S is a *subset* of a set T if each element of S is also an element of T.

    $\star$ $S = T$ if and only if $S \subseteq T$ and $T \subseteq S$.

Example. $\mathbb{N} \subseteq \mathbb{Z} \subseteq \mathbb{Q} \subseteq \mathbb{R} \subseteq \mathbb{C}$, $\quad \{\frac{1}{2}, \pi\} \not\subseteq \mathbb{N}$

- A *subset* of a set is a part of the set.

  $\subseteq$ - "is a subset of"

  $\not\subseteq$ - "is not a subset of"

  - A set S is a *subset* of a set T if each element of S is also an element of T.

    ⋆ $S = T$ if and only if $S \subseteq T$ and $T \subseteq S$.

  - A set S is a *proper subset* of a set T if S is a subset of T and $S \neq T$.

    ⋆ $\varnothing$ is a proper subset of any non-empty set.

    ⋆ Any non-empty set is an improper subset of itself.

Example. $\mathbb{N} \subseteq \mathbb{Z} \subseteq \mathbb{Q} \subseteq \mathbb{R} \subseteq \mathbb{C}, \quad \{\frac{1}{2}, \pi\} \not\subseteq \mathbb{N}$

- A *subset* of a set is a part of the set.

  $\subseteq$ - "is a subset of"

  $\not\subseteq$ - "is not a subset of"

  - A set S is a *subset* of a set T if each element of S is also an element of T.

    $\star$ $S = T$ if and only if $S \subseteq T$ and $T \subseteq S$.

  - A set S is a *proper subset* of a set T if S is a subset of T and $S \neq T$.

    $\star$ $\varnothing$ is a proper subset of any non-empty set.

    $\star$ Any non-empty set is an improper subset of itself.

- The *power set* $P(S)$ of a set S is the set of all subsets of S.

  $\star$ For any set S, we have $\varnothing \subseteq S$ and $S \subseteq S$.

  $\star$ For any set S, we have $\varnothing \in P(S)$ and $S \in P(S)$.

Example. $\mathbb{N} \subseteq \mathbb{Z} \subseteq \mathbb{Q} \subseteq \mathbb{R} \subseteq \mathbb{C}$, $\quad \{\frac{1}{2}, \pi\} \not\subseteq \mathbb{N}$

- A *subset* of a set is a part of the set.

  $\subseteq$ - "is a subset of"

  $\not\subseteq$ - "is not a subset of"

  - A set S is a *subset* of a set T if each element of S is also an element of T.

    $\star$ $S = T$ if and only if $S \subseteq T$ and $T \subseteq S$.

  - A set S is a *proper subset* of a set T if S is a subset of T and $S \neq T$.

    $\star$ $\varnothing$ is a proper subset of any non-empty set.

    $\star$ Any non-empty set is an improper subset of itself.

- The *power set* $P(S)$ of a set S is the set of all subsets of S.

  $\star$ For any set S, we have $\varnothing \subseteq S$ and $S \subseteq S$.

  $\star$ For any set S, we have $\varnothing \in P(S)$ and $S \in P(S)$.

- The number of subsets of S is $|P(S)| = 2^{|S|}$. (*Why?*)

Example. $\mathbb{N} \subseteq \mathbb{Z} \subseteq \mathbb{Q} \subseteq \mathbb{R} \subseteq \mathbb{C}$, $\{\frac{1}{2}, \pi\} \not\subseteq \mathbb{N}$

- A *subset* of a set is a part of the set.

  $\subseteq$ - "is a subset of"
  $\not\subseteq$ - "is not a subset of"

  - A set S is a *subset* of a set T if each element of S is also an element of T.

- The *power set* $P(S)$ of a set S is the set of all subsets of S.

- The number of subsets of S is $|P(S)| = 2^{|S|}$.

- A *subset* of a set is a part of the set.

