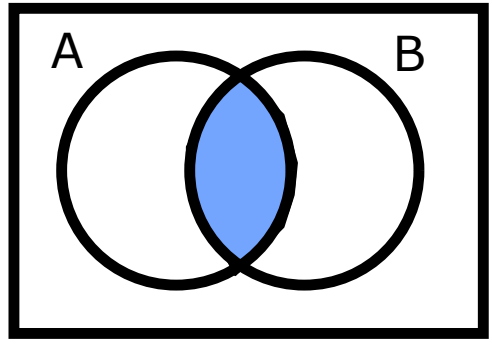
Set operations and Venn diagrams

$A \cap B = \{ x \mid x \in A \text{ and } x \in B \}$
This is the intersection of A and B.

$A \cup B = \{ x \mid x \in A \text{ or } x \in B \}$
This is the union of A and B.

An element of $A \cap B$ belongs to both A and B,

an element of $A \cup B$ is required to belong to at least one of the sets.



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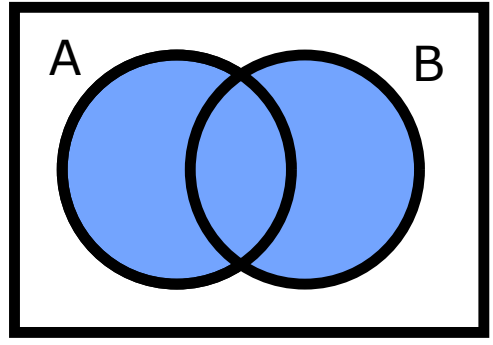

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Sets and the Universal Set

A = {1,2,3,4}, B = {1,3,5,7}, and C = {7,9,3}, and the universal set U = {1,2,3,4,5,6,7,8,9}. Locate all this information appropriately in a Venn diagram.

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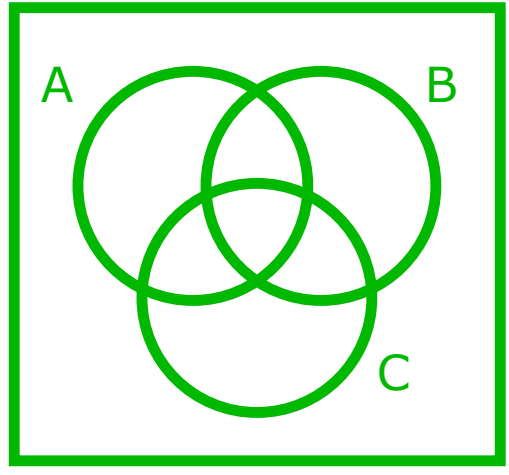

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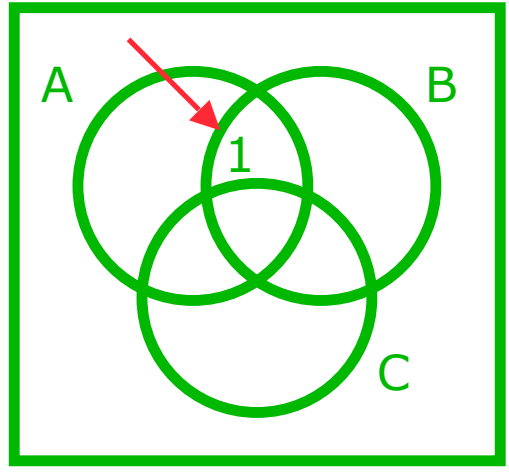

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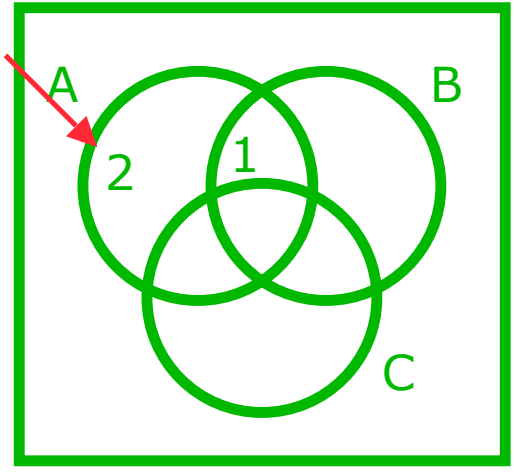

