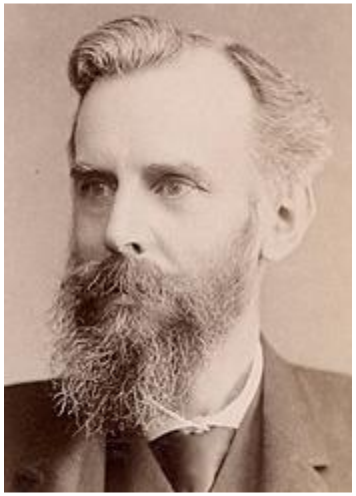
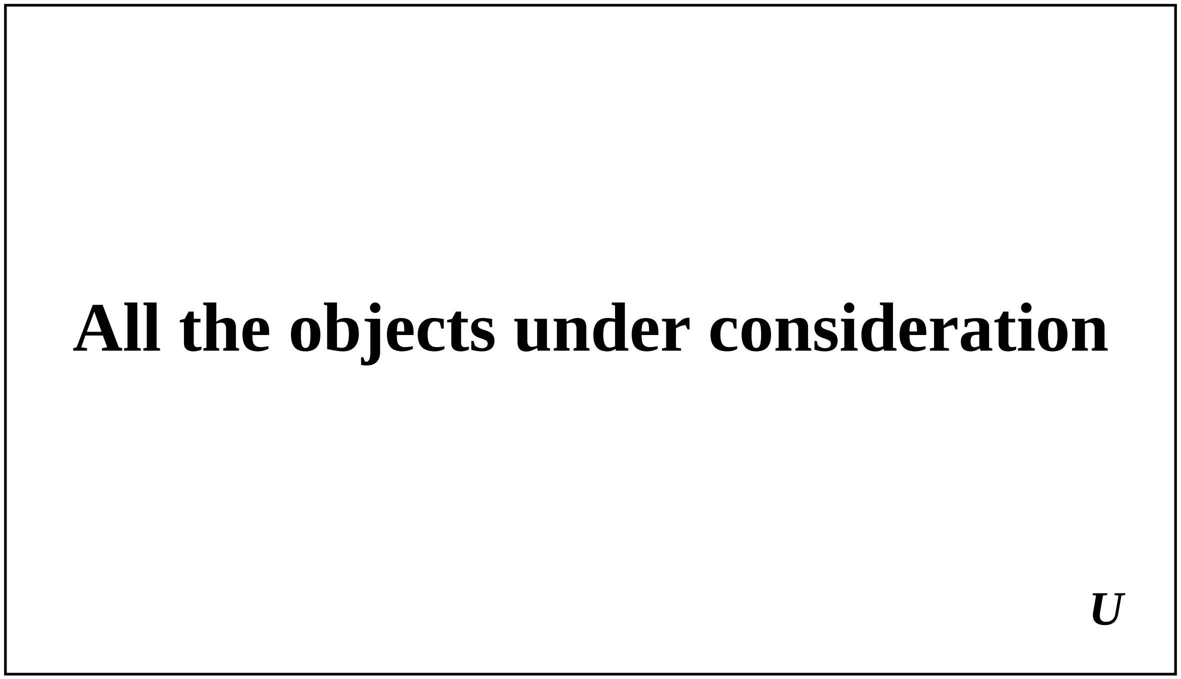
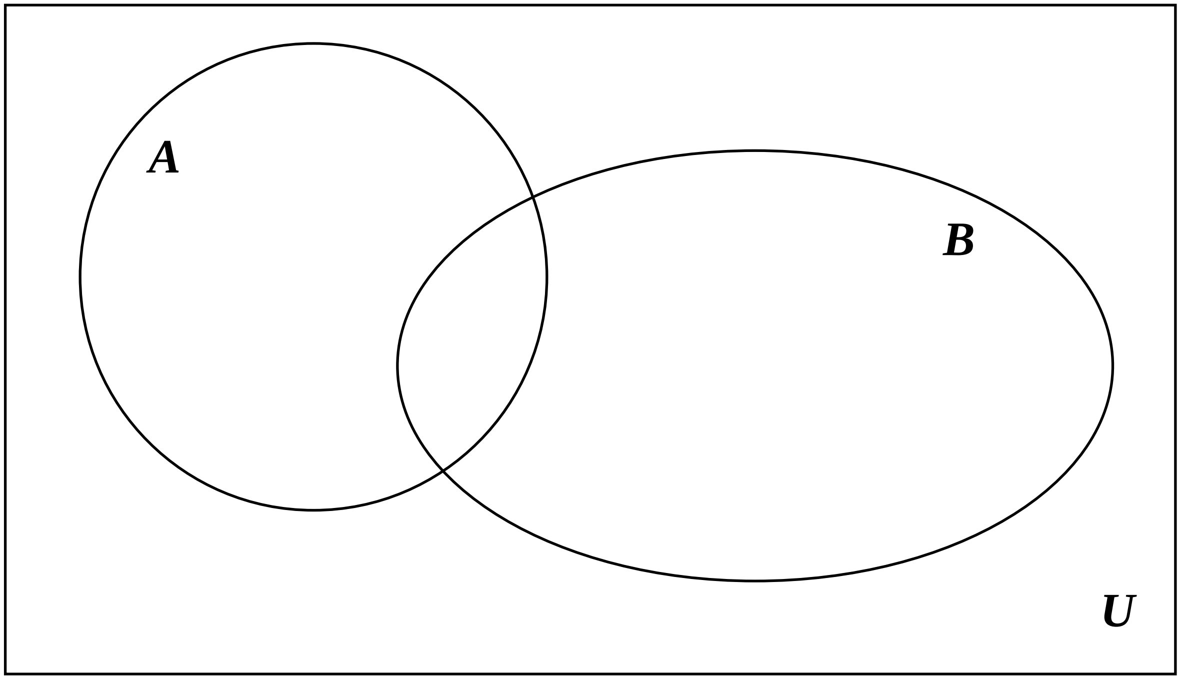
Set Operations and Venn Diagrams:

