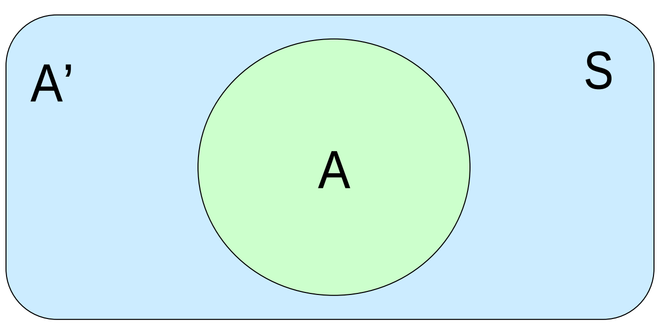
4.3 Finding Probability Using Sets (pg221)

Warm-up

- When rolling a die with sides numbered from 1 to 20, if event A is the event that a number divisible by 5 is rolled:
- i) What is the sample space, S? n(S)?
- ii) What is the event space, A? n(A)?
- iii) What is P(A)?
- ***i) S = {1, 2, 3, …, 20}, n(S) = 20***
- ***ii) A = {5, 10, 15, 20}, n(A) = 4***
- ***iii)P(A) = 4/20 = 1/5 or 0.2***

Counting Outcomes with Venn Diagrams (named after John Venn)

- **Venn Diagram**: a diagram in which sets are represented by shaded or coloured geometrical shapes.

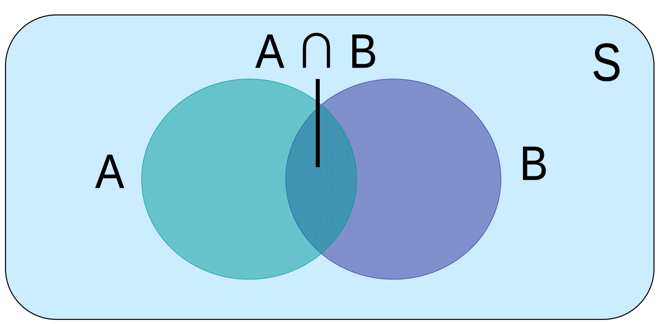


…remember…Set Notation

- In mathematics, curly brackets are used to denote a **set** of items (a list of items)
- e.g., A = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10}
- B = {2, 4, 6, 8, 10}
- C = {1, 2, 3, 4, 5}
- D = {10}
- The items in a set are commonly called **elements**.

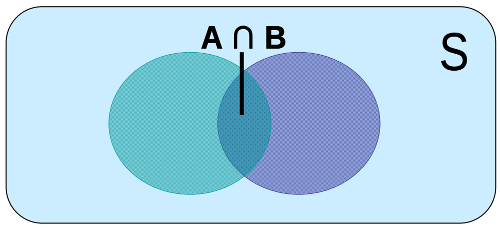
Intersection of Sets

- Given two sets, A and B, the set of common elements is called the **intersection** of A and B, is written as A ∩ B ("A intersect B").



Intersection of Sets (continued)

- Elements that belong to the set **A ∩ B** are members of set **A *and*** members of set **B**.
- "shared" "overlap" "in common"
- So… **A ∩ B** = {elements in both **A AND B**}



Example 1 - Intersection

Let

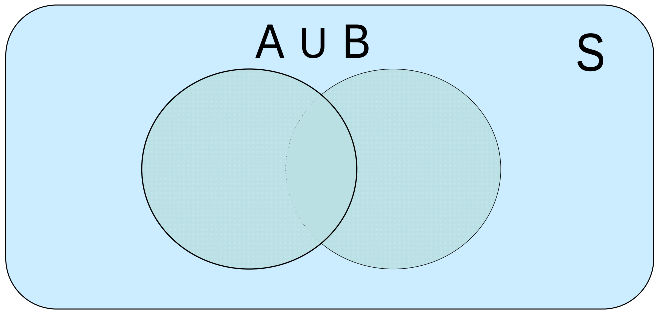
A = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10} C = {1, 2, 3, 4, 5}

B = {2, 4, 6, 8, 10} D = {10}

- a) What is A ∩ B?
- {2, 4, 6, 8, 10} or B
- b) B ∩ C?
- {2, 4}
- c) C ∩ D?
- { } or Ø (the empty set)
- d) A ∩B ∩D?
- {10} or D

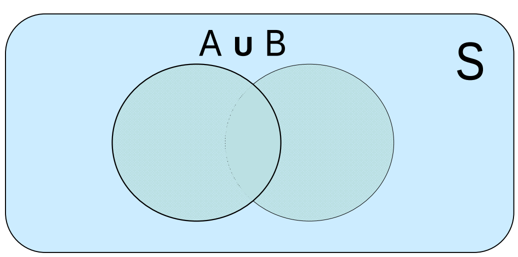
Union of Sets

- The set formed by combining the elements of A with those in B is called the **union** of A and B, and is written A **U** B. “all”



Union of Sets (continued)

- Elements that belong to the set A **U** B are members of set A ***or*** members of set B (or both).
- So… A **U** B = {elements in A OR B (or both)}



Example 2 - Union

A = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10} B = {2, 4, 6, 8, 10}
C = {1, 2, 3, 4, 5} D = {10}

- a) What is A U B?
- {1, 2, 3, 4, 5, 6, 7, 8, 9, 10} or A
- b) B U C?
- {1, 2, 3, 4, 5, 6, 8, 10}
- c) C U D?
- {1, 2, 3, 4, 5, 10}
- d) B U C U D?
- {1, 2, 3, 4, 5, 6, 8, 10}

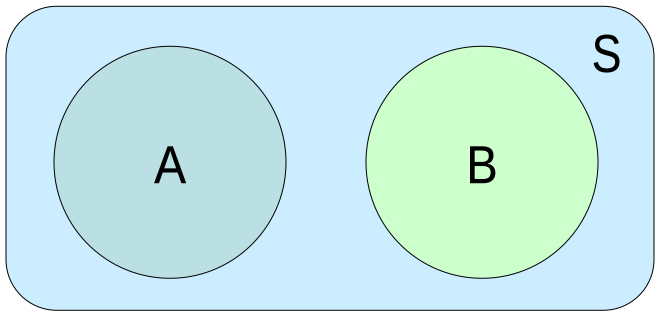
Disjoint Sets

- If set A and set B have no elements in common (that is, if $n(A \cap B) = 0$), then A and B are said to be disjoint sets and their intersection is the empty set, Ø.

- Another way of writing this: $A \cap B = \emptyset$

Disjoint Sets (continued)

- A Venn diagram for two disjoint sets might look like this:



The Additive Principle

- **Remember:**
  - n(A) is the number of elements in set A
  - P(A) is the probability of event A

- The Additive Principle for the Union of Two Sets:
  - $n(A \cup B) = n(A) + n(B) - n(A \cap B)$
  - $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

- Alternatively, the Additive Principle for the Intersection of Two Sets:
  - $n(A \cap B) = n(A) + n(B) - n(A \cup B)$
  - $P(A \cap B) = P(A) + P(B) - P(A \cup B)$

Mutually Exclusive Events

- A and B are mutually exclusive events if and only if: $(A \cap B) = \emptyset$
  (i.e., they have no elements in common)

- This means that for mutually exclusive events A and B, $n(A \cup B) = n(A) + n(B)$

4.3 Classwork/Homework Assessment:

- Pg222 discussion questions
- pg 228 #1 to 8.
- 4.2 #11-14

- Yesterday's work - 4.2 #1,2,9,10.
  - RAMN 4.3