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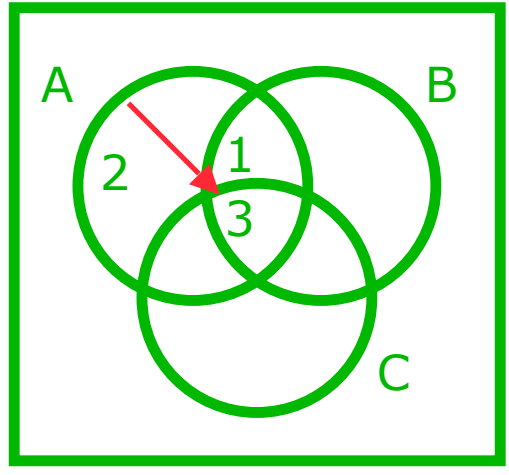

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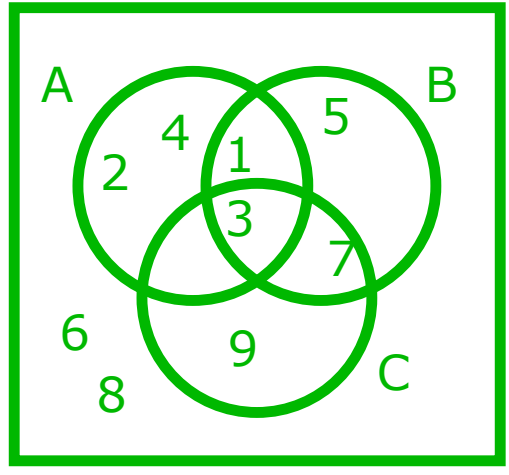
Check out the Venn diagram and make sure you agree with where all the elements have been placed.



Distributive Law for Unions

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

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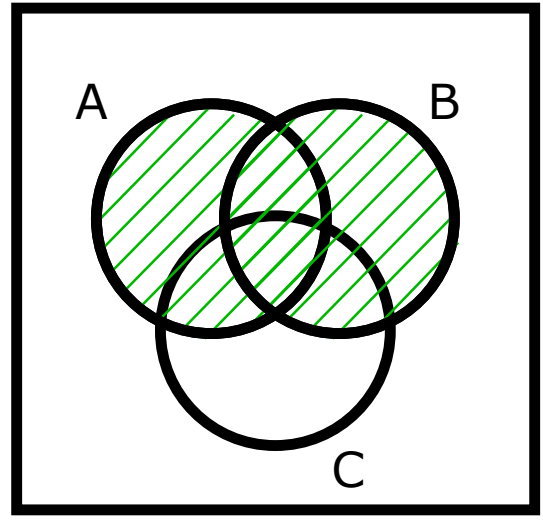

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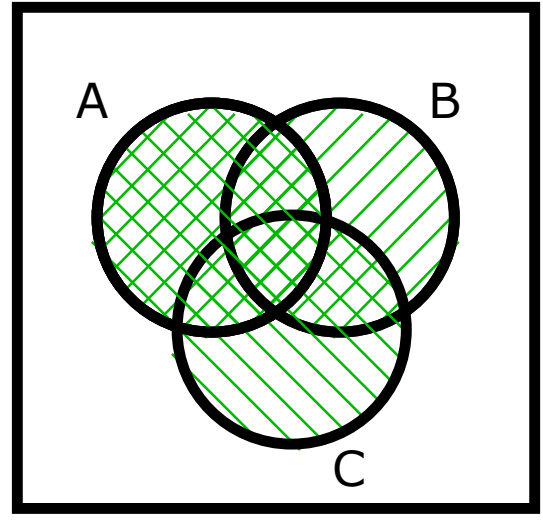