In a particular problem or situation, the set of all objects under consideration is called a universal set. It is abbreviated with the letter *U*, and represented in a Venn diagram as a large square or rectangle.





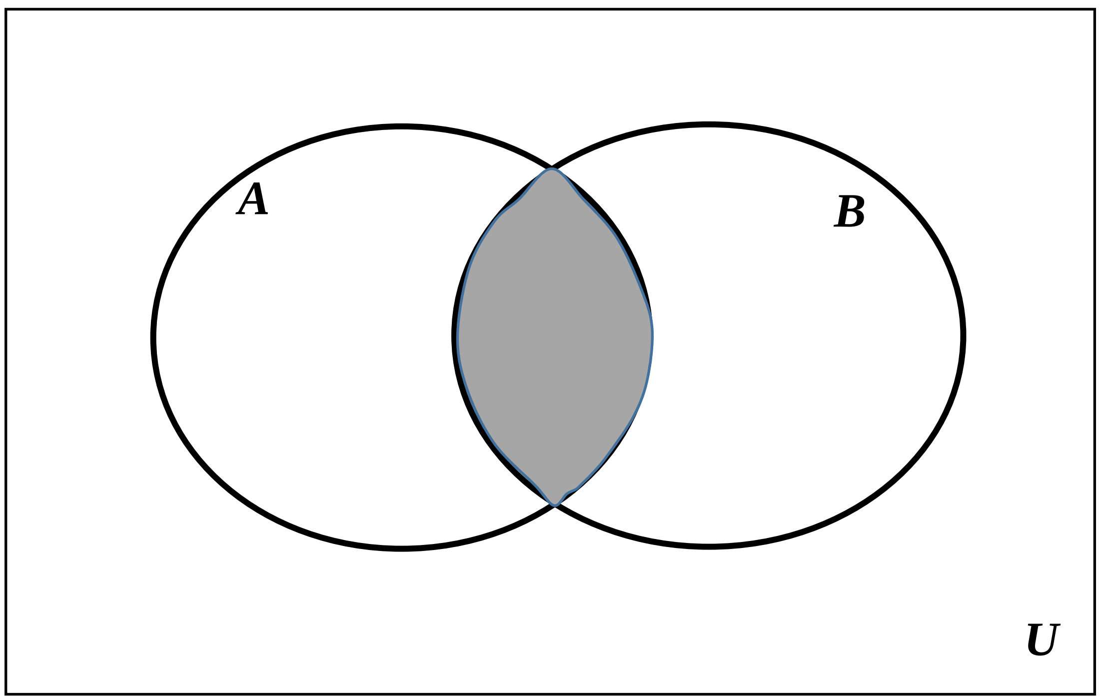
Sets of objects in a universal set are represented by circles or ovals.



