

CSE 20

DISCRETE MATH

Fall 2020

<http://cseweb.ucsd.edu/classes/fa20/cse20-a/>

Today's learning goals

- Translate sentences from English to propositional logic using appropriate propositional variables and boolean operators
- Evaluate the truth value of a compound proposition given truth values of its constituent variables.
- Form the converse, contrapositive, and inverse of a given conditional statement.
- Decide and justify whether or not a collection of propositions is consistent.

Conditional

Rosen p. 6-10

The hypothesis of $p \rightarrow q$ is _____

The antecedent of $p \rightarrow q$ is _____

The conclusion of $p \rightarrow q$ is _____

The consequent of $p \rightarrow q$ is _____

Input		Output
p	q	$p \rightarrow q$
T	T	T
T	F	F
F	T	T
F	F	T

Which of the following is NOT true?

- A. p, q, p, q
- B. p, p, q, q
- C. $p, \neg p, q, \neg q$
- D. q, q, p, p
- E. None of the above

The only way to make
a conditional
statement false is to

...

Conditional and biconditional

Rosen p. 6-10

Input		Output
p	q	$p \rightarrow q$
T	T	T
T	F	F
F	T	T
F	F	T

“If p, then q”

Conditional

Input		Output
p	q	$p \leftrightarrow q$
T	T	T
T	F	F
F	T	F
F	F	T

“p iff q”
“p if and only if q”

Biconditional

Which of the following is NOT true?

- A. $p \rightarrow q \equiv \neg p \vee q$
- B. $p \leftrightarrow q \equiv p \wedge q$
- C. $\neg(p \leftrightarrow q) \equiv p \oplus q$
- D. $p \rightarrow q \equiv q \rightarrow p$
- E. More than one

Conditionals: vocabulary

Rosen p. 6-10

- The converse of $p \rightarrow q$ is _____
- The inverse of $p \rightarrow q$ is _____
- The contrapositive of $p \rightarrow q$ is _____

Which of the following is true?

A. $p \rightarrow q \equiv q \rightarrow p$

B. $p \rightarrow q \equiv \neg p \rightarrow \neg q$

C. $p \rightarrow q \equiv \neg q \rightarrow \neg p$

D. More than one of the above

E. None of the above

Translation

Rosen p. 14 #22a

Express the sentence

“A sufficient condition for the warranty to be good is that you bought the computer less than a year ago” using the propositions

w: “the warranty is good”

b: “you bought the computer less than a year ago”

Translation

Rosen p. 22: 1.2#7

Express the sentence

“whenever the message was sent from an unknown system, it is scanned for viruses” using the propositions

s: “The message is scanned for viruses”

u: “The message was sent from an unknown system”

A. $s \wedge u$

B. $s \vee \neg u$

C. $\neg s \wedge u$

D. $(s \wedge u) \vee (\neg s \wedge \neg u)$

E. None of the above.

Translation

See more on Rosen p. 14

Express the sentence

“I will complete my to-do list only if I put a reminder in my calendar” using the propositions

r: “I will complete my to-do list”

c: “I put a reminder in my calendar”

Consistency

Rosen p. 22: 1.2#10

Are these system specifications consistent?

“Whenever the system software is being upgraded, users cannot access the file system. If users can access the file system, then they can save new files. If users cannot save new files, then the system software is not being upgraded.”

Consistency

Rosen p. 22: 1.2#10

Are these system specifications consistent?

“Whenever the system software is being upgraded, users cannot access the file system. If users can access the file system, then they can save new files. If users cannot save new files, then the system software is not being upgraded.”

Definition: a collection of compound propositions is **consistent** means

Consistency

Rosen p. 22: 1.2#10

“Whenever the system software is being upgraded, users cannot access the file system. If users can access the file system, then they can save new files. If users cannot save new files, then the system software is not being upgraded.”

1. Translate to **symbolic** compound propositions
2. Look for some truth assignment to the propositional variables for which *all* the compound propositions output T

Consistency

Rosen p. 22: 1.2#10

“Whenever the system software is being upgraded, users cannot access the file system. If users can access the file system, then they can save new files. If users cannot save new files, then the system software is not being upgraded.”

A = “the system software is being upgraded”

B = “users can access the file system”

C = “users can save files”

Consistency

Rosen p. 22: 1.2#10

“Whenever the system software is being upgraded, users cannot access the file system. If users can access the file system, then they can save new files. If users cannot save new files, then the system software is not being upgraded.”

A = “the system software is being upgraded”

B = “users can access the file system”

C = “users can save files”

Propositions:

For next time

- Read website carefully

<http://cseweb.ucsd.edu/classes/fa20/cse20-a/>

- Next pre-class reading:
 - Section 1.4 Definitions 1 (p. 40) and 2 (p. 42), Table 2 (p 47), Examples 21-22 (pp. 47-48)