Section 12.1 Sets and Counting

A **set** is a well-defined collection of objects, called **elements**

Well-defined means there is a rule that we can use to determine whether the element is in the set.

Empty, or null, set - a set with no elements.

ex: Write the set of all possible outcomes when you flip a coin twice.

$$\{HH, HT, TH, TT\}$$

Sets A and B are **equal** if they have the same elements.

If every element in A is also in B we say A is a **subset** of B, $A \subseteq B$

If $A \subseteq B$ and $A \neq B$ then we call A a proper subset of B, $A \subset B$

Note that the empty set $\emptyset$, is a subset of any set, so $\emptyset \subseteq A$

ex: Subsets of $\{a, b, c\}$

$\emptyset, \{a\}, \{b\}, \{c\}, \{a, b\}, \{a, c\}, \{b, c\}, \{a, b, c\}$

The intersection of 2 sets, $A \cap B$ consists of all elements that are in A and in B.

The union of A and B, denoted $A \cup B$ is the set containing elements in A or B, or both.

ex: $A = \{1,3,5,8\}$, $B = \{3,5,7\}$, $C = \{2,4,6,8\}$

a) $A \cap B = \{3,5\}$

b) $A \cup B = \{1,3,5,7,8\}$

c) $B \cap (A \cup C)$

$\{3,5,7\} \cap \{1,2,3,4,5,6,8\} = \{3,5\}$

A universal set U is the set consisting of all elements we wish to consider.

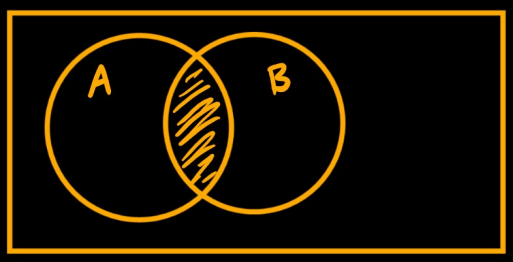
If A is a set, $\bar{A}$ is called its complement. It consists of all elements in U that are not in A.

ex: $U = \{1,2,3,4,5,6,7,8,9\}$ $A = \{1,3,5,7,9\}$

$\bar{A} = \{2,4,6,8\}$

Venn Diagrams

$A \cap B$

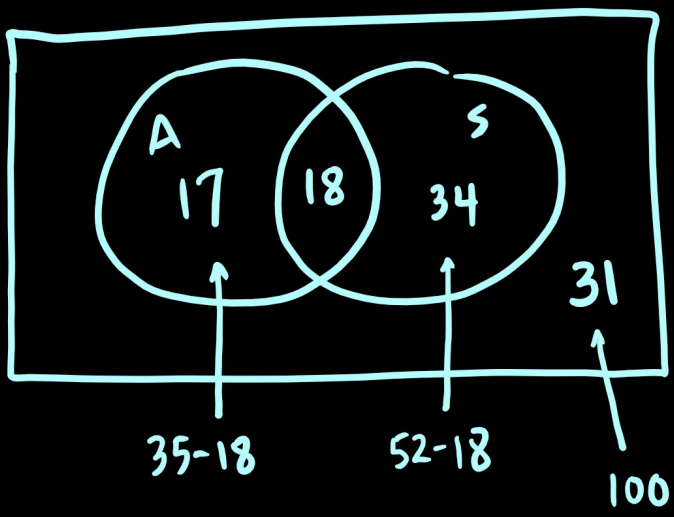


$A \cup B$

$\overline{A}$

$n(A)$ = number of elements in A

ex: Survey 100 college students $n(U) = 100$



$n(A) = 35$ ← algebra

$n(S) = 52$ ← computer

$n(A \cap S) = 18$

a) How many registered for Alg. or C.S.? 69

b) How many taking neither? 31

$n(A \cup B) = n(A) + n(B) - n(A \cap B)$

$35 + 52 - 18$

If A and B have no common elements, then

$$n(A \cup B) = n(A) + n(B)$$

A and B are called mutually exclusive.

p907 1-37 odd