  $\subseteq$ - "is a subset of"

  $\not\subseteq$ - "is not a subset of"

  - A set S is a *subset* of a set T if each element of S is also an element of T.

- The *power set* $P(S)$ of a set S is the set of all subsets of S.

- The number of subsets of S is $|P(S)| = 2^{|S|}$.

Example. Let $S = \{a, b, c\}$. The subsets of S are:

$$\varnothing,\ \ \{a\}, \{b\}, \{c\},\ \ \{a, b\}, \{a, c\}, \{b, c\},\ \ \{a, b, c\}\,.$$

- A *subset* of a set is a part of the set.

  $\subseteq$ - "is a subset of"

  $\not\subseteq$ - "is not a subset of"

  - A set S is a *subset* of a set T if each element of S is also an element of T.

- The *power set* $P(S)$ of a set S is the set of all subsets of S.

- The number of subsets of S is $|P(S)| = 2^{|S|}$.

Example. Let $S = \{a, b, c\}$. The subsets of S are:

$$\varnothing, \ \{a\}, \{b\}, \{c\}, \ \{a, b\}, \{a, c\}, \{b, c\}, \ \{a, b, c\}\,.$$

S has 8 subsets.

- A *subset* of a set is a part of the set.

  $\subseteq$ - "is a subset of"

  $\not\subseteq$ - "is not a subset of"

  - A set S is a *subset* of a set T if each element of S is also an element of T.

- The *power set* $P(S)$ of a set S is the set of all subsets of S.

- The number of subsets of S is $|P(S)| = 2^{|S|}$.

Example. Let $S = \{a, b, c\}$. The subsets of S are:

$$\varnothing, \ \{a\}, \{b\}, \{c\}, \ \{a, b\}, \{a, c\}, \{b, c\}, \ \{a, b, c\}\,.$$

S has 8 subsets. We can write $\varnothing \subseteq S$, $\{b\} \subseteq S$, $\{a, c\} \subseteq S$, $\{a, b, c\} \subseteq S$, etc.

- A *subset* of a set is a part of the set.

  $\subseteq$ - "is a subset of"

  $\not\subseteq$ - "is not a subset of"

  - A set S is a *subset* of a set T if each element of S is also an element of T.

- The *power set* $P(S)$ of a set S is the set of all subsets of S.

- The number of subsets of S is $|P(S)| = 2^{|S|}$.

Example. Let $S = \{a, b, c\}$. The subsets of S are:

$$\varnothing, \ \{a\}, \{b\}, \{c\}, \ \{a, b\}, \{a, c\}, \{b, c\}, \ \{a, b, c\}.$$

S has 8 subsets. We can write $\varnothing \subseteq S$, $\{b\} \subseteq S$, $\{a, c\} \subseteq S$, $\{a, b, c\} \subseteq S$, etc. The power set of S is

$$P(S) = \{\varnothing, \ \{a\}, \{b\}, \{c\}, \ \{a, b\}, \{a, c\}, \{b, c\}, \ \{a, b, c\}\}.$$

- A *subset* of a set is a part of the set.

  $\subseteq$ - "is a subset of"

  $\not\subseteq$ - "is not a subset of"

  - A set S is a *subset* of a set T if each element of S is also an element of T.

- The *power set* $P(S)$ of a set S is the set of all subsets of S.

- The number of subsets of S is $|P(S)| = 2^{|S|}$.

Example. Let $S = \{a, b, c\}$. The subsets of S are:

$$\varnothing, \ \{a\}, \{b\}, \{c\}, \ \{a, b\}, \{a, c\}, \{b, c\}, \ \{a, b, c\}.$$

S has 8 subsets. We can write $\varnothing \subseteq S$, $\{b\} \subseteq S$, $\{a, c\} \subseteq S$, $\{a, b, c\} \subseteq S$, etc. The power set of S is

$$P(S) = \{\varnothing, \ \{a\}, \{b\}, \{c\}, \ \{a, b\}, \{a, c\}, \{b, c\}, \ \{a, b, c\}\}.$$

and $|P(S)| = 2^3 = 8$.

