

Math 155: Logical Reasoning In-class Exercises

1. Are the following pairs of statements negations of each other?

(a) Pat drinks coffee. Υ
Pat does not drink coffee.

(b) Pat drinks coffee. N
Pat drinks tea.

(c) The number of students in this class is even. Υ
The number of students in this class is odd.

*the number of students is a whole number (0, 1, 2, 3 ...)
whole number and integers are either even or odd but*

(d) The balance in my Visa account is a positive number. N *not both*
The balance in my Visa account is a negative number.

real numbers are either positive or negative or zero

(e) There are fewer than twenty students in this class. Υ
There are at least twenty students in this class.
 $x < 20$ \downarrow $x \geq 20$

(f) Everyone at the bar right now wants a beer. N
No-one at the bar wants a beer.

see notes

2. Which “or”, inclusive or exclusive, is meant in the following sentences?

(a) Wanted: Dead or Alive! *exclusive*

(b) Would you like milk or sugar in your tea? *inclusive*

(c) I want to get an A or a B for my final mark in Pat’s math class. *exclusive*

3. Let p = “Pat drank tea” and q = “Pat drank coffee”. Translate the following into logical symbols.

(a) Pat drank tea or coffee. $p \vee q$

(b) Pat drank tea or she didn't. $p \vee \bar{p}$ } either
 $p \oplus \bar{p}$

(c) Pat drank tea and not coffee.

$$p \wedge \bar{q}$$

(d) Pat drank tea but not coffee.

$$p \wedge \bar{q}$$

(e) It's not true that Pat drank both tea and coffee.

$$\overline{p \wedge q}$$

4. Answer the questions, based on the given information, with Y (yes), N (no), or M (maybe).

(a) True: I drank tea and coffee today. \leftarrow "and" means both are true
 Question: Did I drink tea today? \leftarrow "or" is at least one true?
 Y

(b) True: I drank tea today.
 Question: Did I drink tea or coffee today? Y (at least one)

Question: Did I drink tea and coffee today? M

(c) True: I drank tea or coffee today. \rightarrow tea or ~~coffee~~ or ~~both~~
 True: I did not drink coffee today. \uparrow
 Question: Did I drink tea today? Y

(d) True: I drank tea or coffee today. \rightarrow ~~tea~~ or coffee or both
 True: I drank coffee today. \uparrow no tea \uparrow tea
 Question: Did I drink tea? M

(e) True: I drank tea or coffee today but not both. tea or coffee or ~~both~~
 True: I drank coffee today.
 Question: Did I drink tea today? N