



# Introduction to Sets



## 1 Introduction to Sets

- List the elements of the following sets
  - $A =$  the set of all even numbers from 1 to 10.
  - $B =$  the set of all odd numbers from 1 to 10.
  - $C =$  the set of all prime numbers from 1 to 10.
- Consider the following sets:
  - $A = \{2,4,6,8,10,12,14,16\}$
  - $B = \{1,3,5,7,9,11,13,15\}$
  - $C = \{4,8,12,16\}$
  - $D = \{16,12,8,4\}$

Are the following statements true or false?

- $4 \in A$
  - $13 \in B$
  - $8 \notin A$
  - $16 \notin B$
  - $C = D$
  - $C \subset A$
  - $D \subset B$
  - $D \not\subset A$
- List the elements of the following sets:
    - $A$  is the set of all factors of 24.
    - $B$  is the set of all multiples of 4, from 1 to 24.
    - $C$  is the set of prime numbers from 1 to 24.
    - $D$  is the set of even numbers from 1 to 24.

Are the following statements true or false?

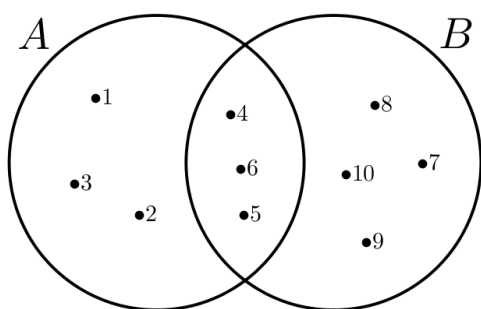




- i.  $12 \in A$
- ii.  $12 \in C$
- iii.  $8 \notin C$
- iv.  $D \subset A$
- v.  $B \subset D$
- vi.  $A = B$
- vii.  $C \neq D$
- viii.  $\{2, 7, 11\} \subset C$
- ix.  $\{2, 4, 6, 8, 10\} \subset A$
- x.  $\{2, 7, 11\} \not\subset C$

## 2 Venn Diagrams

1. .



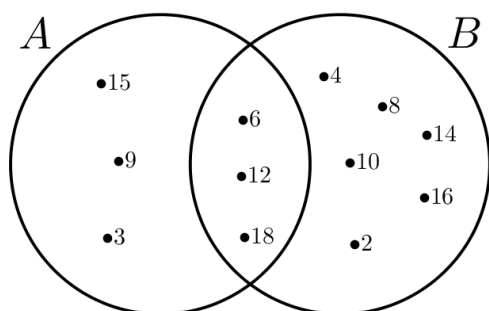
(a) Using the venn diagram on the left, list the elements of the following sets:

- i.  $A \cup B$
- ii.  $A \cap B$
- iii.  $A \setminus B$
- iv.  $B \setminus A$

(b) What is  $\#A$ ?

(c) What is  $\#B$ ?

2. .



Using the venn diagram on the left, list the elements of the following sets:

- i.  $A \cup B$
- ii.  $A \cap B$
- iii.  $A \setminus B$
- iv.  $B \setminus A$

(a) What is  $\#A$ ?

(b) What is  $\#B$ ?

(c) What is  $\#(A \cup B)$ ?

(d) What is  $\#(A \cap B)$ ?





