Venn diagrams with 3 sets

The presentation will introduce two ways of representing appropriate regions on Venn diagrams with 3 sets. The fist one is done by shading regions step by step (it may require some erasing as well). In the second method we do most of the work in our heads.

Example 1

Represent the set $(A \cap B') \cup C$ on a Venn diagram.

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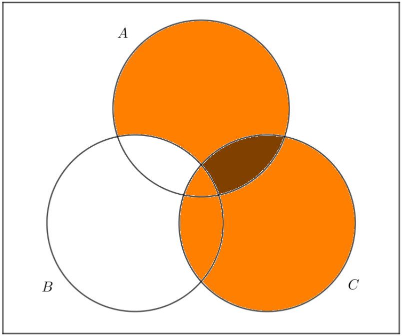
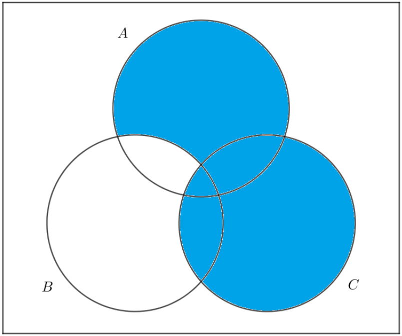
We can start by shading $A \cap B'$ and C. We get the following diagram:



The darker colour means that this region has been shaded twice.

Example 1

Now we want the union ∪ of these two sets, this means that we take everything that has been shaded at least once, so the answer will be:



Example 2

Represent the set $(A \cup B) \cap C'$ on a Venn diagram.

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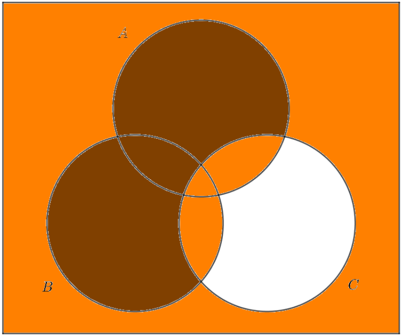
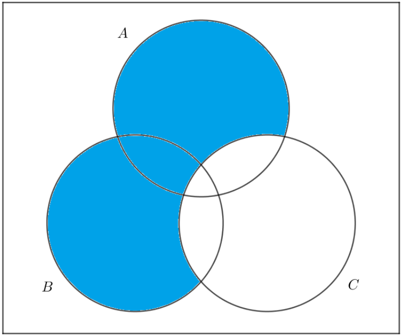
We can start by shading $A \cup B$ and C'. We get the following diagram:



Example 2

Now we want the intersection ∩ of these two sets, so we take everything that has been shaded twice, so the answer will be:



Example 3

Represent the set $B \cap (A \cap C')$ on a Venn diagram.

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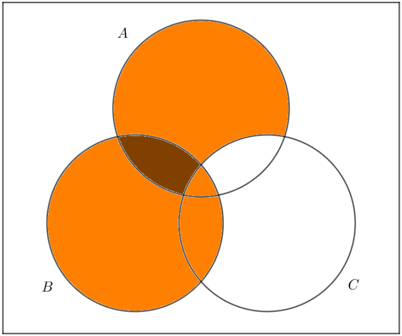
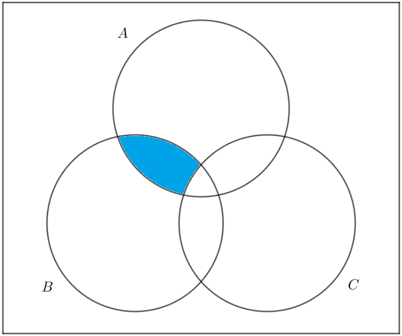
We can start by shading B and $A \cap C'$. We get the following diagram:



Example 3

Now we want the intersection $\cap$ of these two sets, so the answer will be:



Example 4

Represent the set $B \cup (A' \cap C')$ on a Venn diagram.