<u>Set Intersection:</u>

The intersection of sets *A* and *B*, written as $A \cap B$, is the set of elements common to both set *A* *<u>and</u>* set *B*. In other words, it's the objects shared by the two sets.

$A \cap B$ is represented in a Venn diagram as the shaded region, the region of overlap of the two ovals.



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

List the elements in the following sets:

$A \cap B$

$B \cap C$

$A \cap C$

$C \cap D$

$A \cap \phi$

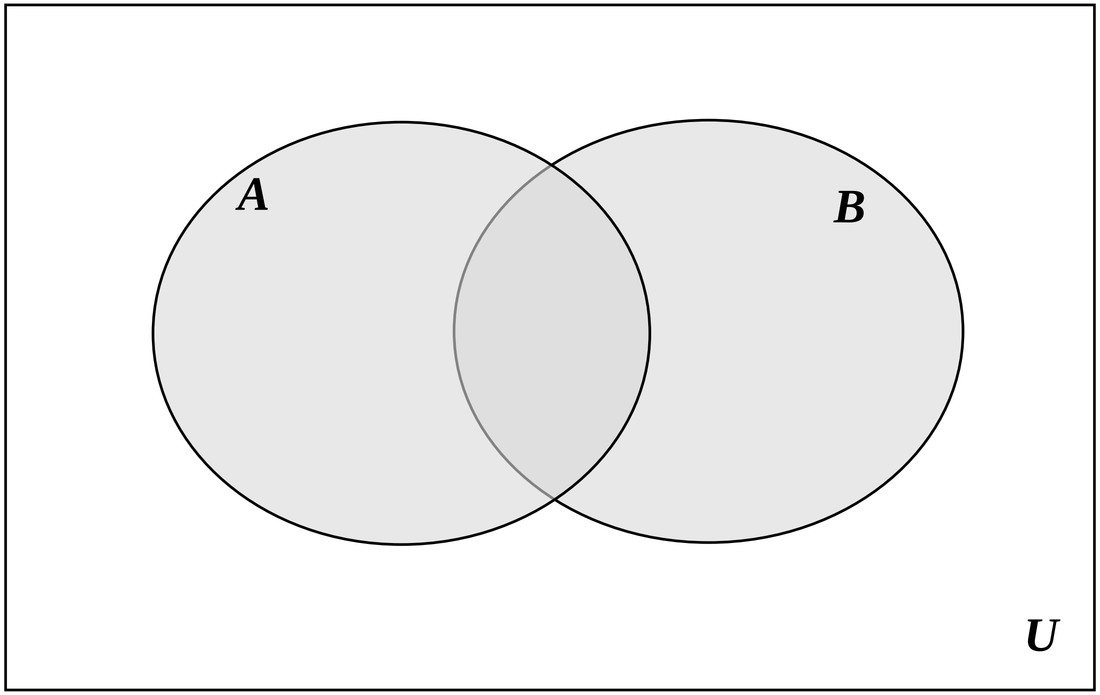
$A \cap B \cap C$

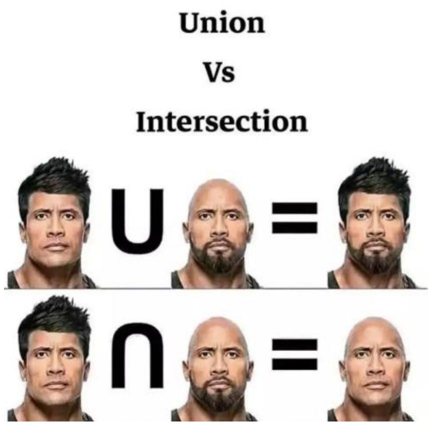
$C \cap C$

Set Union:

