Sept 7 Slides

Properties Of Set Union

- $A \cup \varnothing =$
- $A \cup \boldsymbol{U} =$
- $A \cup A =$

Properties Of Set Union

- A U $\varnothing$ = A   Identity law
- A U $\boldsymbol{U}$ =
- A U A =

Properties Of Set Union

- $A \cup \emptyset = A$ Identity law
- $A \cup \boldsymbol{U} = \boldsymbol{U}$ Domination law
- $A \cup A =$

Properties Of Set Union

- A U ∅ = A — Identity law
- A U ***U*** = ***U*** — Domination law
- A U A = A — Idempotent law

Properties Of Set Union

- $A \cup \emptyset = A$ — Identity law
- $A \cup \boldsymbol{U} = \boldsymbol{U}$ — Domination law
- $A \cup A = A$ — Idempotent law
- $A \cup B = B \cup A$ — Commutative law

Properties Of Set Intersection

- $A \cap \boldsymbol{U} =$
- $A \cap \varnothing =$
- $A \cap A =$

Properties Of Set Intersection

- $A \cap \boldsymbol{U} = A$ Identity law
- $A \cap \varnothing =$
- $A \cap A =$

Properties Of Set Intersection

- $A \cap \boldsymbol{U} = A$ Identity law
- $A \cap \varnothing = \varnothing$ Domination law
- $A \cap A =$

Properties Of Set Intersection

- $A \cap \boldsymbol{U} = A$ — Identity law
- $A \cap \varnothing = \varnothing$ — Domination law
- $A \cap A = A$ — Idempotent law

Properties Of Set Intersection

$A \cap \boldsymbol{U} = A$	Identity law
$A \cap \varnothing = \varnothing$	Domination law
$A \cap A = A$	Idempotent law
$A \cap B = B \cap A$	Commutative law

Propositions

A proposition is a statement that is either true or false

Examples of Proposition

(Eggs are blue) = *p*

(I am a human) = *q*

(2 + 3 = 5) = *r*

Examples of things that aren’t Proposition

What are you doing Friday?

What is 3 + 3?

Sit down!

Propositions

A proposition is a statement that is either true or false

When dealing with propositions, we abstract away difficulties of defining, and we can just give them letters (define variables), like p

Propositions

A proposition, *p*, is a statement that is either true or false. “True” or “False” is considered the “truth value” of *p*.

https://www.cs.virginia.edu/luther/2102/F2020/symbols.html

Concept	Java/C	Python	This class	Bitwise	Other
true	`true`	`True`	$\top$ or 1	`-1`	T, tautology
false	`false`	`False`	$\bot$ or 0	`0`	F, contradiction

Propositions

A proposition is a statement that is either true or false

We can modify, combine and relate propositions with *connectives:*

Propositions

A proposition is a statement that is either true or false

We can modify, combine and relate propositions with *connectives:*

- $\vee$ is “or”
- $\wedge$ is “and”
- $\neg$ is “not”

Looks Familiar?

We can modify, combine and relate propositions with *connectives:*

- $\vee$ is "or"
- $\wedge$ is "and"
- $\neg$ is "not"

$$\boxed{} = \{x \in U \mid x \in S \wedge x \notin T\}$$

Looks Familiar?

We can modify, combine and relate propositions with *connectives:*

- $\lor$ is "or"
- $\land$ is "and"
- $\neg$ is "not"

$$S \setminus T = \{x \in U \mid x \in S \land x \notin T\}$$

Looks Familiar?

We can modify, combine and relate propositions with *connectives:*

- $\vee$ is “or”
- $\wedge$ is “and”
- $\neg$ is “not”

$$\boxed{} = \{x \in U \mid x \in S \vee x \in T\}$$

Looks Familiar?

We can modify, combine and relate propositions with *connectives:*

- $\vee$ is "or"
- $\wedge$ is "and"
- $\neg$ is "not"

$$S \cup T = \{x \in U \mid x \in S \vee x \in T\}$$

Looks Familiar?

We can modify, combine and relate propositions with *connectives:*

- $\vee$ is "or"
- $\wedge$ is "and"
- $\neg$ is "not"

$$\square = \{x \in U \mid x \in S \wedge x \in T\}$$

Looks Familiar?

We can modify, combine and relate propositions with *connectives:*

- $\vee$ is "or"
- $\wedge$ is "and"
- $\neg$ is "not"

$$S \cap T = \{x \in U \mid x \in S \wedge x \in T\}$$

Looks Familiar?

We can modify, combine and relate propositions with *connectives:*

- $\lor$ is "or"
- $\land$ is "and"
- $\neg$ is "not"

Set theory is a branch of mathematical logic. So it makes sense to use logical language and symbols to describe sets.

“Not” operator

How to define:

Make a truth table

“Not” operator

p	$\neg p$
T	F
F	T

“And” operator

“And” operator

p	q	$p \wedge q$
T	T	T
T	F	F
F	T	F
F	F	F

“Or” operator

"Or" operator

p	q	$p \vee q$
T	T	T
T	F	T
F	T	T
F	F	F

“Implies” operator

If p, then q

The conditional $p \to q$ can be expressed by different sentences, some of them are listed below:

- p implies q
- p is a sufficient condition for q
- q is a necessary condition for p
- q follows from p
- p only if q

"Implies" operator

p	q	$p \to q$
T	T	T
T	F	F
F	T	T
F	F	T

Supose $A \subset B$ and $B \subseteq C$ are true, and $B \subseteq D$ and $D \subseteq B$ are both false.

For each of the following, decide if it

- must, could, or can't be empty
- how it must relate ($\subseteq$, $\subset$, $\supseteq$, $\supset$, $=$) to the four named sets (if any)

a. $A \cap B$
b. $A \cup B$
c. $B \cap C$
d. $B \cup C$
e. $B \cap D$
f. $B \cup D$
g. $C \cap D$
h. $C \cup D$
i. $A \cap C$
j. $A \cup C$
k. $A \cap D$
l. $A \cup D$