- Course website: http://uoft.me/MAT137
 My page: Course website → Resources → click on my name
- Problem Set 1 is available on the course website, and is due **Thursday, September 26 by 11:59pm**.
 - You will get an email about a week before it's due telling you how to submit it online.
- Today's lecture will assume you have watched up to and including video 1.6.

For this Thursday's lecture, watch videos 1.7 through 1.9.

Last week, we did an exercise in which you identified some sets written in set-builder notation with quantifiers.

For example, we saw that

$$\{x \in \mathbb{R} : \exists y \in [5, 7] \text{ such that } x < y\} = (-\infty, 7).$$

In the next exercise, we'll go the other way.

Problem. Let E be the set of even integers. Which of the following is correct?

$$\bullet E = \{ n \in \mathbb{Z} : \forall a \in \mathbb{Z}, n = 2a \}$$

2
$$E = \{ n \in \mathbb{Z} : \exists a \in \mathbb{Z} \text{ such that } n = 2a \}$$

We skipped over this slide in class, but it's also one of the Playlist 1 practice problems.

Problem. Recall that a real number that is not rational is called *irrational*. For example, π , e, and $-\sqrt{2}$ are all irrational numbers.

Let A be the set of all negative, rational numbers and positive, irrational numbers.

Write a definition of A using mathematical notation. (There is more than one way to do this. Feel free to use the words "and", "or", etc.)

The following two statements are identical *except* for the order of the two quantifiers:

•
$$\forall x \in \mathbb{R}, \exists y \in \mathbb{R} \text{ such that } x < y.$$

a
$$\exists y \in \mathbb{R}$$
 such that $\forall x \in \mathbb{R}, x < y$.

Try to rephrase each of them as an English sentence.

Do the two statements say the same thing?

Follow-up question. Do either of these statements set a value for the symbols "x" and/or "y"?

Are the following statements true or false?

- There is a purple giraffe in this room.
- All giraffes in this room are purple.
- All giraffes in this room are green.

Some negations

We only discussed the first of these questions in class. Think about the remaining ones for next class.

Write down the negations of the following statements as simply as you can:

- Every student in this room has a cellphone.
- There is a province in Canada with fewer than 1000 inhabitants.
- Ivan likes coffee and tea.
- Every building at UofT contains a classroom with no windows.