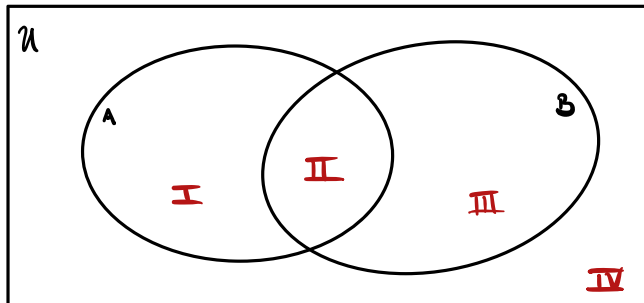


## 7.2 Applications of Venn Diagrams

Given a universal set  $U$  with 2 subsets  $A, B$ ,

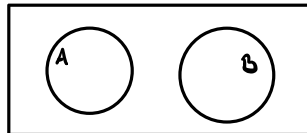
The 2 subsets partition  $U$  into 4 regions



I  $A \cap B'$   
 II  $A \cap B$   
 III  $A' \cap B$   
 IV  $A' \cap B'$

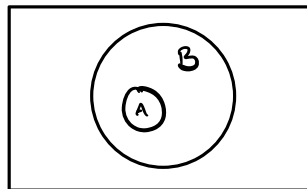
Note:  $A = \underset{\text{I}}{(A \cap B')} \cup \underset{\text{II}}{(A \cap B)}$

If  $A \cap B = \emptyset$

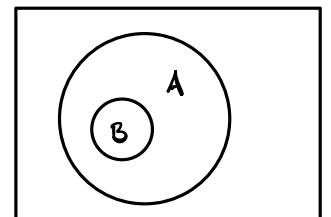


←  $A$  &  $B$  ARE **DISJOINT SETS**

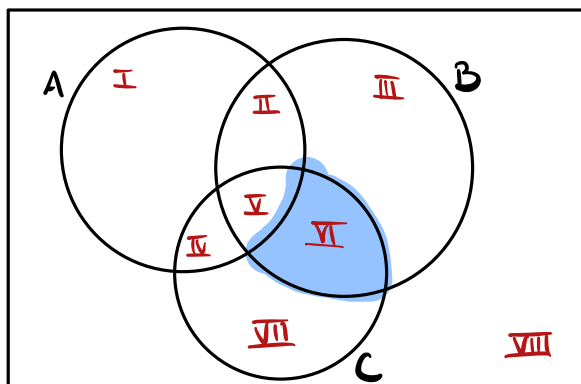
If  $A \cap B' = \emptyset$



If  $A' \cap B = \emptyset$



3 subsets  $A, B, C \subseteq U$  partition  $U$  into 8 regions



I  $A \cap B' \cap C'$   
 II  $A \cap B \cap C'$   
 III  $A' \cap B \cap C'$   
 IV  $A \cap B' \cap C$   
 V  $A \cap B \cap C$   
 VI  $A' \cap B \cap C$   
 VII  $A' \cap B' \cap C$   
 VIII  $A' \cap B' \cap C'$

**Example 3****Business**

A market researcher collecting data on 100 household finds that

- 81 have cable television (CT);
- 65 have high-speed Internet (HSI);
- 56 have both.

The researcher wants to answer the following questions:

- (a) How many households do not have high-speed Internet? 35
- (b) How many households have neither cable television nor high-speed Internet? 10
- (c) How many have cable television, but not high-speed Internet? 25

Tips: (1) Work from the inside out

(2) Don't draw unnecessary sets

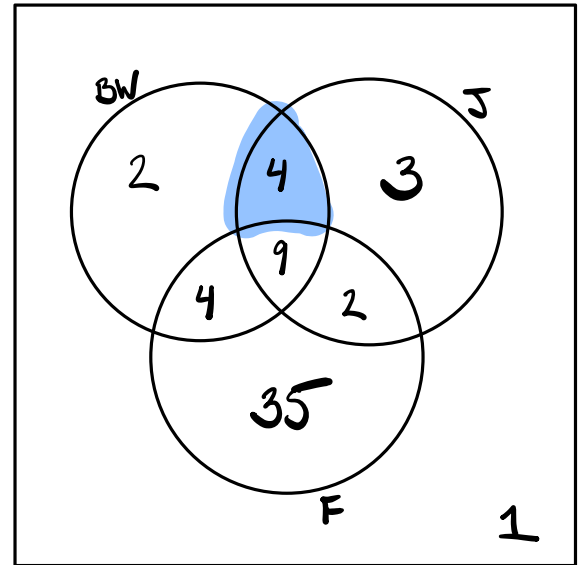
**Example 4****Social Science**

A group of 60 first-year business students at a large university was surveyed, with the following results:

- 19 of the students read *Business Week*;
- 18 read the *Wall Street Journal*;
- 50 read *Fortune*;
- 13 read *Business Week* and the *Journal*;
- 11 read the *Journal* and *Fortune*;
- 13 read *Business Week* and *Fortune*;
- 9 read all three magazines.

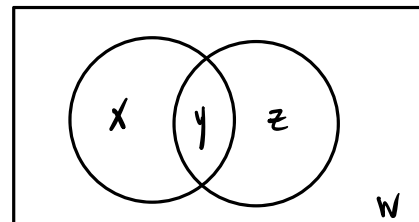
Use the preceding data to answer the following questions:

- (a) How many students read none of the publications? 1
- (b) How many read only *Fortune*? 35
- (c) How many read *Business Week* and the *Journal*, but not *Fortune*? 4

**Addition Rule for Counting**

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

WHY?



ex.

- 30 customers in a restaurant.
- 15 order appetizer
- 20 order entree
- 6 order neither.

How many customers order both?  
only app?  
only entree?

