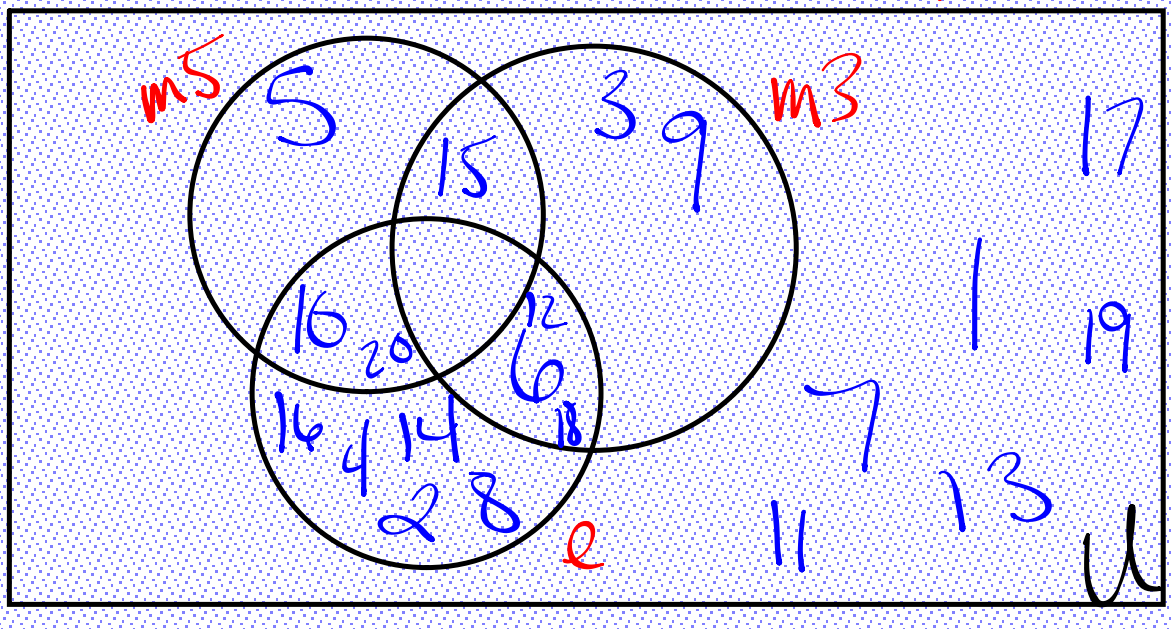
2.3 - Venn Diagrams and Set Operations

TERMINOLOGY

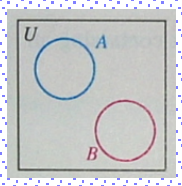
Venn Diagram - A rectangle representing the universal set, U, where the items inside the rectangle may be divided into subsets of the universal set

#1-20

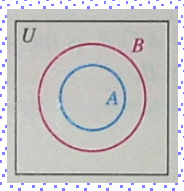


THE FOUR TYPES OF SUBSETS IN VENN DIAGRAMS

CASE 1: Disjoint Sets

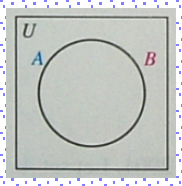


CASE 2: Subsets

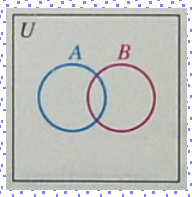


$A \subset B$

CASE 3: Equal Sets



CASE 4: Overlapping Sets



KEY CONCEPTS

The **compliment** of set A, symbolized by A', is the set of all the elements in the universal set that are not in set A

