

Section 2-3 Other Set Operations

Let's get a bunch of definitions out of the way first.

The set of elements that lie in sets A and B is the intersection of A and B, denoted $A \cap B$.

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

If 2 sets have no elements in common, they are disjoint.

(i.e., If $A \cap B = \emptyset$ then A and B are disjoint.)

ex] Given $A = \{1, 2, 3, 5, 9\}$ and $B = \{3, 5, 7, 13\}$ find:

a) $A \cap B = \{3, 5\}$ Elements in both A and B

(b) $A \cup B = \{1, 2, 3, 5, 9, 7, 13\}$ Elements in A or B or both

ex 2 Given: $A = \{1, 3\}$ $B = \{5, 8\}$
and $C = \{1, 5\}$ find:

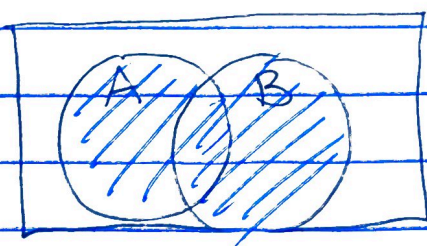
a) $A \cap C = \{1\}$

b) $A \cup C = \{1, 3, 5\}$

c) $A \cap B = \{\}$ or $\emptyset$

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

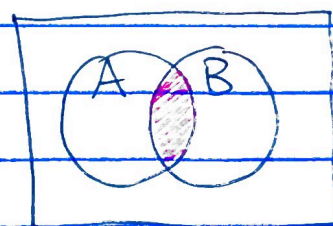
We can use Venn diagrams to represent the union and intersection.



$A \cup B$

"or"

(one or the other
or both)



$A \cap B$

"and"

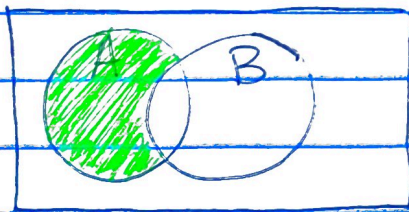
(overlap)

In the previous section we discussed the complement relative to the universe,

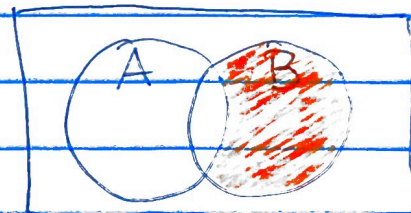
Now we discuss the complement relative to another set.

The complement of A relative to B, denoted $B - A$, is the set of elements in B that are not in set A.

This is sometimes called the set difference since it is similar to subtraction.



$A - B$



$B - A$

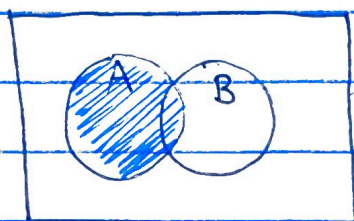
ex. 3 Given $A = \{a, b, c, d, e, f\}$ and $B = \{a, c, h, k\}$ find:

a) $A - B = \{\cancel{a}, b, \cancel{c}, d, e, f\} = \{b, d, e, f\}$

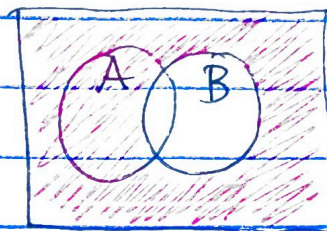
b) $B - A = \{\cancel{a}, \cancel{c}, h, k\} = \{h, k\}$

ex 4 Draw Venn diagrams for the following.

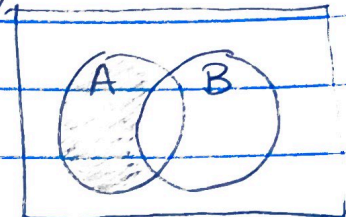
a) $A \cap \overline{B}$



A

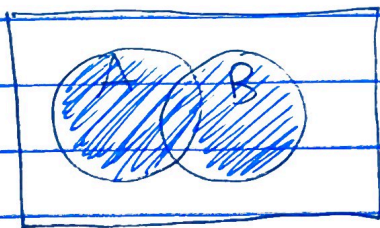


$\overline{B}$

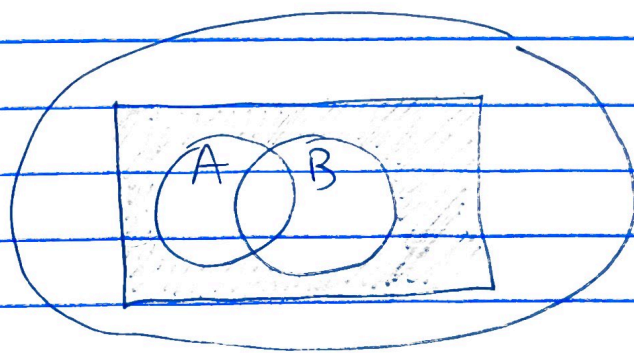


$A \cap \overline{B}$
(overlap)