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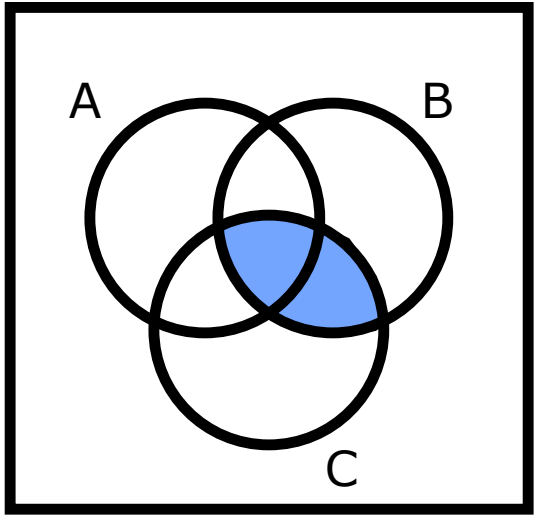

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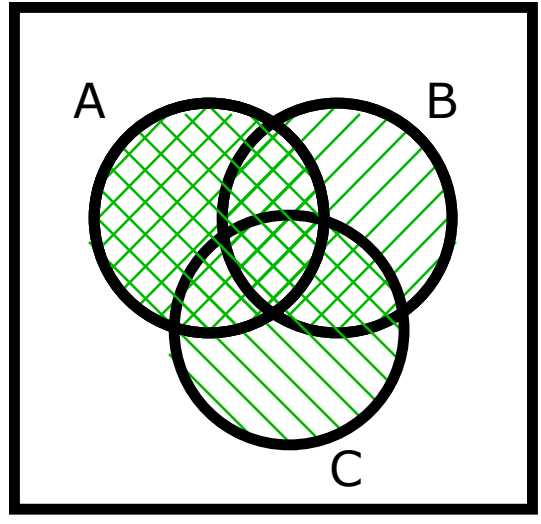

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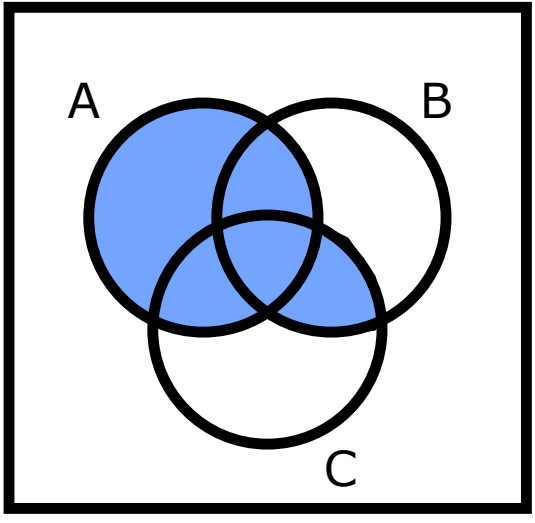

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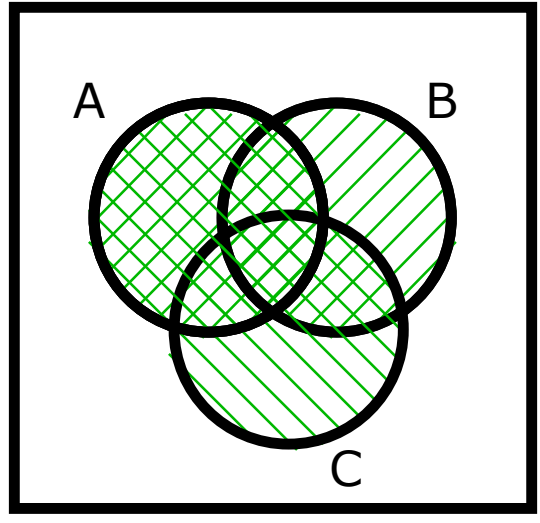

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DeMorgan's Law

$$(A \cup B)^c = A^c \cap B^c$$

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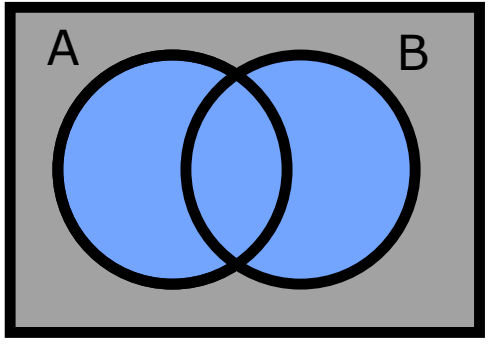

