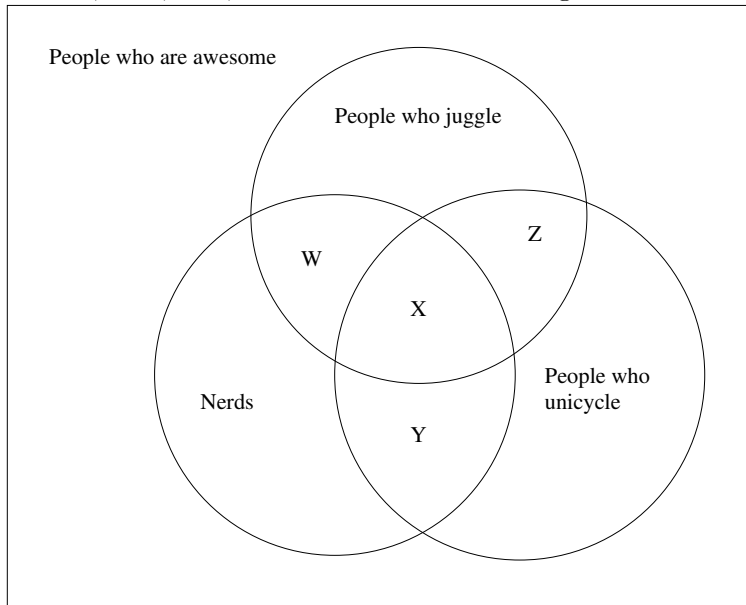


Read the question, write the answer. *Show all work*, as answers without supporting work will receive *no credit*. Calculators are permitted (*not cell phones*), but notes, texts, talking, and other resources are strictly forbidden. You have until the end of class to complete the exam. Seriously, *no cell phones*.

1. (2 points) Write down an example of a set using { bracket } notation.

2. (6 points) Here is a Venn diagram. Write a sentence to describe the regions marked with the "X," "Y," "Z," and "W." Mark the diagram in the area that you fit into.



**3.** (*6 points*) At my birthday party I had 25 guests. 10 were computer hackers, 12 were mathematicians, and 3 were complete strangers who heard the music from the street (Dvořák's New World Symphony).

(a) Facebook says I have 78 friends. What percentage of my friends came to the party? Strangers aren't my friends.

(b) My sister's last birthday had 110 guests. Facebook says she has 188 friends. No strangers came to her party. What percentage of her friends were there?

(c) There were 25 people at my party and 110 at hers. What is the relative (percent) difference? There are two ways to answer this question; compute them both.

**4.** (*2 points*) Is this argument inductive or deductive? If it's inductive, how strong is it? If it's deductive, is it valid? Sound?

I can unicycle. My colleague Ron (a mathematician) can unicycle. My old advisor Dylan (a mathematician) can unicycle. Therefore all mathematicians can unicycle.

5. (6 points) Give an example of a deductive argument which is *valid* but not *sound*.

6. (2 points) Convert  $144 \text{ in}^2$  to  $\text{ft}^2$ . Here, let me get you started:

$$144 \text{ in}^2 = 144 \text{ in} \cdot \text{in} \left( \frac{\text{ft}}{\text{in}} \right) \left( \frac{\text{ft}}{\text{in}} \right) =$$

7. (2 points) Here I've worked out a problem that required me to convert between different units. I've done all of the number work, but forgot to write in the units at the end. Based on what I've written down, what units should be answer be in?

$$\frac{10 \text{ apples} \left( \frac{150 \text{ grams}}{1 \text{ apple}} \right) \left( \frac{1 \text{ lb}}{454 \text{ grams}} \right)}{\frac{1}{2} \text{ ft} \left( \frac{12 \text{ in}}{1 \text{ ft}} \right) 5 \text{ in}} = 1.1 \text{ \_\_\_\_\_\_}$$

8. (6 points) The moon is roughly 384,403 kilometers from the Earth. The Segway is a 2-wheeled balancing scooter that can travel at about 12 miles per hour. Given that there is 1.6 kilometers in 1 mile, how long *in years* would it take for me to drive a Segway from the Earth to the moon? No round-trip ticket, thanks; I'm just going one-way.

**9.** (*10 points*) Michael Phelps eats 12,000 Calories a day, which is more than 6 times what I eat a day. It's madness, it really is. I've got 6 100-watt light bulbs. Suppose that instead of powering that human-speedboat, those 12,000 Calories were used to power my house. How long could I keep those bulbs lit? Recall that 1 Calorie is 4184 Joules, and 1 Watt is 1 Joule/second.