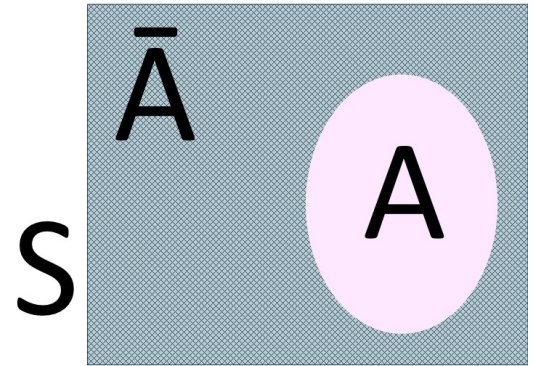


$$\bar{A} = S - A = \{x \in S : x \notin A\}$$

Subtraction principle:

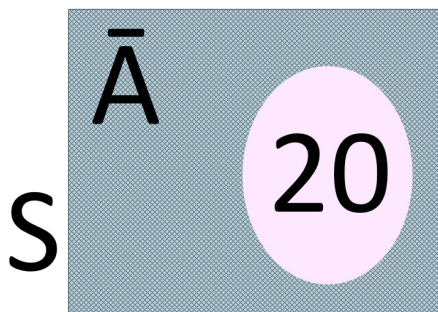
$$|\bar{A}| = |S| - |A|$$



Example: Suppose $|S| = 100$.

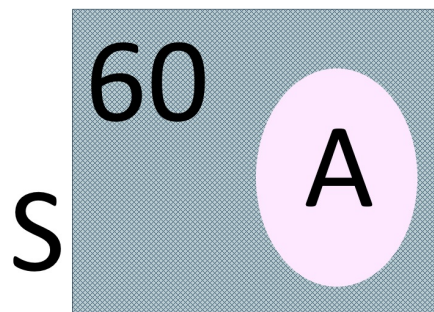
1.) If $|A| = 20$,

then $|\bar{A}| =$



2.) If $|\bar{A}| = 60$

then $|A| =$



Let $S = \{n : 1 \leq n \leq 1000\}$,

Let $A_i = \{n \in S : i|n\}$

Ex: $A_{10} = \{10, 20, 30, 40, \dots, 980, 990, 1000\}$

3.) Find the number of integers between 1 and 1,000 inclusive that are not divisible by 10.

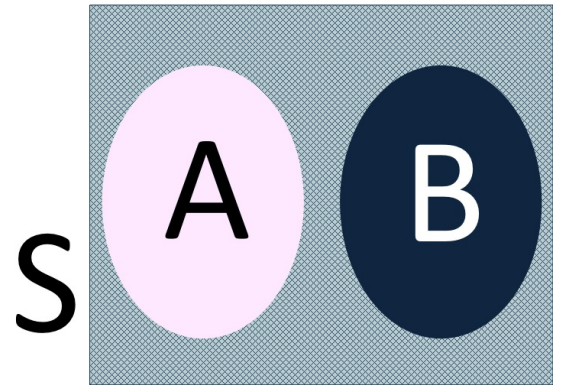
4.) Find the number of integers between 1 and 1,000 inclusive that are not divisible by 199.

5.) $|A_{15}| =$ $|\overline{A_{15}}| =$

Subtraction Principle:

If $A \cup B = \emptyset$, then

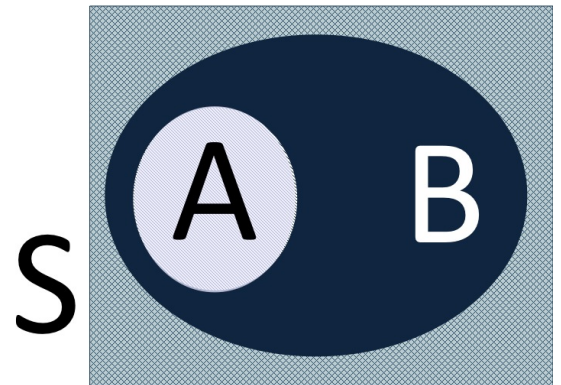
$$|\overline{A \cup B}| = |S| - |A| - |B|$$



Easy case:

If $A \subset B$, then

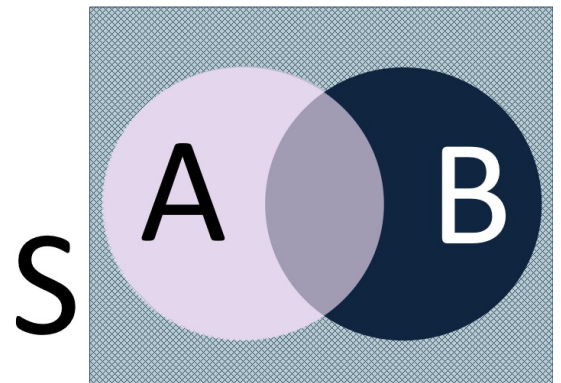
$$|\overline{A \cup B}| = |\overline{B}| = |S| - |B|$$



Inclusion-Exclusion Principle

$$|\overline{A \cup B}| =$$

$$|S| - |A| - |B| + |A \cap B|$$

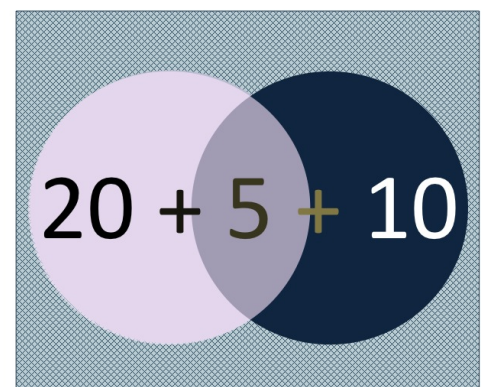


6.) Suppose $|S| = 1000$,

$$|A| = 25, \quad |B| = 15,$$

$$|A \cap B| = 5,$$

then $|\overline{A \cup B}| =$



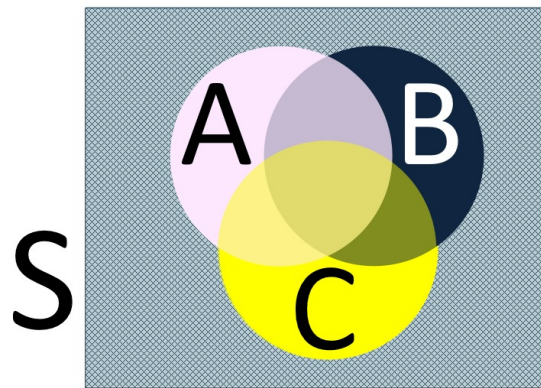
7.) Find the number of integers between 1 and 1,000 inclusive that are not divisible by 10 or 15.

8.) Find the number of integers between 1 and 1,000 inclusive that are not divisible by 10 or 199.

9.) Find the number of integers between 1 and 1,000 inclusive that are not divisible by 15 or 199.

10.) Find the number of integers between 1 and 1,000 inclusive that are not divisible by 10 or 20.

Inclusion-Exclusion Principle



$$|\overline{A \cup B \cup C}| =$$

11.) Find the number of integers between 1 and 1,000 inclusive that are not divisible by 10, 15, 20, or 199.

12.) Find the number of integers between 1 and 1,000 inclusive that are not divisible by 10, 15, 20, or 126.