The union of sets *A* and *B*, written as $A \cup B$, is the set of elements that are in set *A* *or* in set *B*, *or* in both. In other words, it's the elements of both sets combined into one.

$A \cup B$ is represented in a Venn diagram as the shaded region below. It's formed by joining the regions inside the ovals.





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

List the elements in the following sets:

$A \cup B$

$C \cup D$

$\phi \cup D$

$A \cap (C \cup D)$

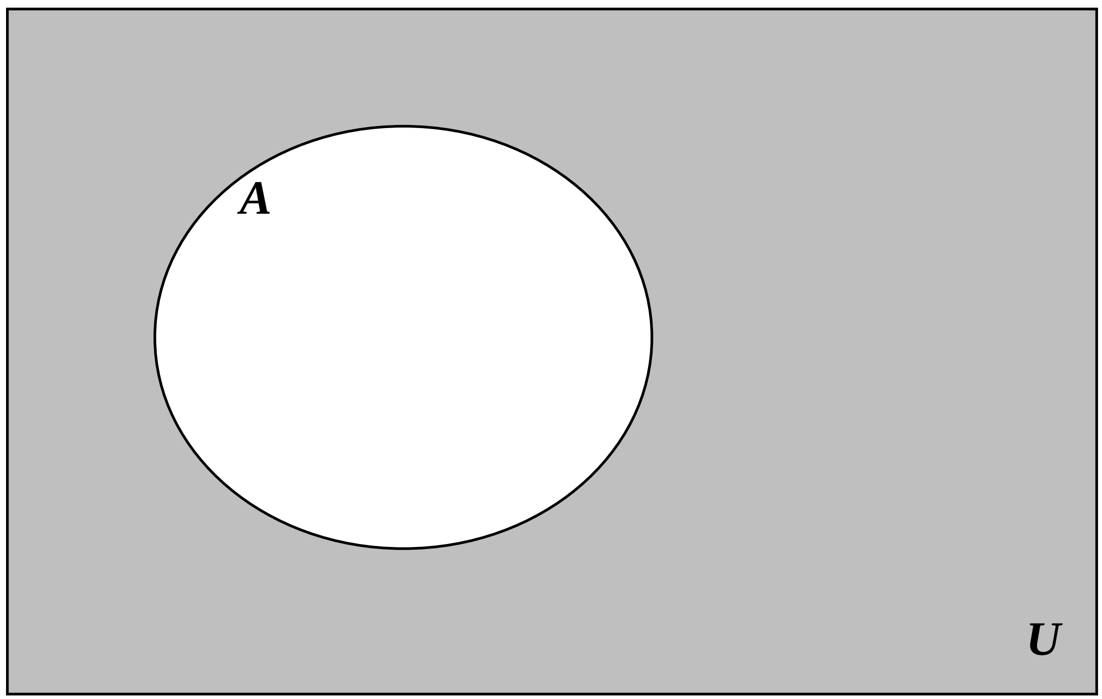
$A \cup B \cup C$

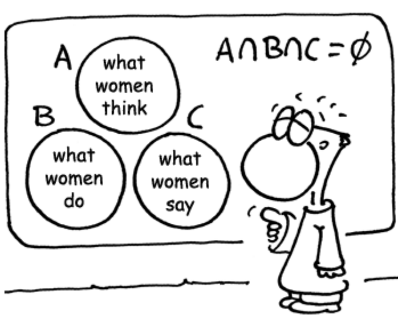
$(B \cap C) \cup (A \cap D)$

Set Complement:

The complement of the set A, written A', is the set of all objects in the universe that are *not* in the set A. In other words it's the opposite of A.