- A *subset* of a set is a part of the set.

  $\subseteq$ - "is a subset of"

  $\not\subseteq$ - "is not a subset of"

  - A set S is a *subset* of a set T if each element of S is also an element of T.

- The *power set* $P(S)$ of a set S is the set of all subsets of S.

- The number of subsets of S is $|P(S)| = 2^{|S|}$.

Example. Let $S = \{a, b, c\}$. The subsets of S are:

$$\varnothing,\ \ \{a\}, \{b\}, \{c\},\ \ \{a, b\}, \{a, c\}, \{b, c\},\ \ \{a, b, c\}\,.$$

S has 8 subsets. We can write $\varnothing \subseteq S$, $\{b\} \subseteq S$, $\{a, c\} \subseteq S$, $\{a, b, c\} \subseteq S$, etc. The power set of S is

$$P(S) = \{\varnothing,\ \ \{a\}, \{b\}, \{c\},\ \ \{a, b\}, \{a, c\}, \{b, c\},\ \ \{a, b, c\}\}\,.$$

and $|P(S)| = 2^3 = 8$.
We can write $\varnothing \in P(S)$, $\{b\} \in P(S)$, $\{a, c\} \in P(S)$, $\{a, b, c\} \in P(S)$, etc.

- An *element* of a set is any object in the set.

  $\in$ - "belongs to" or "is an element of"

- A *subset* of a set is a part of the set.

  $\subseteq$ - "is a subset of"

  - A set S is a *subset* of a set T if each element of S is also an element of T.

- The *power set* $P(S)$ of a set S is the set of all subsets of S.

- The number of subsets of S is $|P(S)| = 2^{|S|}$.

Exercise. Let $A = \{0, 1, \{0, 1\}\}$. What are the elements of A? What are the subsets of A? Find $P(A)$ and $|P(A)|$.

- An *element* of a set is any object in the set.

  $\in$ - "belongs to" or "is an element of"

- A *subset* of a set is a part of the set.

  $\subseteq$ - "is a subset of"

  - A set S is a *subset* of a set T if each element of S is also an element of T.

- The *power set* $P(S)$ of a set S is the set of all subsets of S.
- The number of subsets of S is $|P(S)| = 2^{|S|}$.

Exercise. Let $A = \{0, 1, \{0, 1\}\}$. What are the elements of A? What are the subsets of A? Find $P(A)$ and $|P(A)|$.

Elements: 0, 1, and $\{0, 1\}$.

- An *element* of a set is any object in the set.

  $\in$ - "belongs to" or "is an element of"

- A *subset* of a set is a part of the set.

  $\subseteq$ - "is a subset of"

  - A set S is a *subset* of a set T if each element of S is also an element of T.

- The *power set* $P(S)$ of a set S is the set of all subsets of S.

- The number of subsets of S is $|P(S)| = 2^{|S|}$.

Exercise. Let $A = \{0, 1, \{0, 1\}\}$. What are the elements of A? What are the subsets of A? Find $P(A)$ and $|P(A)|$.

Elements: 0, 1, and $\{0, 1\}$.

Subsets: $\varnothing$, $\{0\}$, $\{1\}$, $\{\{0, 1\}\}$, $\{0, 1\}$, $\{0, \{0, 1\}\}$, $\{1, \{0, 1\}\}$, $\{0, 1, \{0, 1\}\}$.

- An *element* of a set is any object in the set.

  $\in$ - "belongs to" or "is an element of"

- A *subset* of a set is a part of the set.

  $\subseteq$ - "is a subset of"

  - A set S is a *subset* of a set T if each element of S is also an element of T.

- The *power set* $P(S)$ of a set S is the set of all subsets of S.

- The number of subsets of S is $|P(S)| = 2^{|S|}$.