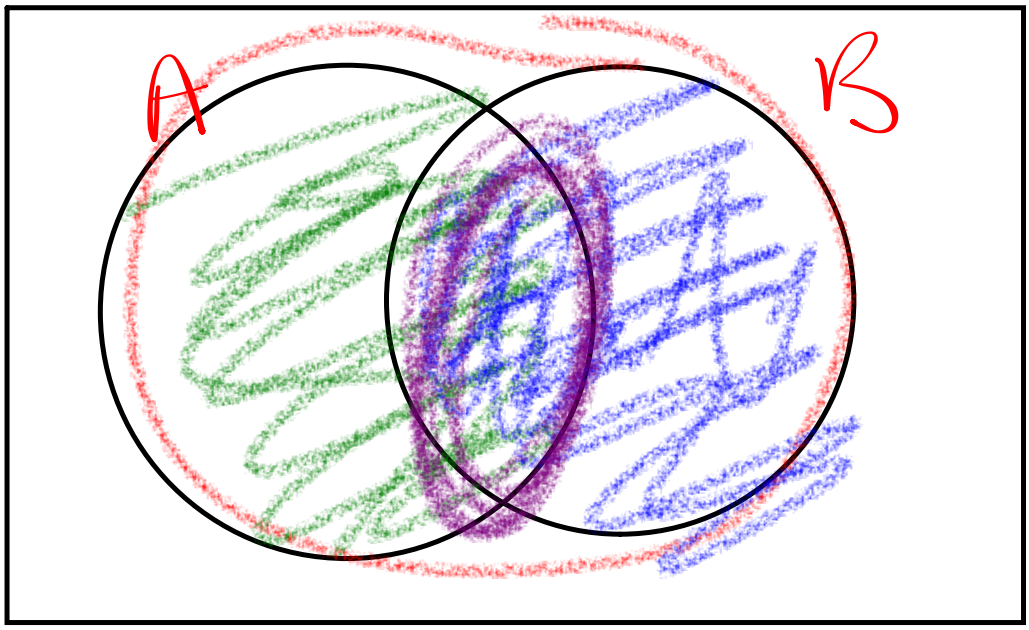
The **intersection** of sets A and B, symbolized by $A \cap B$, is the set containing all the elements that are common to both set A and set B.

The **union** of sets A and B, symbolized by $A \cup B$, is the set containing all the elements that are members of Set A or of Set B, or of both sets.

The word OR means union and the word AND means intersection.

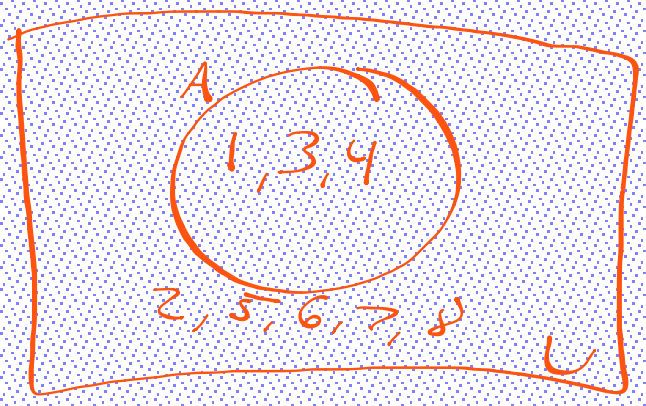
$$n(A \cup B) = n(A) + n(B) - n(A \cap B)$$

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



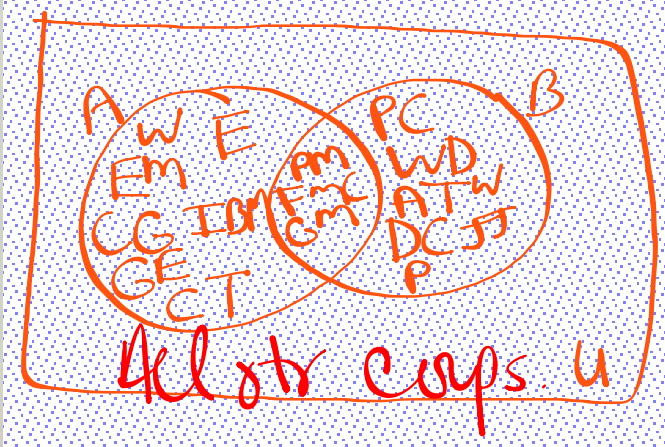
Example 1: A Set and Its Compliment

Given $U = \{ x \mid 0 \leq x < 9, x \in N\}$ and $A = \{1, 3, 4\}$, find A' and illustrate the relationship among sets U, A, and A' in a Venn Diagram.



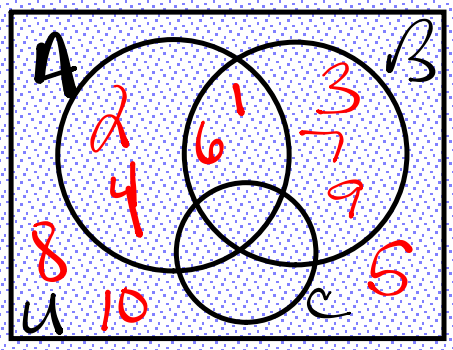
Example 2: Let the universal set, U, represent the set of all US corporations in 2001. Let Set A represent the 10 largest US corporations in 2001 and let set B represent the set of the 10 leading advertisers. Draw a Venn diagram illustrating the relationship between set A and set B.

