

VENN DIAGRAMS

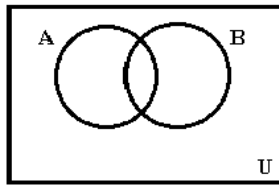
Section 1.5: Venn Diagrams - Shading

A **Venn diagram** is a way to graphically represent sets and set operations. Each Venn diagram begins with a rectangle representing the universal set. Then each set is represented by a circle inside the rectangle. We will only be studying with Venn diagrams that have 2 or 3 overlapping circles (sets). There are Venn diagrams that contain more than 3 circles (sets).

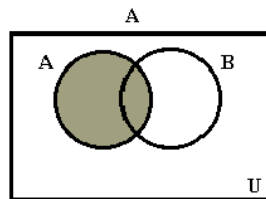
In this section we will learn how to graphically represent union, intersection and complement of sets using Venn diagrams. We will start with Venn diagrams that have two sets as they are easier.

Venn diagrams for two sets:

Here is a Venn diagram for two sets A and B. The universal set is depicted with a rectangle. The two sets "A" and "B" are depicted with overlapping circles inside the rectangle.



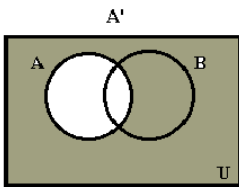
This is a Venn diagram associated with the set A. Notice we shade the set that the Venn diagram depicts.



Now for some set operations.

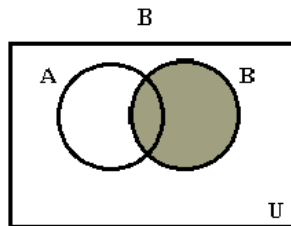
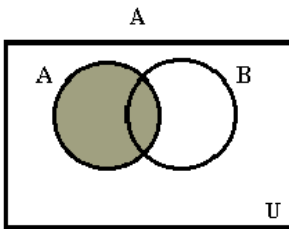
Example: Create a Venn diagram for A' . That is shade the area depicted by the set A' .

Recall that the complement of A (denoted A') is everything in the universal set that is not in set A. We shade everything except what's in the A circle. Here is the Venn diagram that depicts set A' .

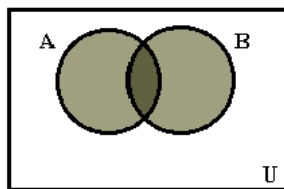


Example: Create a Venn diagram for $A \cup B$.

To do this: first create a shaded Venn diagram for each set described in the problem. I will create a Venn diagram for set A and another for set B.

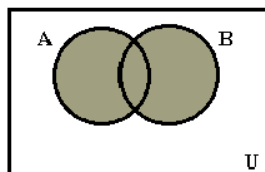


Now put them together. Notice that I darkened the area that is shaded in both diagrams.



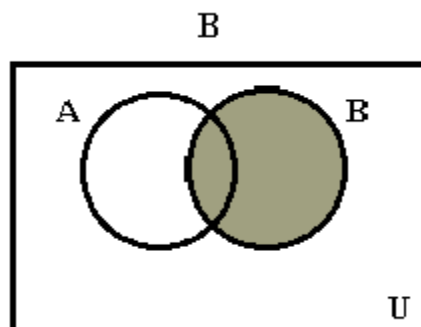
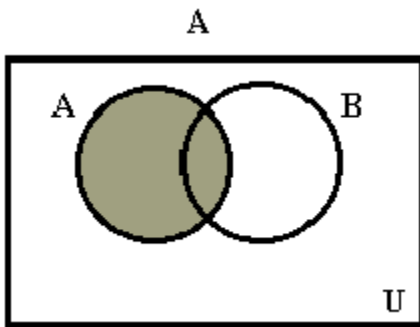
This is a union problem so anything that gets shaded at least once is in the union, so here's the Venn diagram that shows the answer.

$A \cup B$

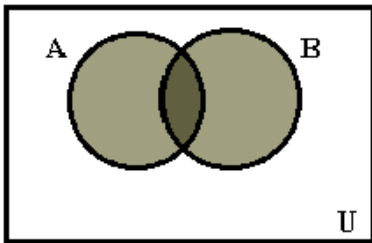


Example: Create a Venn diagram for $A \cap B$.

First create a shaded Venn diagram for each set described in the problem.

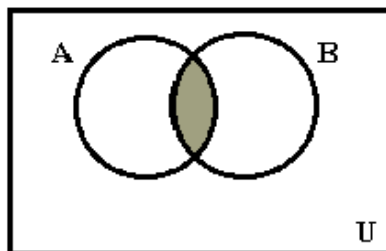


Now put them together.