Exercise. Let $A = \{0, 1, \{0, 1\}\}$. What are the elements of A? What are the subsets of A? Find $P(A)$ and $|P(A)|$.

Elements: 0, 1, and $\{0, 1\}$.

Subsets: $\varnothing$, $\{0\}$, $\{1\}$, $\{\{0, 1\}\}$, $\{0, 1\}$, $\{0, \{0, 1\}\}$, $\{1, \{0, 1\}\}$, $\{0, 1, \{0, 1\}\}$.

$P(A) = \{\varnothing, \{0\}, \{1\}, \{\{0, 1\}\}, \{0, 1\}, \{0, \{0, 1\}\}, \{1, \{0, 1\}\}, \{0, 1, \{0, 1\}\}\}$.

- An *element* of a set is any object in the set.
  - $\in$ - "belongs to" or "is an element of"
- A *subset* of a set is a part of the set.
  - $\subseteq$ - "is a subset of"
  - A set S is a *subset* of a set T if each element of S is also an element of T.
- The *power set* $P(S)$ of a set S is the set of all subsets of S.
- The number of subsets of S is $|P(S)| = 2^{|S|}$.

Exercise. Let $A = \{0, 1, \{0, 1\}\}$. What are the elements of A? What are the subsets of A? Find $P(A)$ and $|P(A)|$.

Elements: 0, 1, and $\{0, 1\}$.

Subsets: $\varnothing$, $\{0\}$, $\{1\}$, $\{\{0, 1\}\}$, $\{0, 1\}$, $\{0, \{0, 1\}\}$, $\{1, \{0, 1\}\}$, $\{0, 1, \{0, 1\}\}$.

$P(A) = \{\varnothing, \{0\}, \{1\}, \{\{0, 1\}\}, \{0, 1\}, \{0, \{0, 1\}\}, \{1, \{0, 1\}\}, \{0, 1, \{0, 1\}\}\}$.

$|P(A)| = 2^3 = 8$.

- $\in$ - "is an element of"
- $\subseteq$ - "is a subset of"
  - A set S is a ***subset*** of a set T if each element of S is also an element of T.
- The *power set* $P(S)$ of a set S is the set of all subsets of S.

Exercise. For $A = \{0, 1, \{0, 1\}\}$, are the following statements true or false?

1. $\varnothing \in A$
2. $\varnothing \subseteq A$
3. $\varnothing \in P(A)$
4. $\varnothing \subseteq P(A)$
5. $0 \in A$
6. $0 \subseteq A$
7. $\{0, 1\} \in A$
8. $\{0, 1\} \in P(A)$
9. $\{\{0, 1\}\} \in A$
10. $\{\{0, 1\}\} \subseteq A$

- $\in$ - "is an element of"
- $\subseteq$ - "is a subset of"
  - A set S is a ***subset*** of a set T if each element of S is also an element of T.
- The *power set* $P(S)$ of a set S is the set of all subsets of S.

For $A = \{0, 1, \{0, 1\}\}$, are the following statements true or false?

1. $\varnothing \in A$ false
2. $\varnothing \subseteq A$
3. $\varnothing \in P(A)$
4. $\varnothing \subseteq P(A)$
5. $0 \in A$
6. $0 \subseteq A$
7. $\{0, 1\} \in A$
8. $\{0, 1\} \in P(A)$
9. $\{\{0, 1\}\} \in A$
10. $\{\{0, 1\}\} \subseteq A$

- $\in$ - "is an element of"
- $\subseteq$ - "is a subset of"
  - A set S is a ***subset*** of a set T if each element of S is also an element of T.
- The *power set* $P(S)$ of a set S is the set of all subsets of S.

For $A = \{0, 1, \{0, 1\}\}$, are the following statements true or false?