A' is represented in a Venn diagram as the shaded region below. It's the region outside of the oval.





"Well, let's continue with set theory, today we will see the concept of disjoint sets."

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

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

List the elements in the following sets:

A'

B'

$(A\cap B)'$

$(A\cup B)'$

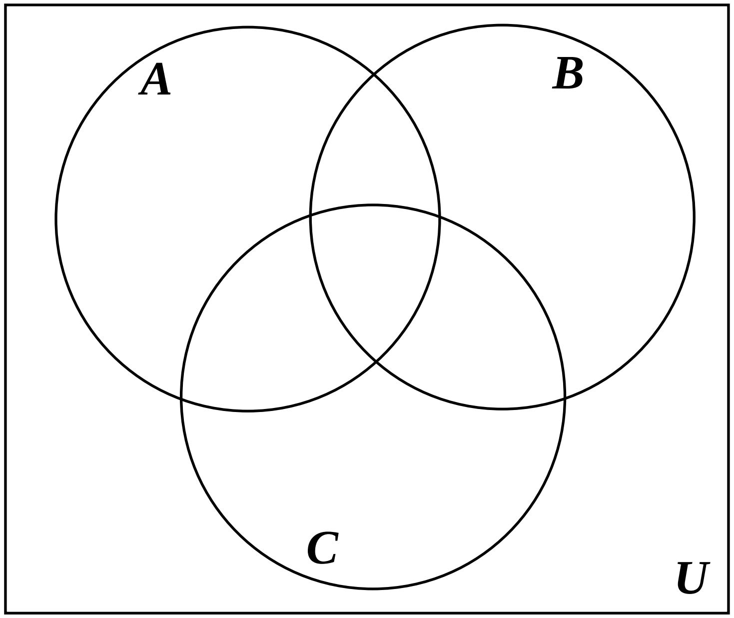
$B'\cap C$

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

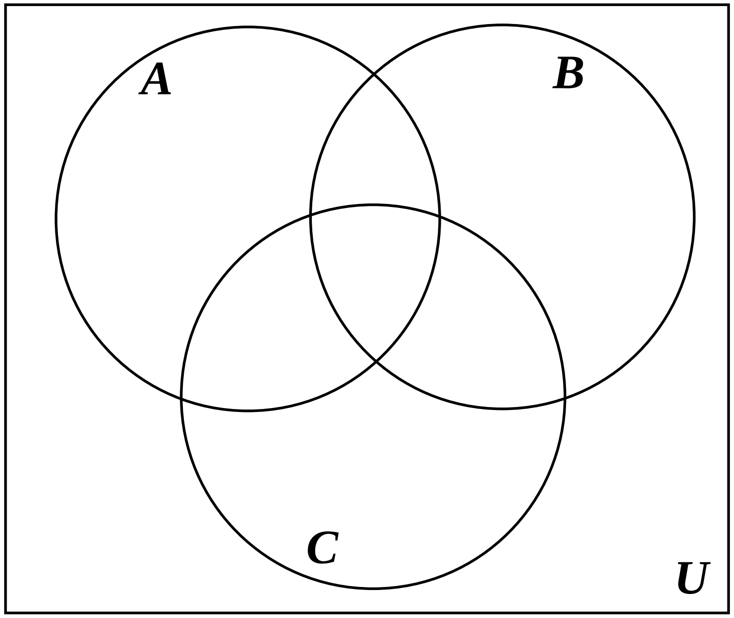
$A'\cap B'$

$A'\cup B'$

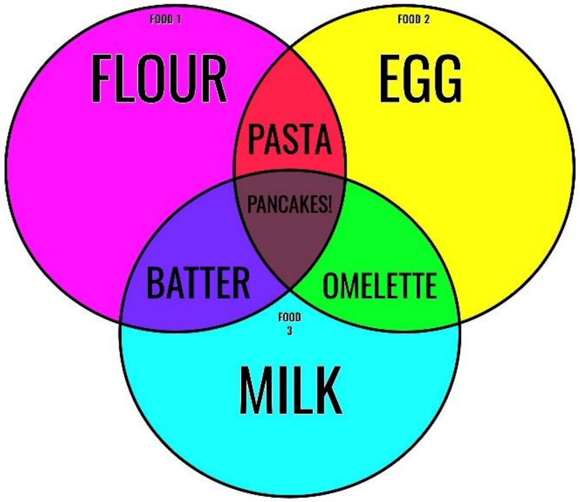
Shade the region(s) that is represented by the following set operations.