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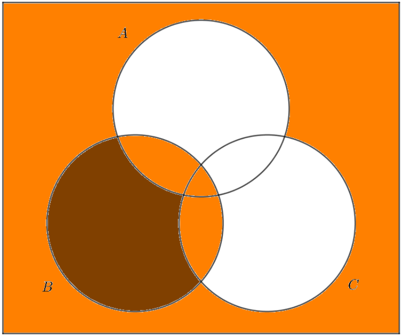
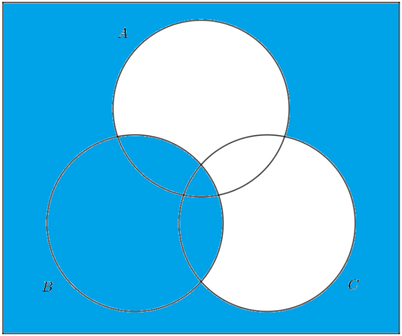


Example 4

Now we want the union ∪ of these two sets, so the answer will be:



Next slides will show a more direct approach.

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Mark on the diagram the set corresponding to $(A \cap B') \cup C$.

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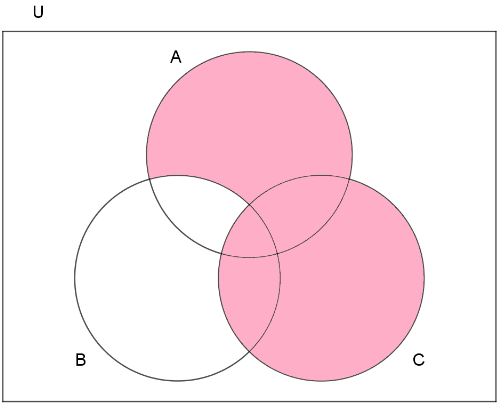
- $(A \cap B')$ is everything in A and not in B.
- C is of course everything in C.
- Finally we have $\cup$ between these, so we want elements that are in at least one of the two sets.

Example 5

Mark on the diagram the set corresponding to $(A \cap B') \cup C$. Answer:



Example 6

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- $(A \cup B)'$ is everything outside of A and B. Using symbolic logic we could read this as: *it is not true that it is in A or in B*.

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Let's make some observations:

- $(A \cup B)'$ is everything outside of A and B. Using symbolic logic we could read this as: *it is not true that it is in A or in B*.
- C' is everything outside of C. In logic this is *not in C*.

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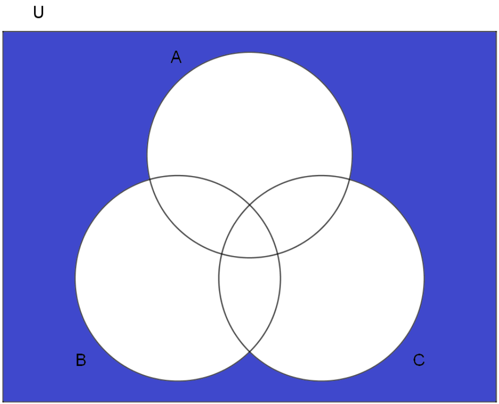
Mark on the diagram the set corresponding to $(A \cup B)' \cap C'$.

Let's make some observations:

- $(A \cup B)'$ is everything outside of A and B. Using symbolic logic we could read this as: *it is not true that it is in A or in B*.
- C' is everything outside of C. In logic this is *not in C*.
- Finally we have $\cap$ between these, so we want elements that are in both sets. Using symbolic logic we have *it is not true that it is in A or in B* ***and*** *it is not in C*.

