

Markus:

Real Soon Now (RSN)

admin has created
instance.... next
48 hours?

CSC165 fall 2019

Mathematical expression:
predicate logic

Do quiz #2
before 1:00
on Thursday!

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Web page:

<http://www.teach.cs.toronto.edu/~heap/165/F19/>

Using [Course notes: Mathematical Expression: predicate logic](#)

sets of sets, etcetera - sets are collections of distinct
 including ordered pairs
 (e.g. \mathbb{C}^2) - even sets (!)
 careful with $A \in A$ (Russell's
 careful with "in" paradox)

$$\underbrace{\mathcal{P}(\{a, b, c\})}_A$$

step 0 : $\{\emptyset\}$

$$|A| = 3$$

step a : $\{\emptyset, \{a\}\}$

$$|\mathcal{P}(A)| = 2^3$$

step b : $\{\emptyset, \{a\}, \{b\}, \{a, b\}\}$

step c : $\{\emptyset, \{a\}, \{b\}, \{a, b\}, \{c\}, \{a, c\}, \{b, c\}, \{a, b, c\}\}$

compare and contrast...

p : "it is raining"
 q : "I am wearing sneakers"

"If it is raining, then I am wearing sneakers."

"If and only if it is raining, then I am wearing sneakers."

$$p \Rightarrow q$$

$$p \Leftrightarrow q$$

$p \Rightarrow q$
 implication
 $q \Rightarrow p$
 converse

p	q	$p \Rightarrow q$	$p \Leftrightarrow q$
T	T	T	T
T	F	F	F
F	T	T	F
F	F	T	T

} symmetry
 $p \Leftrightarrow q$
 bimplication

$\neg q \Rightarrow \neg p$
 contrapositive

$$\neg p \vee q$$

converse, contrapositive

“If I am wearing sneakers, then it is raining.” — $q \Rightarrow p$

“If I am not wearing sneakers, then it is not raining.” — $\neg q \Rightarrow \neg p$

p	q	$q \Rightarrow p$	$\neg q \Rightarrow \neg p$
T	T	T	T
T	F	T	F
F	T	F	T
F	F	T	T

see $p \Rightarrow q$!

what's a predicate?

$$P: X \rightarrow \{T, F\}$$

$$f: \mathbb{R} \rightarrow \{T, F\}, \quad f(n) = n > 7.2$$

$$g: \{x: x \text{ is a building}\} \rightarrow \{T, F\}$$

$$g(x) = x > 100 \text{ m}$$

$$g(\text{CN tower}) \rightarrow T$$
$$g(\text{Athletic Centre}) \rightarrow F$$

$$f(4) \rightarrow F$$

$$f(8) \rightarrow T$$

predicate definitions

$g(x)$: "x is taller than 100 m", for
x in the set of buildings.

$f(n)$: "n is greater than 7.2", for n
in real numbers.

