

EECS 203: Discrete Mathematics
Winter 2024
Discussion 1a Notes

1 Definitions

- **Proposition:**
- **Proof:**
- **Negation:**
- **Disproof/Refutation:**
- **Even:**
- **Odd:**

Solution:

- **Proposition:** A statement about the world that has a truth value (either true or false) or false, but not both.
- **Proof:** A proof shows that a proposition is true by a step-by-step explanation. Each step should be easy enough to follow, even if the overall statement is not obvious.
- **Negation:** The negation of a proposition is the statement with the opposite truth value. In English, we often just add or remove the word “not” to get the negation.
- **Disproof/Refutation:** When you prove that a proposition is false, this is called a disproof or a refutation. You have disproved or refuted the statement. This generally involves proving that the negation is true.
- **Even:** An integer x is even if there exists an integer k with $x = 2k$.
- **Odd:** An integer x is odd if there exists an integer k with $x = 2k + 1$.

2 Exercises

1. Meet your Classmates! ★

Say hello to your classmates. Your peers are an amazing resource, so this exercise is to help you meet some of them.

Tip: One of the questions in Homework 1 is to give some classmates' names and unique names, so this is your head start on that!

In a group of 3 or more:

- a) Introduce yourself
- b) Write down each others' names and usernames
- c) Find one thing you all have in common

Solution: Answers will vary. :-)

2. Propositions ★

Which of these are propositions? What are the truth values of those that are propositions?

- a) Do not pass go.
- b) What time is it?
- c) There are no black flies in Maine.
- d) The moon is made of green cheese.
- e) $2^n \geq 100$
- f) Your discussion leader's favorite number is 2
- g) $4 + x = 5$

Solution:

- a) This is **not** a proposition; it's a command and does not have a truth value.
 - b) This is **not** a proposition; it's a question.

- c) This **is** a proposition that is false, as anyone who has been to Maine knows.
- d) This **is** a proposition that is false.
- e) This is **not** a proposition; its truth value depends on the value of n . This is a predicate, which you will hear more of later.
- f) This **is** a proposition, even if you don't know whether it is true or false.
- g) This is **not** a proposition; its truth value depends on the value of x . This is also a predicate.

3. Beginning to Think Logically ★

Find the negations of each of the following statements. Discuss with a neighbor what that negation means and if there are any other ways to express that statement. (*We will formally define some rules for logic later on.*)

- a) I am a student.
- b) My sister and my mom like ice cream.
- c) I will wear a dress or skirt today.
- d) We all have phones.
- e) Nobody knows everything.
- f) Someone in this class is a math major.

Solution:

- a) I am not a student.
- b) My sister does not like ice cream or my mom does not like ice cream.
- c) I will not wear a dress nor a skirt today.
Equivalently, I will not wear a dress and I will not wear a skirt today.
- d) We don't all have phones.
In other words, at least one of us does not have a phone.
- e) Somebody knows everything
- f) No one in this class is a math major.

4. Logic Puzzle

Knights always tell the truth and Knaves always lie. Figure out what A and B are in each scenario!

- a) A says, “Either I am a Knave, or B is a Knight.”
- b) A says, “I am a Knave, but B isn’t.”

Solution:

- a) A is a Knight and B is a Knight. A cannot be a Knave, because then their claim would be a truth. Because A must be a Knight and can only tell the truth, B must be a Knight.
- b) A is a Knave and B is a Knave. If A were a Knight, A would not be able to claim to be a Knave. In order to make A’s statement a lie, B must be a Knave.

5. Assignment 0

Remember that Assignment 0 is due on **Thursday, January 18th**. This is a great time to get started and maybe even finish it!

Solution: See you next week!