1.	$\varnothing \in A$	false	6.	$0 \subseteq A$
2.	$\varnothing \subseteq A$	true	7.	$\{0, 1\} \in A$
3.	$\varnothing \in P(A)$		8.	$\{0, 1\} \in P(A)$
4.	$\varnothing \subseteq P(A)$		9.	$\{\{0, 1\}\} \in A$
5.	$0 \in A$		10.	$\{\{0, 1\}\} \subseteq A$

- $\in$ - "is an element of"
- $\subseteq$ - "is a subset of"
  - A set S is a *subset* of a set T if each element of S is also an element of T.
- The *power set* $P(S)$ of a set S is the set of all subsets of S.

For $A = \{0, 1, \{0, 1\}\}$, are the following statements true or false?

1.	$\varnothing \in A$	false	6.	$0 \subseteq A$
2.	$\varnothing \subseteq A$	true	7.	$\{0, 1\} \in A$
3.	$\varnothing \in P(A)$	true	8.	$\{0, 1\} \in P(A)$
4.	$\varnothing \subseteq P(A)$		9.	$\{\{0, 1\}\} \in A$
5.	$0 \in A$		10.	$\{\{0, 1\}\} \subseteq A$

- $\in$ - "is an element of"
- $\subseteq$ - "is a subset of"
  - A set S is a *subset* of a set T if each element of S is also an element of T.
- The *power set* $P(S)$ of a set S is the set of all subsets of S.

For $A = \{0, 1, \{0, 1\}\}$, are the following statements true or false?

1.	$\varnothing \in A$	false	6.	$0 \subseteq A$
2.	$\varnothing \subseteq A$	true	7.	$\{0, 1\} \in A$
3.	$\varnothing \in P(A)$	true	8.	$\{0, 1\} \in P(A)$
4.	$\varnothing \subseteq P(A)$	true	9.	$\{\{0, 1\}\} \in A$
5.	$0 \in A$		10.	$\{\{0, 1\}\} \subseteq A$

- $\in$ - "is an element of"
- $\subseteq$ - "is a subset of"
  - A set S is a ***subset*** of a set T if each element of S is also an element of T.
- The *power set* $P(S)$ of a set S is the set of all subsets of S.

For $A = \{0, 1, \{0, 1\}\}$, are the following statements true or false?

1.	$\varnothing \in A$	false	6.	$0 \subseteq A$
2.	$\varnothing \subseteq A$	true	7.	$\{0, 1\} \in A$
3.	$\varnothing \in P(A)$	true	8.	$\{0, 1\} \in P(A)$
4.	$\varnothing \subseteq P(A)$	true	9.	$\{\{0, 1\}\} \in A$
5.	$0 \in A$	true	10.	$\{\{0, 1\}\} \subseteq A$

- $\in$ - "is an element of"
- $\subseteq$ - "is a subset of"
  - A set S is a ***subset*** of a set T if each element of S is also an element of T.
- The *power set* $P(S)$ of a set S is the set of all subsets of S.

For $A = \{0, 1, \{0, 1\}\}$, are the following statements true or false?

1.	$\varnothing \in A$	false	6.	$0 \subseteq A$	false
2.	$\varnothing \subseteq A$	true	7.	$\{0, 1\} \in A$	
3.	$\varnothing \in P(A)$	true	8.	$\{0, 1\} \in P(A)$	
4.	$\varnothing \subseteq P(A)$	true	9.	$\{\{0, 1\}\} \in A$	
5.	$0 \in A$	true	10.	$\{\{0, 1\}\} \subseteq A$	

- $\in$ - "is an element of"
- $\subseteq$ - "is a subset of"
  - A set S is a ***subset*** of a set T if each element of S is also an element of T.
- The *power set* $P(S)$ of a set S is the set of all subsets of S.

For $A = \{0, 1, \{0, 1\}\}$, are the following statements true or false?