$(A \cup B)^c$ is the gray region in this picture

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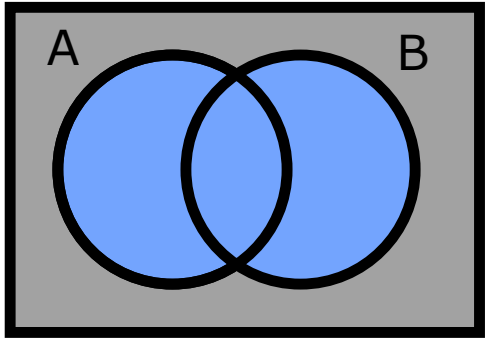

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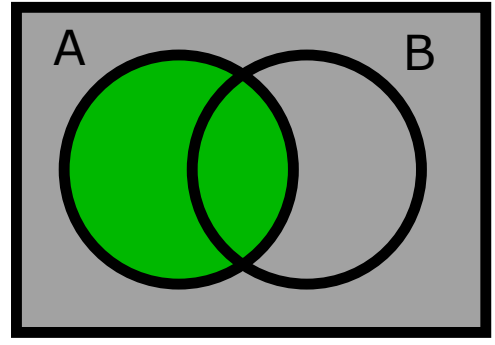

At this stage A is painted green.

DeMorgan's Law

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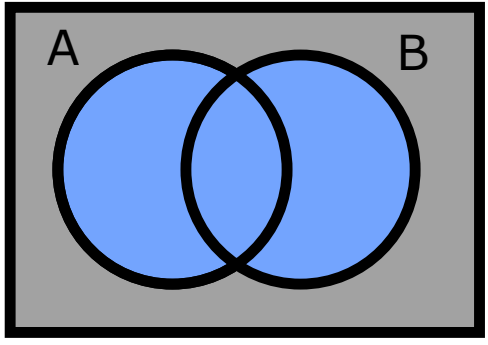

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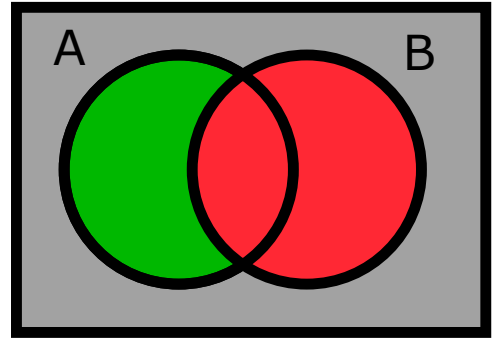

Now B is painted red, so what's outside of A and outside of B hasn't been painted.

DeMorgan's Law

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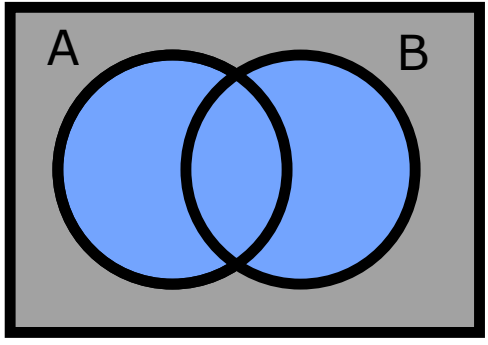

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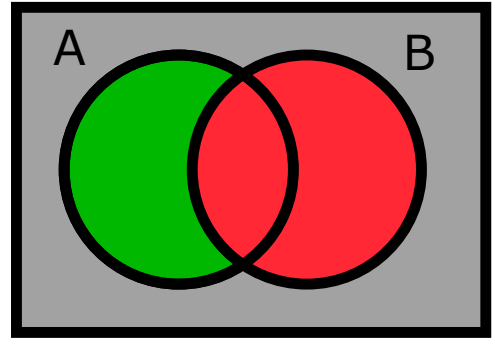

