Sets Lesson 2: Set Operations

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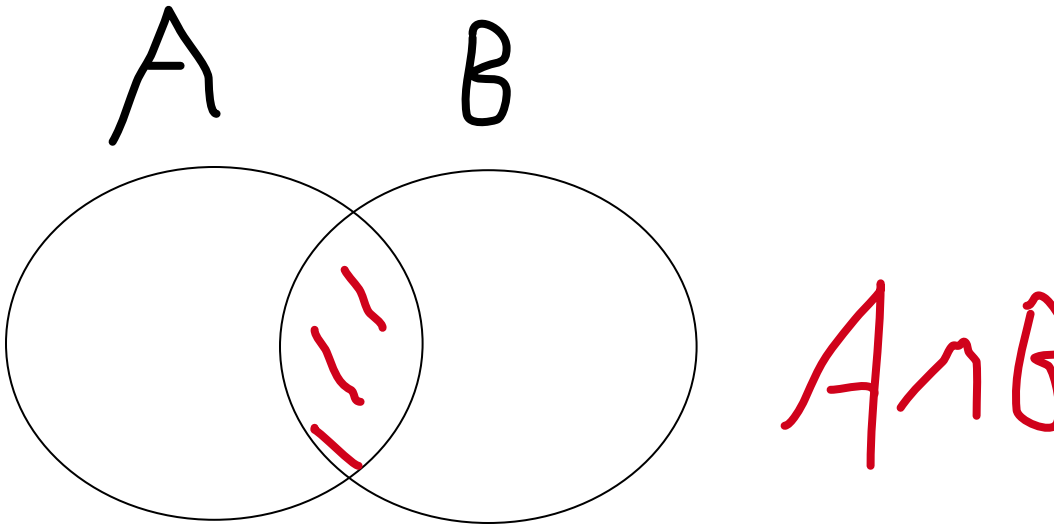
As Ch. 1 section 2 of the book lays out, we have two more set operations in addition to complement A', and those operations are intersection and union.

Intersection and Union

REMINDER: " $\in$ " symbol is the "element sign"

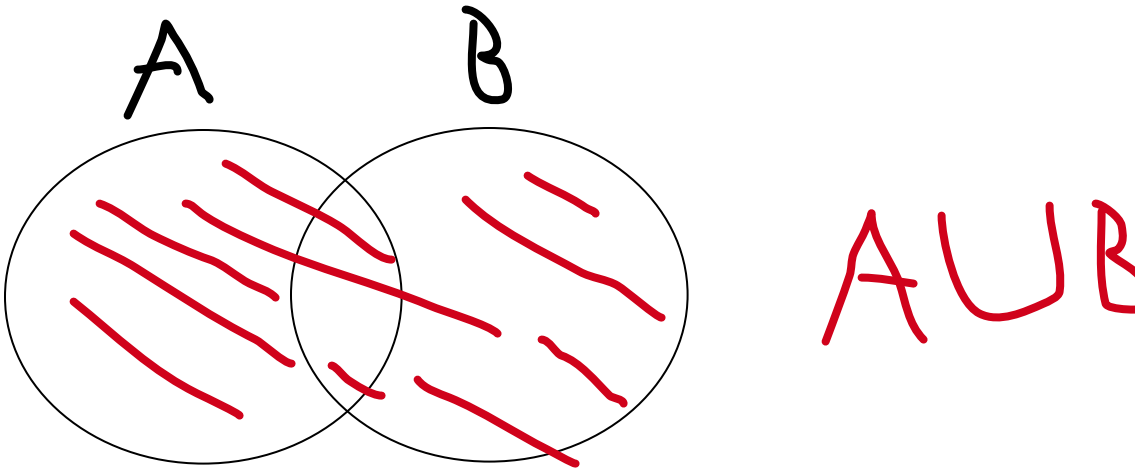
Intersection: $A \cap B := \{x : x \in A \text{ and } x \in B\}$ we call it "A intersect B"

The symbol " $\cap$ " that looks like a rainbow is the intersect symbol



Union: $A \cup B := \{x : x \in A \text{ or } x \in B\}$ we call it "A union B"

NOTE: When I say "or", I mean inclusive or (so elements that are of A and B are included, so if $x \in A$ and $x \in B$ then $x \in A \cup B$. So $A \cap B \subset A \cup B$



To sum it all up: "A union is what they both have, and an intersection what both sets have in common"-a few awesome students

Order of Operations

In practice, like with arithmetic, we use multiple operations for multiple sets, such as $A \cup B \cap C'$ and $(A \cap B)' \cup C$, so to do the order correctly, we have an **order of operations**, which is as follows

1. Work inside the innermost parenthesis
Ex. $(\{1,2\} \cap \{1\})' \cup \{3\}$

We do $\{1,2\} \cap \{1\}$ first, since it's in parenthesis

2. Complements before intersections or unions
Ex.
$U = \{1,2,3\}$
$A = \{1,2\}$
$B = \{3\}$
$(A \cup B)' = \varnothing$
$A \cup B' = A \cup \{1,2\} = \{1,2\} = A$

Ex. 2.4 b. (in the book)
$(A \cap C)'$

$A \cap C = \{2, 3\}$
$(A \cap C)' = \{2, 3\}' = \{1, 4, 5, \ldots, 9\}$

3. find intersections and unions from left to right

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Last Time:

Warm-up

Let
$E = \{x | x \text{ is enrolled in English}\}$
$P = \{x | x \text{ is enrolled in Psych}\}$
What does the following mean in English?

a. $E \cap P$ "the students enrolled in english and psych"
b. $E \cap P'$ "the students enrolled in english but not psych"
"the students (both enrolled in english and not enrolled in psych)"
c. $E \cup P'$ "(every student enrolled in english) as well as (every student not enrolled in psych)"
"(every student that is enrolled in english or not enrolled in psych)"
d. $E' \cup P'$ "every student not taking english or not taking psych"

Let
$U = \{apple, orange, bannana, strawberry\}$
$X = \{apple, orange\}$
$Y = \{orange, bannana\}$
$Z = \{apple, bannana, strawberry\}$

a.
$(X \cup Y)'$
first we do parantheses
$X \cup Y = \{apple, orange, bannana\}$
next we take the complement
$\{apple, orange, bannana\}' = \{strawberry\}$

b.
$Y' \cap X$
first we do complements

$Y' = \{strawberry,\ apple\}$
next, we do the intersection
$\{strawberry,\ apple\} \cap \{apple,\ orange\} = \{apple\}$

c.
$X \cap Z \cup Y = (X \cap Z) \cup Y$
We go from left to right
$X \cap Z = \{apple\}$
$\{apple\} \cup \{orange,\ bannana\} = \{apple,\ orange,\ bannana\}$

Sets Homework 2 Questions

No questions