1.	$\varnothing \in A$	false	6.	$0 \subseteq A$	false
2.	$\varnothing \subseteq A$	true	7.	$\{0, 1\} \in A$	true
3.	$\varnothing \in P(A)$	true	8.	$\{0, 1\} \in P(A)$	
4.	$\varnothing \subseteq P(A)$	true	9.	$\{\{0, 1\}\} \in A$	
5.	$0 \in A$	true	10.	$\{\{0, 1\}\} \subseteq A$	

- $\in$ - "is an element of"
- $\subseteq$ - "is a subset of"
  - A set S is a ***subset*** of a set T if each element of S is also an element of T.
- The *power set* $P(S)$ of a set S is the set of all subsets of S.

For $A = \{0, 1, \{0, 1\}\}$, are the following statements true or false?

1.	$\varnothing \in A$	false	6.	$0 \subseteq A$	false
2.	$\varnothing \subseteq A$	true	7.	$\{0, 1\} \in A$	true
3.	$\varnothing \in P(A)$	true	8.	$\{0, 1\} \in P(A)$	true
4.	$\varnothing \subseteq P(A)$	true	9.	$\{\{0, 1\}\} \in A$	
5.	$0 \in A$	true	10.	$\{\{0, 1\}\} \subseteq A$	

- $\in$ - "is an element of"
- $\subseteq$ - "is a subset of"
  - A set S is a ***subset*** of a set T if each element of S is also an element of T.
- The *power set* $P(S)$ of a set S is the set of all subsets of S.

For $A = \{0, 1, \{0, 1\}\}$, are the following statements true or false?

1.	$\varnothing \in A$	false	6.	$0 \subseteq A$	false
2.	$\varnothing \subseteq A$	true	7.	$\{0, 1\} \in A$	true
3.	$\varnothing \in P(A)$	true	8.	$\{0, 1\} \in P(A)$	true
4.	$\varnothing \subseteq P(A)$	true	9.	$\{\{0, 1\}\} \in A$	false
5.	$0 \in A$	true	10.	$\{\{0, 1\}\} \subseteq A$	

- $\in$ - "is an element of"
- $\subseteq$ - "is a subset of"
  - A set S is a ***subset*** of a set T if each element of S is also an element of T.
- The ***power set*** $P(S)$ of a set S is the set of all subsets of S.

Exercise. For $A = \{0, 1, \{0, 1\}\}$, are the following statements true or false?

1.	$\varnothing \in A$	false	6.	$0 \subseteq A$	false
2.	$\varnothing \subseteq A$	true	7.	$\{0, 1\} \in A$	true
3.	$\varnothing \in P(A)$	true	8.	$\{0, 1\} \in P(A)$	true
4.	$\varnothing \subseteq P(A)$	true	9.	$\{\{0, 1\}\} \in A$	false
5.	$0 \in A$	true	10.	$\{\{0, 1\}\} \subseteq A$	true

- $\in$ - "is an element of"
- $\subseteq$ - "is a subset of"
  - A set S is a ***subset*** of a set T if each element of S is also an element of T.
- The *power set* $P(S)$ of a set S is the set of all subsets of S.

Exercise. For $B = \{\varnothing, 0, \{1\}\}$, are the following statements true or false?

1. $\varnothing \in B$
2. $\varnothing \subseteq B$
3. $\{\varnothing\} \in B$
4. $\{\varnothing\} \subseteq P(B)$
5. $\{0\} \in P(B)$
6. $\{\{0\}\} \subseteq P(B)$
7. $1 \in B$
8. $\{1\} \subseteq B$
9. $\{1\} \in P(B)$
10. $\{\{1\}\} \subseteq P(B)$

- $\in$ - "is an element of"
- $\subseteq$ - "is a subset of"
  - A set S is a ***subset*** of a set T if each element of S is also an element of T.
- The *power set* $P(S)$ of a set S is the set of all subsets of S.

Exercise. For $B = \{\varnothing, 0, \{1\}\}$, are the following statements true or false?

