

## Problem Set 1 — Propositions

Complete by **Wednesday, January 30**  
Grade by **Friday, February 1**

### Purpose

This problem set develops your ability to recognize mathematical statements. In particular, when you finish this problem set you should be able to ...

- Distinguish English phrases that are mathematical statements (propositions) from ones that aren't
- Determine informally when an unconditional statement is true and when it is false
- Determine informally when a conditional statement is true and when it is false.

### Background

This problem set is based on section 1.1 of our textbook. We discussed that section in class on January 25 and 28.

### Activity

Answer the following questions:

**Question 1.** For each of the following sentences, determine whether it is or is not a mathematical statement. For each that is a statement, decide whether it is true or false. Give a brief reason, although not a formal proof, why you classify it as true/false:

- Every even number is a multiple of 2.
- Beethoven's Ninth Symphony is the best piece of music ever written.
- More than half of Earth's atmosphere by volume is nitrogen.
- $x$  is a real number.
- There is some real number that is greater than 7.
- There is some real number,  $x$ , such that  $x > 7$ .
- There is some real number,  $x$ , such that  $x > y$ .
- If  $x$  is a real number and  $x > 10$ , then  $x + 1 > 11$ .

**Question 2.** Determine whether each of the following conditional statements is true or false. Briefly explain, although not necessarily in a formal proof, why each is true/false:

- If  $1 < 2$  then Engl 342 is a prerequisite for Math 239.

- If  $1 < 2$  then Math 222 (or permission of the department) is a prerequisite for Math 239.
- If Engl 342 is a prerequisite for Math 239 then  $1 < 2$ .
- For all real numbers  $x$ , if Engl 342 is a prerequisite for Math 239 then calculating  $3x + 1$  will cause a genie to appear and grant you three wishes.
- If New Years Day of 2099 falls on a Sunday, then Prof. Baldwin sometimes teaches Math 239.

## Follow-Up

I will grade this exercise in a face-to-face meeting with you. During this meeting I will look at your solution, ask you any questions I have about it, answer questions you have, etc. Please bring a written solution to the exercise to your meeting, as that will speed the process along.

Sign up for a meeting via Google calendar. Please make the meeting 15 minutes long, and schedule it to finish before the end of the “Grade By” date above.