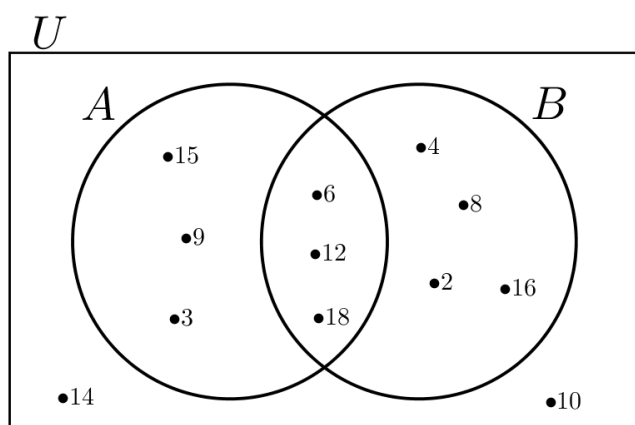
3.  $A = \{3, 5, 7, 9, 11, 13, 15\}$     $B = \{3, 6, 9, 12, 15\}$
- (a) Represent the sets  $A$  and  $B$  on a Venn diagram.
  - (b) List the elements of the following sets:
    - i.  $A \cup B$
    - ii.  $A \cap B$
    - iii.  $A \setminus B$
    - iv.  $B \setminus A$
4.  $A = \{2, 4, 6, 8, 10, 12\}$     $B = \{1, 2, 4, 8, 16\}$
- (a) Represent the sets  $A$  and  $B$  on a Venn diagram.
  - (b) List the elements of the following sets:
    - i.  $A \cup B$
    - ii.  $A \cap B$
    - iii.  $A \setminus B$
    - iv.  $B \setminus A$
  - (c) What is  $\#A$ ?
  - (d) What is  $\#B$ ?
  - (e) What is  $\#(A \cap B)$ ?
  - (f) What is  $\#(A \cup B)$ ?
5.  $A$  is the set of all factors of 24.  
 $B$  is the set of all multiples of 4, from 1 to 24.
- (a) Represent the sets  $A$  and  $B$  on a Venn diagram.
  - (b) List the elements of the following sets:
    - i.  $A \cup B$
    - ii.  $A \cap B$
    - iii.  $B \setminus A$
  - (c) What is  $\#A$ ?
  - (d) What is  $\#(A \cap B)$ ?
  - (e) What is  $\#(A \cup B)$ ?
  - (f) What is  $\#(A \setminus B)$ ?
6.  $A = \{1, 3, 5, 7, 9\}$     $B = \{2, 4, 6, 8, 10\}$
- (a) Represent the sets  $A$  and  $B$  on a Venn diagram.
  - (b) List the elements of the following sets:
    - i.  $A \cup B$
    - ii.  $A \cap B$
    - iii.  $A \setminus B$
    - iv.  $B \setminus A$
  - (c) What is  $\#(A \cap B)$ ?
  - (d) What is  $\#(A \cup B)$ ?
  - (e) What is  $\#(B \setminus A)$ ?





### 3 Universal Set

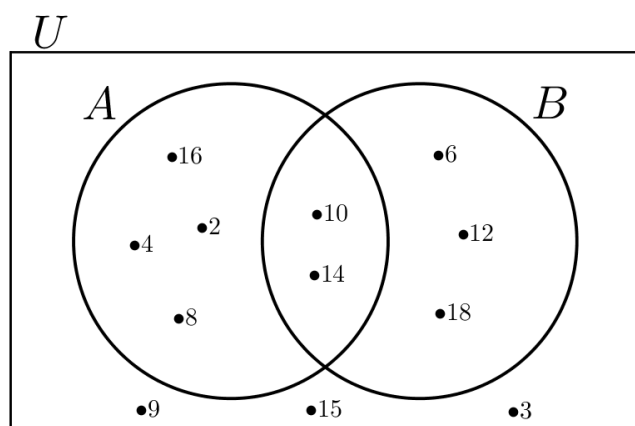
1. .



Using the venn diagram on the left, list the elements of the following sets:

- i.  $U$
- ii.  $A \cup B$
- iii.  $A \cap B$
- iv.  $A'$
- v.  $B'$
- vi.  $(A \cup B)'$

2. .



Using the venn diagram on the left, list the elements of the following sets:

- i.  $A$
- ii.  $A'$
- iii.  $A \cup B$
- iv.  $(A \cup B)'$
- v.  $A \cap B$
- vi.  $(A \cap B)'$
- vii.  $A \setminus B$

3.  $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15\}$   
 $A = \{3, 5, 7, 9, 11, 13, 15\}$      $B = \{3, 6, 9, 12, 15\}$

(a) Represent this information on a Venn Diagram.