Example 6

Mark on the diagram the set corresponding to $(A \cup B)' \cap C'$. Answer:



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Observations:

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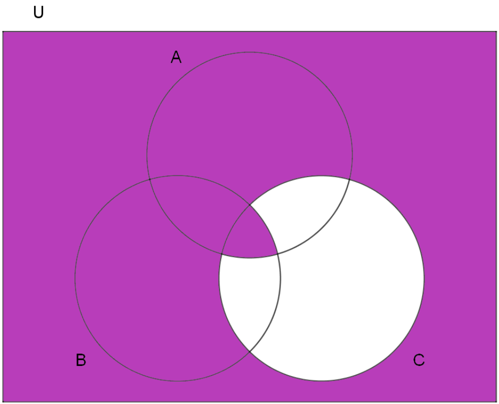
Observations:

- $(A \cap B)$ is everything that is both in A and in B.
- C' is again everything outside of C.
- Finally we have $\cup$ between these, so we want elements that are in at least one of the two sets. Using logic we have *it is both in A and B **or** it is not in C*.

Example 7

Mark on the diagram the set corresponding to $(A \cap B) \cup C'$ Answer:



Example 8

Mark on the diagram the set corresponding to $(A \cup B) \cap (C \cap A)$.

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- $(A \cup B)$ is everything in A or in B.
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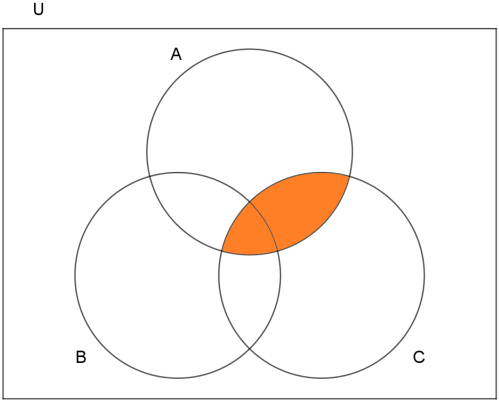
Mark on the diagram the set corresponding to $(A \cup B) \cap (C \cap A)$.

Let's make some observations:

- $(A \cup B)$ is everything in A or in B.
- $(C \cap A)$ is everything in C and in A.
- $(A \cup B) \cap (C \cap A)$ is everything in both of the above so *in A or in B* ***and*** *in C and in A.*

Example 8

Mark on the diagram the set corresponding to $(A \cup B) \cap (C \cap A)$. Answer:



Example 9

Mark on the diagram the set corresponding to $(A' \cap B') \cap (B \cup C)$.

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- $(A' \cap B')$ is everything that is both outside of A and outside of B.

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Mark on the diagram the set corresponding to $(A' \cap B') \cap (B \cup C)$.

Let's make some observations:

- $(A' \cap B')$ is everything that is both outside of A and outside of B.
- $(B \cup C)$ is everything in B or in C.

Example 9

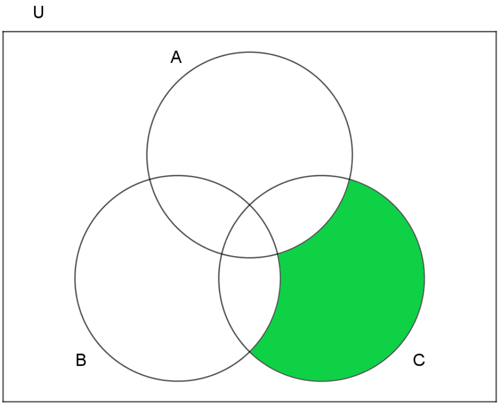
Mark on the diagram the set corresponding to $(A' \cap B') \cap (B \cup C)$.

Let's make some observations:

- $(A' \cap B')$ is everything that is both outside of A and outside of B.
- $(B \cup C)$ is everything in B or in C.
- $(A' \cap B') \cap (B \cup C)$ is everything in both of the above so *not in A and not in B* ***and*** *in B or in C*.

Example 9

Mark on the diagram the set corresponding to $(A' \cap B') \cap (B \cup C)$. Answer:



The short test at the beginning of the class will be similar to one of the examples above.