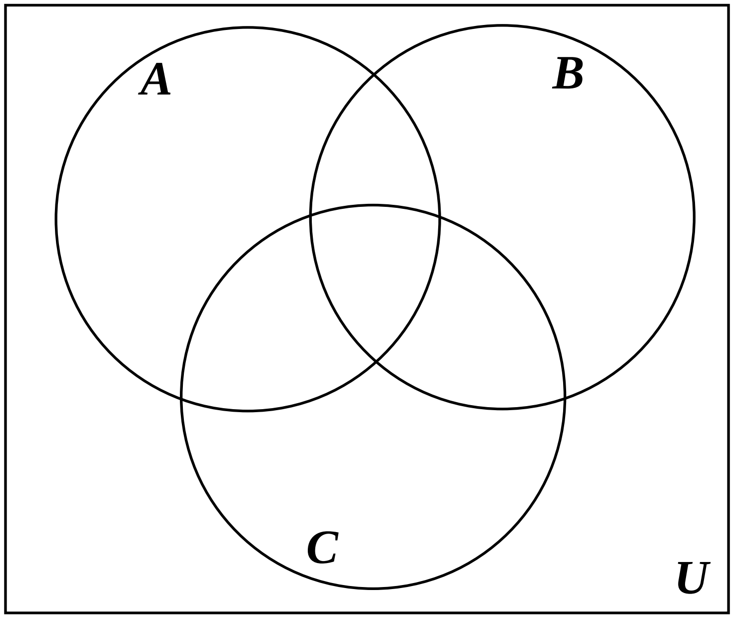


$A \cap B \cap C$

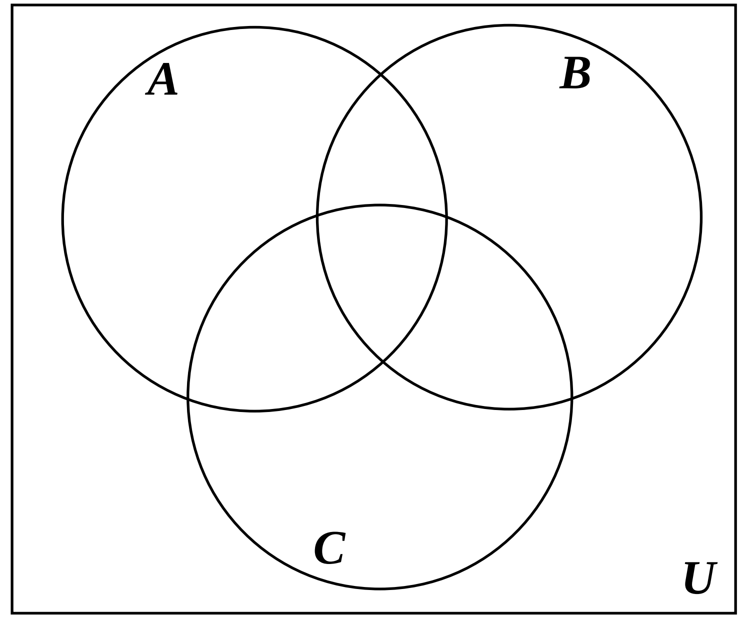


$A \cup B$

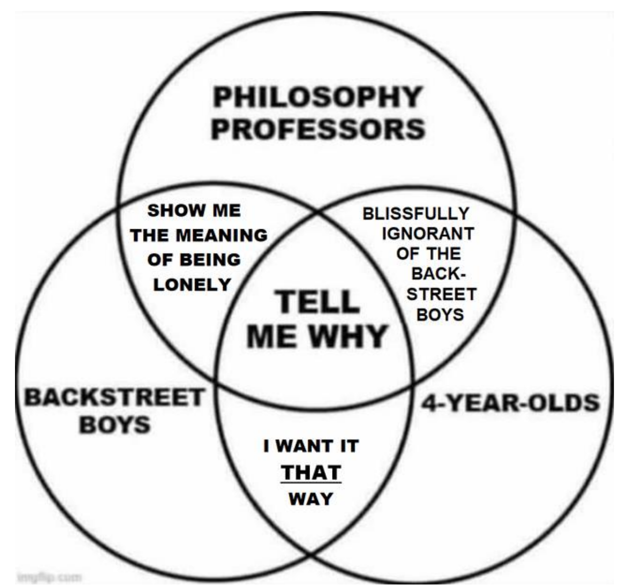


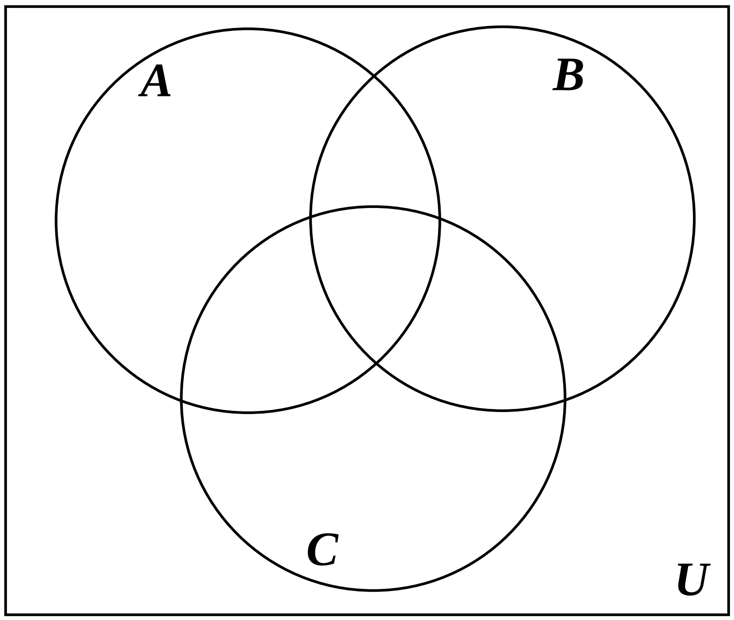


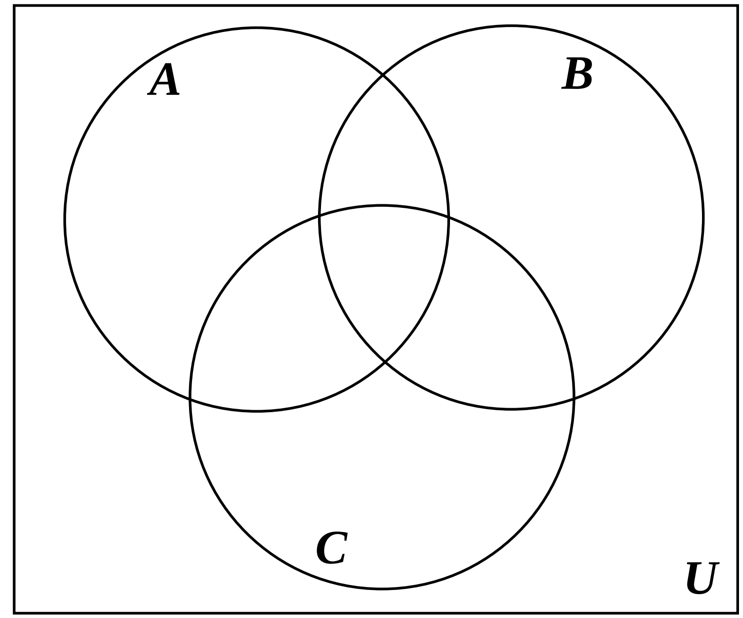
$A \bigcap B'$