(b) List the elements of the following sets:

- i.  $A \cup B$
- ii.  $A \cap B$
- iii.  $A \setminus B$
- iv.  $B \setminus A$
- v.  $A'$
- vi.  $B'$





4.  $U = \{5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60\}$   
 $A = \{10, 20, 30, 40, 50, 60\}$      $B = \{5, 10, 25, 30, 45, 50\}$
- Represent this information on a Venn Diagram.
  - List the elements of the following sets:
    - $A \cup B$
    - $A \cap B$
    - $A'$
    - $B'$
    - $(A \cup B)'$
    - $(A \cap B)'$
  - What is  $\#A'$ ?
  - What is  $\#(A \cup B)'$ ?
5.  $U =$  the set of all natural numbers from 1 and 12.  
 $A =$  the set of all factors of 12.     $B =$  the set all even numbers from 1 to 12.
- Represent this information on a Venn Diagram.
  - List the elements of the following sets:
    - $A \cup B$
    - $A \cap B$
    - $A'$
    - $B'$
    - $(A \cup B)'$
    - $(A \cap B)'$
  - What is  $\#B'$ ?
  - What is  $\#(A \cap B)'$ ?

## 4 Problem Solving with Venn Diagrams

- There are 30 students in a class. 18 students study French and 16 students study Spanish. 5 students study both French and Spanish.
  - Represent the above information on a Venn diagram.
  - How many students study neither French nor Spanish?
- In a survey of 50 teenagers, it was found that 35 used Facebook, 25 use Snapchat and 21 used both.
  - Represent the above information on a Venn diagram.
  - How many teenagers use neither Facebook nor Snapchat?
  - How many teenagers use Snapchat, but not Facebook?





3. In an all boys school with 200 students, 120 play hurling and 135 play rugby. 90 play both sports.
  - (a) Represent the above information on a Venn diagram.
  - (b) How many boys play neither rugby nor hurling?
  - (c) How many boys play hurling, but don't play rugby?
4. There are 30 students in a class. 18 of the students support Munster Rugby and 20 of the students support Manchester United. 10 students support both Munster Rugby and Manchester United.
  - (a) Represent the above information on a Venn diagram.
  - (b) How many students support Munster, but not Manchester?
  - (c) How many students support Manchester, but not Munster?
  - (d) How many students support neither team?
5. In a survey of 100 people, it was found that 75 own a car and 35 own a bicycle. 10 people owned **neither** a bicycle nor a car.
  - (a) Represent the above information on a Venn diagram.
  - (b) How many people owned **both** a bicycle and a car
  - (c) How many people owned a bicycle, but not a car?
6. In a class of 40 students, 20 play video games, 32 play sports and 5 play neither.
  - (a) Represent the above information on a Venn diagram.
  - (b) How many students play both video games and sports?
  - (c) How many students play video games, but don't play sports?
7. A group of 100 Spanish tourists were surveyed. 80 could speak fluent English. 60 could speak fluent Italian. 5 could not speak English or Italian.
  - (a) Represent the above information on a Venn diagram.
  - (b) How many of the tourists could speak both English and Italian?
  - (c) How many of the tourist could speak Italian but not English?
8. 50 teenagers were surveyed on whether they liked rap music or rock music. 35 liked rap music, 5 liked both rap and rock, 10 said they didn't like either rap music or rock music.
  - (a) Complete a Venn diagram based on the above information.
  - (b) How many people like rock music only?
9. 60 students went to the school shop at lunchtime. 36 students bought a drink. 12 students bought a drink and a bar. 17 students didn't buy either a drink nor a bar.
  - (a) Complete a Venn diagram based on the above information.
  - (b) How many students bought a bar, but not a drink?