b) $\overline{A \cup B}$

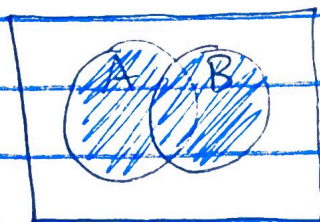


$A \cup B$

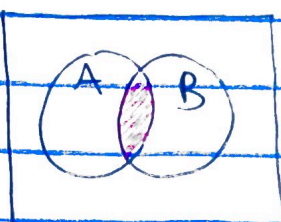


$\overline{A \cup B}$
(everything that is not blue)

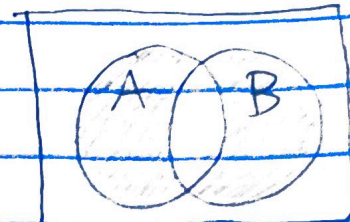
c) $(A \cup B) - (A \cap B)$



$A \cup B$



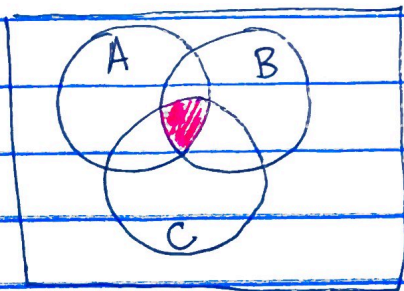
$A \cap B$



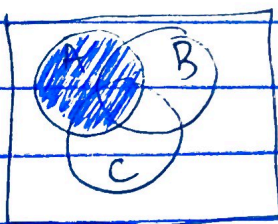
$(A \cup B) - (A \cap B)$
blue with
pink removed

ex 5 Draw a Venn diagram.

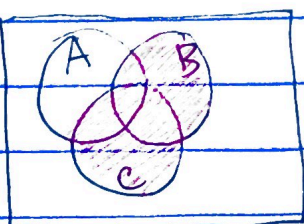
a) $A \cap B \cap C$



b) $\overset{\text{blue}}{A} \cap \overset{\text{pink}}{(B \cup C)}$

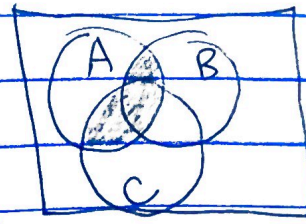


A

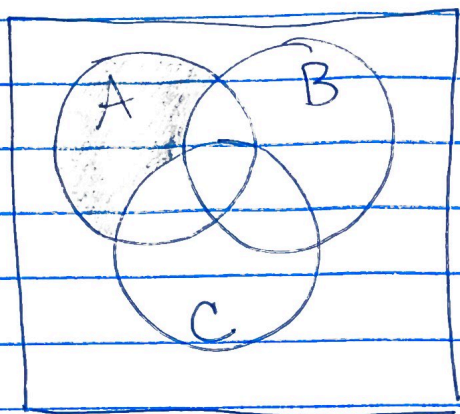


$B \cup C$

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



c) $(A - B) - C$

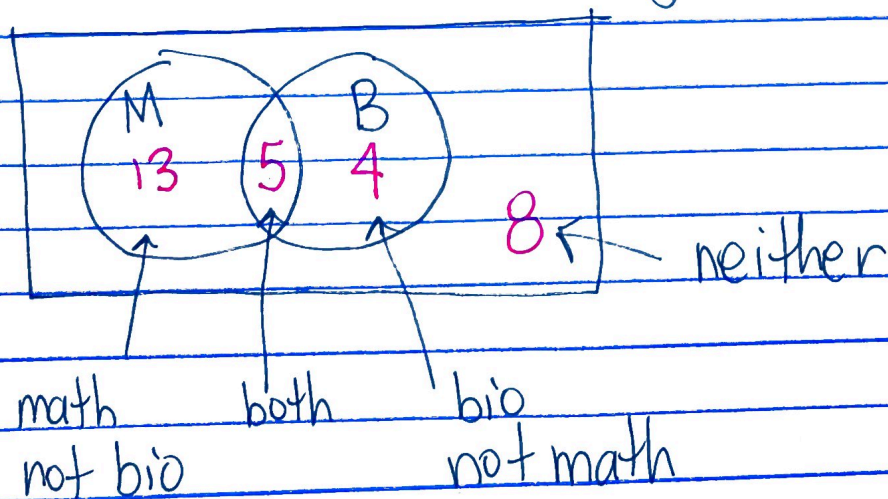


Start with all of A
remove what's in B
remove what's in C

ex 6 In a club with 30 members, 18 take a math class, 5 take both a math and biology class, and 8 take neither math nor biology. How many members take a biology class, but not a math class?

4

Let's use a Venn diagram



end 2-3