This is an intersection problem. The final Venn diagram should be shaded only where the two sets cross. Here is the answer:

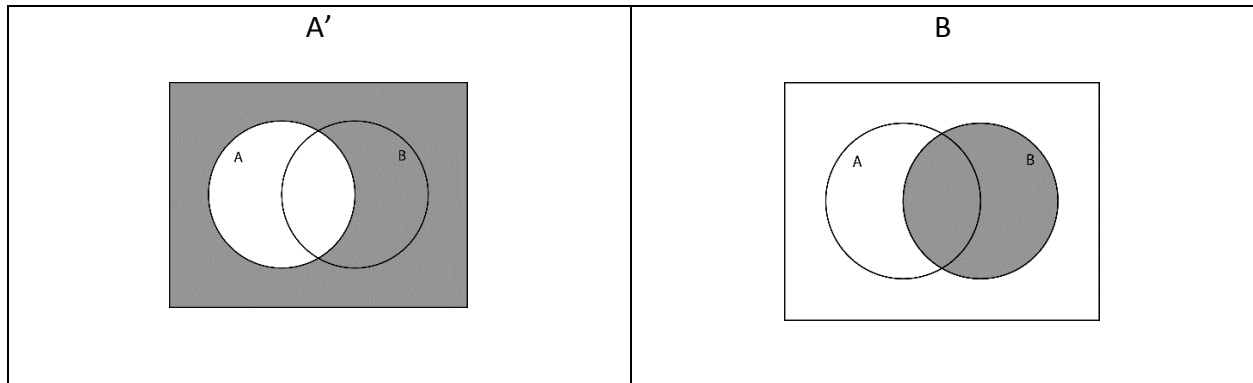
$$A \cap B$$



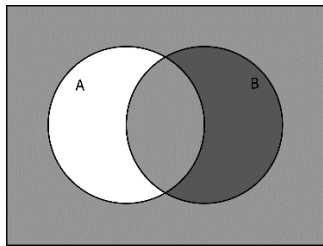
There are the basics, now let's try a couple that are more involved.

Example: Create a Venn diagram for $A' \cap B$

First create a Venn diagram for each set described in the problem.

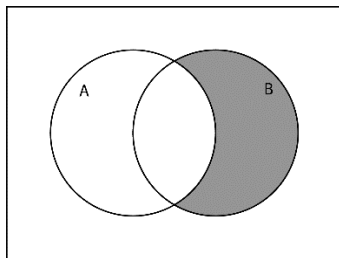


Next, put them together.



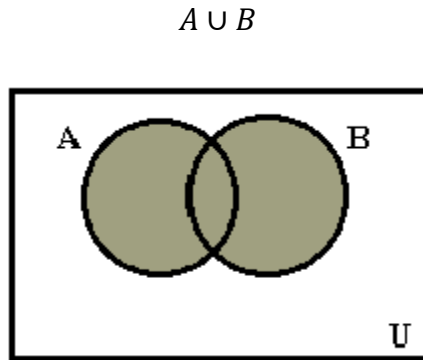
The intersection is the common region that is shaded. Here is my final answer.

$A' \cap B$

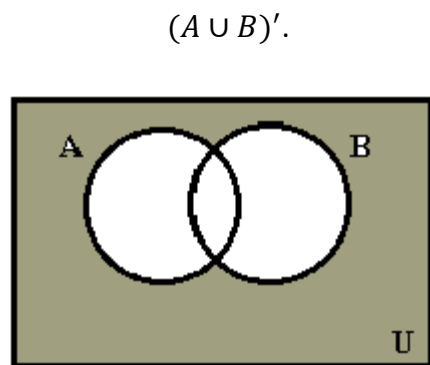


Example: Find a Venn diagram for $(A \cup B)'$.

First shade what's in the parenthesis, that is $A \cup B$. (I took this shading from an earlier example.)



Now take the complement of that set. The complement is the region that is not already shaded. This is my answer.

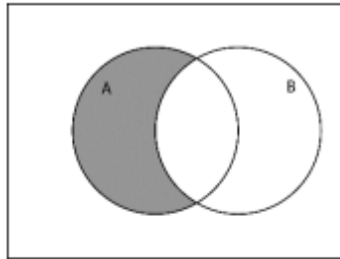


Homework #1-9: Sketch the region.

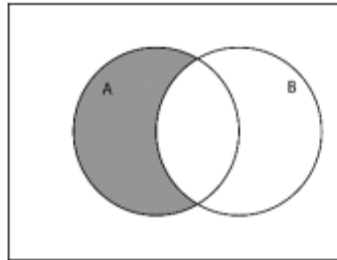
- | | |
|-------------------|-------------------|
| 1) $A \cap B'$ | 2) $A' \cap B'$ |
| 3) $A' \cup B$ | 4) $A \cup B'$ |
| 5) $(A \cap B)'$ | 6) $(A \cap B')'$ |
| 7) $(A' \cup B)'$ | 8) $(A \cup B')'$ |
| 9) $A' \cup B'$ | |

Answers:

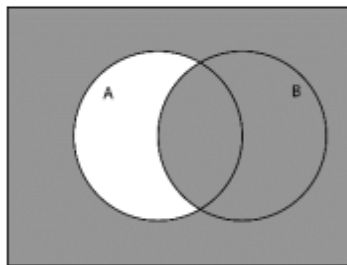
1)



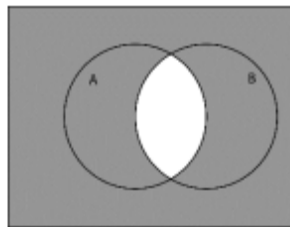
7)



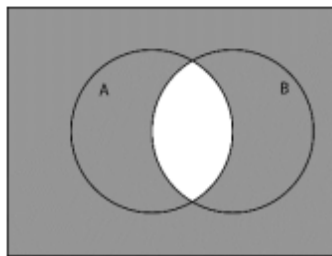
3)



9)



5)



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