

**Friday, Week 1**  
Chapters 1.4-1.5

**Warmup**

Let  $A = \{1, 2, 3\}$ ,  $B = \{3, 4\}$ ,  $U = \mathbb{Z}$ .

1. What is  $A \cup B$ ?  $A \cap B$ ?  $A - B$ ?  $A \times B$ ?
2. How many elements are in  $\mathcal{P}(A)$ ?  $\mathcal{P}(B)$ ?
3. True or False:  $\emptyset \subset A$ .
4. True or False:  $\emptyset \in A$ .

Illustrate with a Venn diagram, and prove: If  $A \subset B$  and  $B \subset C$ , then  $A \subset C$ .

Describe using set builder notation:

1. The unit circle in  $\mathbb{R}^2$ .
2. The line  $y = 2x$  in  $\mathbb{R}^2$ .

**Predicate Logic**

Let  $P(x)$  stand for the statement “ $x > 3$ .” What is  $P(2)$ ?  $P(3)$ ?  $P(4)$ ?

Let  $D(x, y)$  stand for the statement “ $x$  defeats  $y$  in a game of rock-paper-scissors.” What is  $D(\text{paper}, \text{rock})$ ?  $D(\text{rock}, \text{paper})$ ?  $D(\text{paper}, \text{paper})$ ?

## Quantifiers

Let  $H$  be the set of all humans, let  $e$  be Albert Einstein, let  $S(x, y)$  be the statement “ $x$  is *at least* as smart as  $y$ .” Say the following with quantifier notation:

1. Albert Einstein is the smartest human.
2. There is a human who is smarter than Albert Einstein.

## Uniqueness

Given: “There is only one superhero who can save us now!”  $H$  is the set of all superheroes.  $S(x)$  means “ $x$  can save us.”

1. Suppose  $S(\text{Superman})$  is true. What is  $S(\text{Aquaman})$ ?  $S(\text{Ant Man})$ ?
2. Quantifier notation?