1. $\varnothing \in B$ true
2. $\varnothing \subseteq B$
3. $\{\varnothing\} \in B$
4. $\{\varnothing\} \subseteq P(B)$
5. $\{0\} \in P(B)$
6. $\{\{0\}\} \subseteq P(B)$
7. $1 \in B$
8. $\{1\} \subseteq B$
9. $\{1\} \in P(B)$
10. $\{\{1\}\} \subseteq P(B)$

- $\in$ - "is an element of"
- $\subseteq$ - "is a subset of"
  - A set S is a ***subset*** of a set T if each element of S is also an element of T.
- The *power set* $P(S)$ of a set S is the set of all subsets of S.

Exercise. For $B = \{\varnothing, 0, \{1\}\}$, are the following statements true or false?

1.	$\varnothing \in B$	true	6.	$\{\{0\}\} \subseteq P(B)$
2.	$\varnothing \subseteq B$	true	7.	$1 \in B$
3.	$\{\varnothing\} \in B$		8.	$\{1\} \subseteq B$
4.	$\{\varnothing\} \subseteq P(B)$		9.	$\{1\} \in P(B)$
5.	$\{0\} \in P(B)$		10.	$\{\{1\}\} \subseteq P(B)$

- $\in$ - "is an element of"
- $\subseteq$ - "is a subset of"
  - A set S is a ***subset*** of a set T if each element of S is also an element of T.
- The *power set* $P(S)$ of a set S is the set of all subsets of S.

Exercise. For $B = \{\varnothing, 0, \{1\}\}$, are the following statements true or false?

1.	$\varnothing \in B$	true	6.	$\{\{0\}\} \subseteq P(B)$
2.	$\varnothing \subseteq B$	true	7.	$1 \in B$
3.	$\{\varnothing\} \in B$	false	8.	$\{1\} \subseteq B$
4.	$\{\varnothing\} \subseteq P(B)$		9.	$\{1\} \in P(B)$
5.	$\{0\} \in P(B)$		10.	$\{\{1\}\} \subseteq P(B)$

- $\in$ - "is an element of"
- $\subseteq$ - "is a subset of"
  - A set S is a ***subset*** of a set T if each element of S is also an element of T.
- The *power set* $P(S)$ of a set S is the set of all subsets of S.

Exercise. For $B = \{\varnothing, 0, \{1\}\}$, are the following statements true or false?

1.	$\varnothing \in B$	true	6.	$\{\{0\}\} \subseteq P(B)$
2.	$\varnothing \subseteq B$	true	7.	$1 \in B$
3.	$\{\varnothing\} \in B$	false	8.	$\{1\} \subseteq B$
4.	$\{\varnothing\} \subseteq P(B)$	true	9.	$\{1\} \in P(B)$
5.	$\{0\} \in P(B)$		10.	$\{\{1\}\} \subseteq P(B)$

- $\in$ - "is an element of"
- $\subseteq$ - "is a subset of"
  - A set S is a ***subset*** of a set T if each element of S is also an element of T.
- The *power set* $P(S)$ of a set S is the set of all subsets of S.

Exercise. For $B = \{\varnothing, 0, \{1\}\}$, are the following statements true or false?

1.	$\varnothing \in B$	true	6.	$\{\{0\}\} \subseteq P(B)$
2.	$\varnothing \subseteq B$	true	7.	$1 \in B$
3.	$\{\varnothing\} \in B$	false	8.	$\{1\} \subseteq B$
4.	$\{\varnothing\} \subseteq P(B)$	true	9.	$\{1\} \in P(B)$
5.	$\{0\} \in P(B)$	true	10.	$\{\{1\}\} \subseteq P(B)$

- $\in$ - "is an element of"
- $\subseteq$ - "is a subset of"
  - A set S is a ***subset*** of a set T if each element of S is also an element of T.
- The *power set* $P(S)$ of a set S is the set of all subsets of S.

Exercise. For $B = \{\varnothing, 0, \{1\}\}$, are the following statements true or false?