What hasn't been painted is $A^c \cap B^c$

DeMorgan's Other Law

$$(A \cap B)^c = A^c \cup B^c$$

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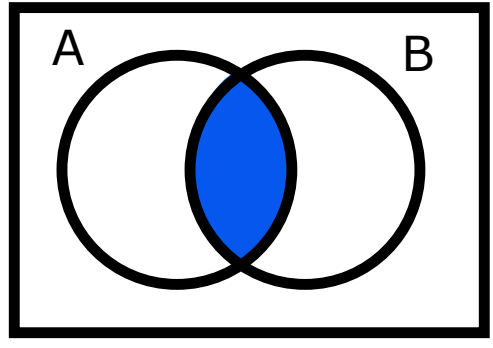

Grouping Students

Let's denote by M and B the students in a particular university that are studying mathematics and business. Write down the set that describes each of the following groups of students:

(a) students studying math but not business

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$$M \cap B^c$$

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Let's denote by M and B the students in a particular university that are studying mathematics and business. Write down the set that describes each of the following groups of students:

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$$(M \cup B)^c \text{ or } M^c \cap B^c$$

Grouping Students

Let's denote by M and B the students in a particular university that are studying mathematics and business. Write down the set that describes each of the following groups of students:

(e) students who don't study math and who don't study business

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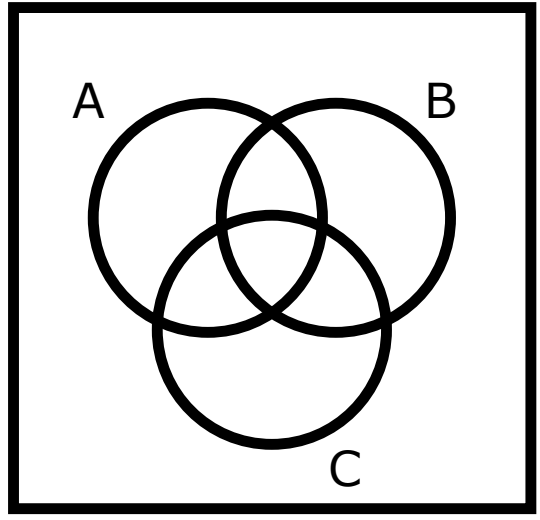
Sketching regions representing sets:

Sketch the region corresponding to the set

$$(A \cup B^c) \cap C$$



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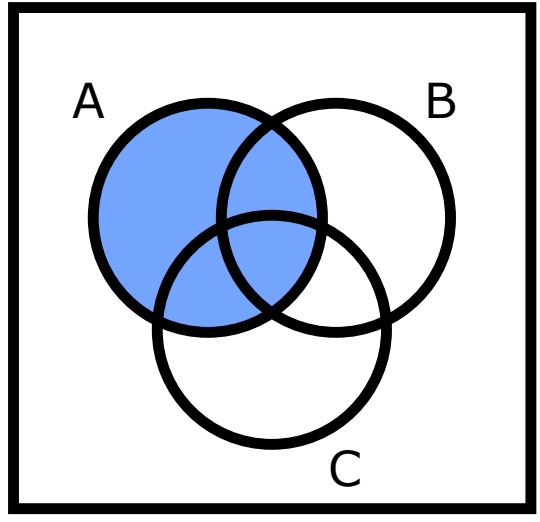

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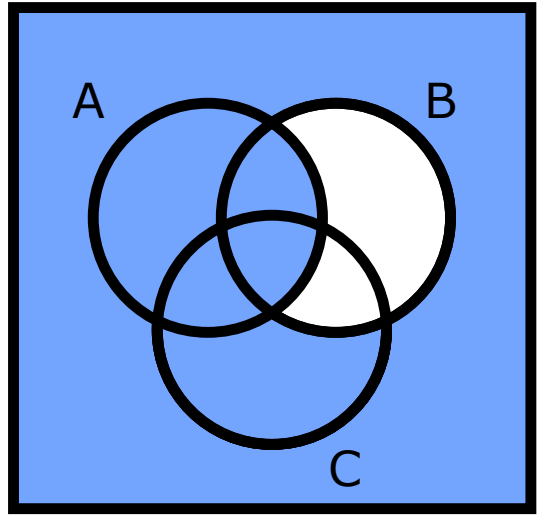

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