$C \bigcap B$

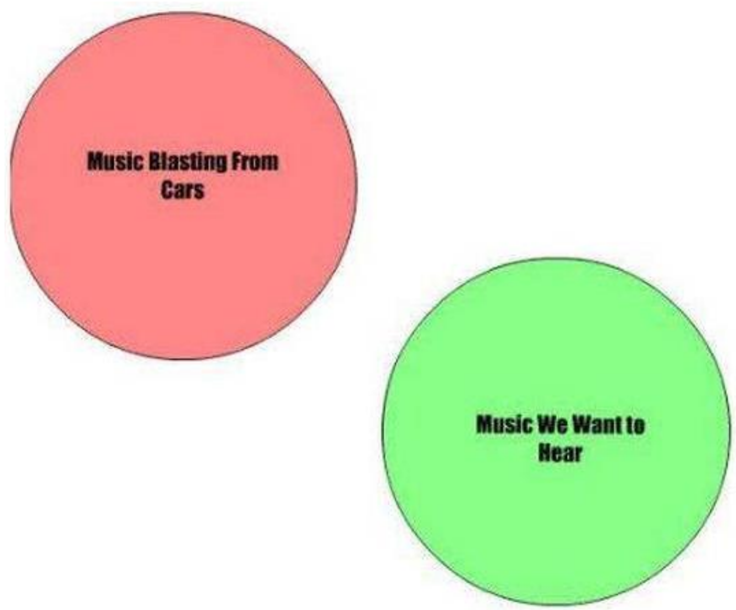




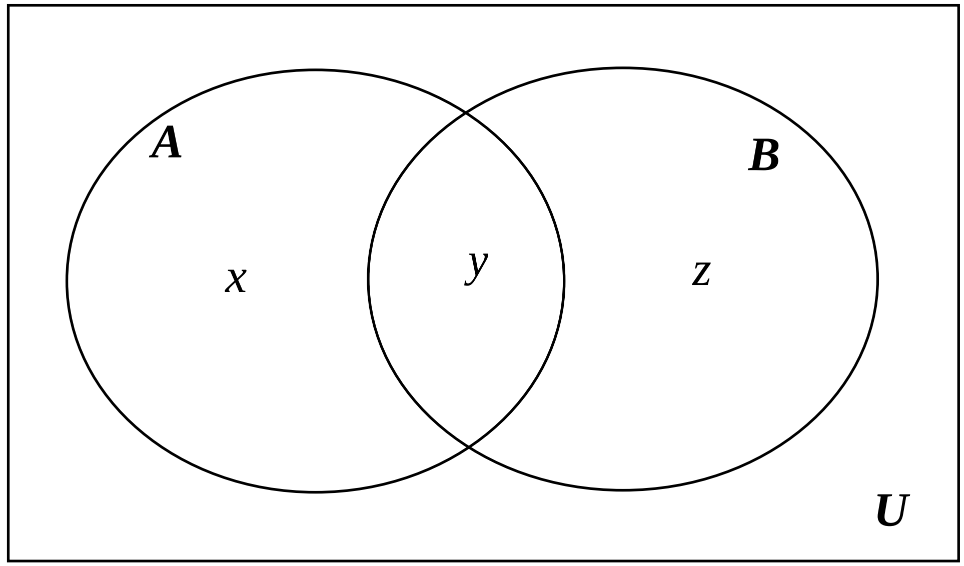


$(A\cup B)\cap C'$

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



Counting Formula for the Union of Two Sets:



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

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

Examples:

If $n(A)=10$**,** $n(B)=19$**, and** $n(A\cap B)=5$**, then what's** $n(A\cup B)$**?**

If $n(A\cup B)=27$**,** $n(A)=12$**, and** $n(B)=23$**, then what's** $n(A\cap B)$**?**