1.	$\varnothing \in B$	true	6.	$\{\{0\}\} \subseteq P(B)$	true
2.	$\varnothing \subseteq B$	true	7.	$1 \in B$	
3.	$\{\varnothing\} \in B$	false	8.	$\{1\} \subseteq B$	
4.	$\{\varnothing\} \subseteq P(B)$	true	9.	$\{1\} \in P(B)$	
5.	$\{0\} \in P(B)$	true	10.	$\{\{1\}\} \subseteq P(B)$	

- $\in$ - "is an element of"
- $\subseteq$ - "is a subset of"
  - A set S is a ***subset*** of a set T if each element of S is also an element of T.
- The *power set* $P(S)$ of a set S is the set of all subsets of S.

Exercise. For $B = \{\varnothing, 0, \{1\}\}$, are the following statements true or false?

1.	$\varnothing \in B$	true	6.	$\{\{0\}\} \subseteq P(B)$	true
2.	$\varnothing \subseteq B$	true	7.	$1 \in B$	false
3.	$\{\varnothing\} \in B$	false	8.	$\{1\} \subseteq B$	
4.	$\{\varnothing\} \subseteq P(B)$	true	9.	$\{1\} \in P(B)$	
5.	$\{0\} \in P(B)$	true	10.	$\{\{1\}\} \subseteq P(B)$	

- $\in$ - "is an element of"
- $\subseteq$ - "is a subset of"
  - A set S is a ***subset*** of a set T if each element of S is also an element of T.
- The *power set* $P(S)$ of a set S is the set of all subsets of S.

Exercise. For $B = \{\varnothing, 0, \{1\}\}$, are the following statements true or false?

1.	$\varnothing \in B$	true	6.	$\{\{0\}\} \subseteq P(B)$	true
2.	$\varnothing \subseteq B$	true	7.	$1 \in B$	false
3.	$\{\varnothing\} \in B$	false	8.	$\{1\} \subseteq B$	false
4.	$\{\varnothing\} \subseteq P(B)$	true	9.	$\{1\} \in P(B)$	
5.	$\{0\} \in P(B)$	true	10.	$\{\{1\}\} \subseteq P(B)$	

- $\in$ - "is an element of"
- $\subseteq$ - "is a subset of"
  - A set S is a ***subset*** of a set T if each element of S is also an element of T.
- The *power set* $P(S)$ of a set S is the set of all subsets of S.

Exercise. For $B = \{\varnothing, 0, \{1\}\}$, are the following statements true or false?

1.	$\varnothing \in B$	true	6.	$\{\{0\}\} \subseteq P(B)$	true
2.	$\varnothing \subseteq B$	true	7.	$1 \in B$	false
3.	$\{\varnothing\} \in B$	false	8.	$\{1\} \subseteq B$	false
4.	$\{\varnothing\} \subseteq P(B)$	true	9.	$\{1\} \in P(B)$	false
5.	$\{0\} \in P(B)$	true	10.	$\{\{1\}\} \subseteq P(B)$	

- $\in$ - "is an element of"
- $\subseteq$ - "is a subset of"
  - A set S is a ***subset*** of a set T if each element of S is also an element of T.
- The *power set* $P(S)$ of a set S is the set of all subsets of S.

Exercise. For $B = \{\varnothing, 0, \{1\}\}$, are the following statements true or false?

1.	$\varnothing \in B$	true	6.	$\{\{0\}\} \subseteq P(B)$	true
2.	$\varnothing \subseteq B$	true	7.	$1 \in B$	false
3.	$\{\varnothing\} \in B$	false	8.	$\{1\} \subseteq B$	false
4.	$\{\varnothing\} \subseteq P(B)$	true	9.	$\{1\} \in P(B)$	false
5.	$\{0\} \in P(B)$	true	10.	$\{\{1\}\} \subseteq P(B)$	false