Ten Largest U.S. Corporations	Ten Leading U.S. Advertisers
Wal-Mart	General Motors
Exxon Mobil	Procter & Gamble
General Motors	Ford Motor Company
Ford Motor Company	PepsiCo
Enron	Pfizer
General Electric	DaimlerChrysler
Citigroup	AOL Time Warner
ChevronTexaco	Phillip Morris
International Business Machines	Walt Disney
Phillip Morris	Johnson & Johnson



Example 3: Given: U = { 1, 2, 3, 4, 5, 6, 7, 8, 9, 10}, A = {1, 2, 4, 6}, B = {1, 3, 6, 7, 9}, and C = { }, find the following:

a) A ∩ B {1, 6}



e) A ∪ B {2, 4, 6, 1, 3, 9}

b) A ∩ C ∅

f) A ∪ C {2, 4, 1, 6}

c) A' ∩ B {3, 7, 9}

g) A' ∪ B {1, 6, 3, 5, 7, 8, 9, 10}

d) (A ∩ B)' {2, 3, 4, 5, 7, 8, 9, 10}

h) (A ∪ B)' {5, 8, 10}

Example 4: Use the Venn Diagram to find the following

a) U

everything

b) A

{9, $, t, @, s, o, &}

c) B'

{#, 9, 8, $, t, &, !}

d) A ∩ B

{s, @, o}

e) A ∪ B

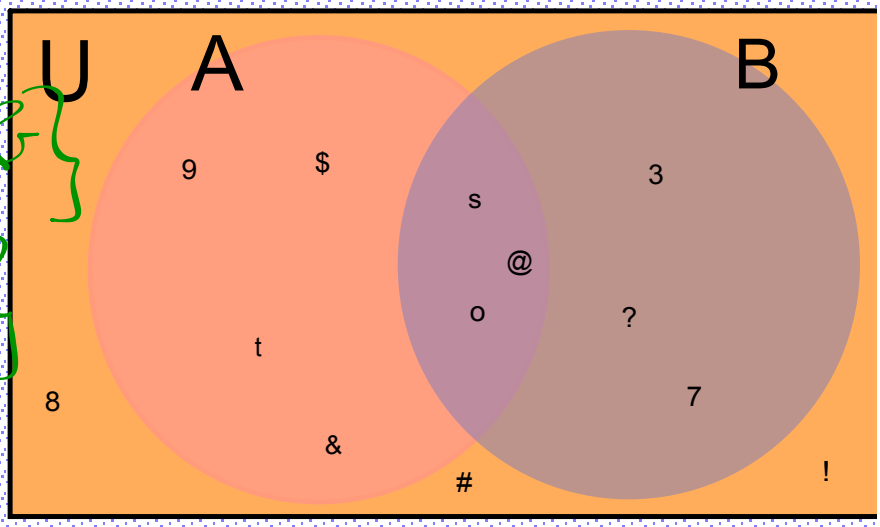
all but 8, #, !

f) (A ∪ B)'

{8, #, !}

g) n(A ∪ B)

10



Example 5: Given U = {a, b, c, d, e, f, g}, A = {a, b, e, g}, B = {a, c, d, e} and C = {b, e, f} find the following:

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

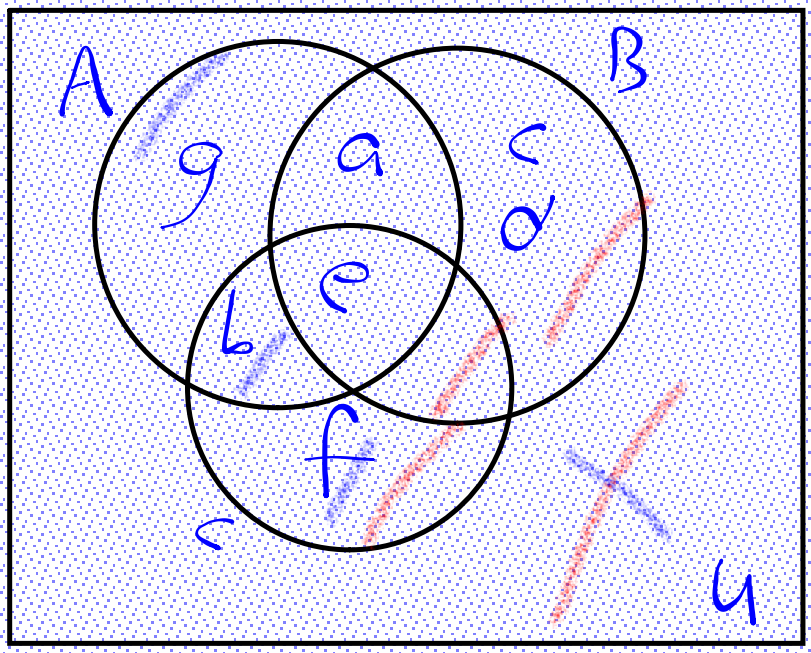
g, a, b, e

b) $(A \cup B) \cap C'$

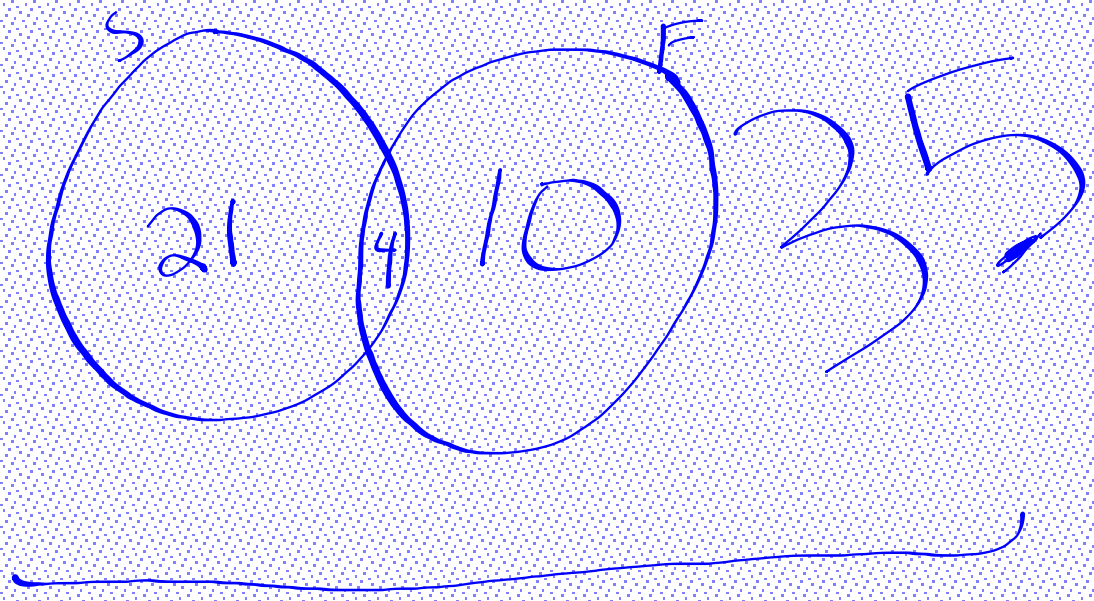
a, g, c, d

c) $A' \cap B'$

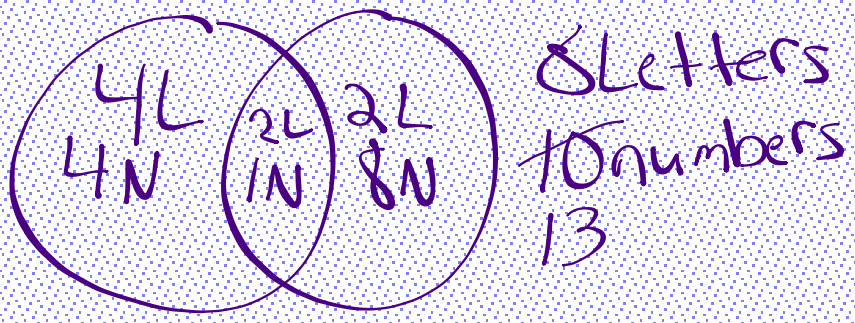
f



Example 6: The results of a survey of visitors at the Grand Canyon showed that 25 speak Spanish, 14 speak French, and 4 speak both Spanish and French. How many speak Spanish or French?



Example 7: Set A contains 6 letters and 5 numbers. Set B contains 4 letters and 9 numbers. Two letters and 1 number are common to both sets A and B. Find the number of elements in set A or set B.



HOMEWORK