

# Sets & Stuff

Let the sets  $A$ ,  $Z$ , and  $B$  be the sets defined in class and use the logic notation from the textbook ( $\vee$ ,  $\wedge$ ,  $\neg$ ).

**Definition 1.** The cardinality of a finite set  $X$  is equal to the number of elements in the set  $X$  and is denoted as  $|X|$ .

1. Find each of the following:
  - (a) the number of elements in the set  $A$ .
  - (b)  $|Z|$
  - (c) the cardinality of the set  $B$ .

**Definition 2.** Let  $X$  and  $Y$  be sets. The Cartesian product of  $X$  and  $Y$ , denoted by  $X \times Y$ , is the set of all ordered pairs  $[x, y]$  where  $x \in X$  and  $y \in Y$ .

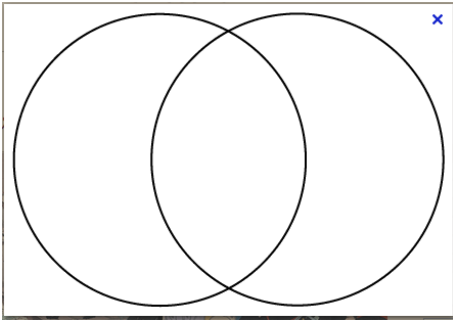
2. Write out 2 elements from  $A \times B$  and 2 elements from  $B \times A$ .
3. Find  $|A \times B|$ .

**Definition 3.** Given a set  $X$ , the power set of  $X$  is the set of all subsets of the set  $X$  and is denoted by  $\mathcal{P}(X)$

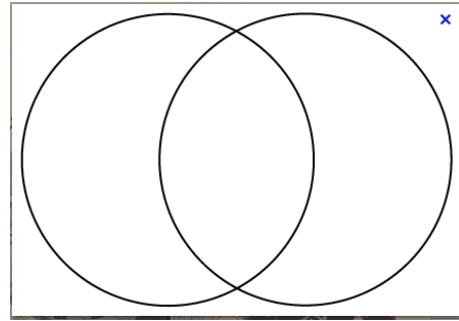
4. Write down  $\mathcal{P}(A)$ .
5. Find  $|\mathcal{P}(Z)|$ .
6. Consider the set  $C = \{x^2 | x \in \mathbb{Z} \wedge 0 \leq x^2 \leq 10000\}$ 
  - (a) Enter the set  $C$  into sage.
  - (b) Use sage to find the cardinality of  $C$ . (Don't forget about the tab completion!)
  - (c) Find  $|\mathcal{P}(C)|$ .

7. Consider the sets  $S$  and  $T$  within the Universal set  $U$ . For each of the following, identify the regions on the Venn diagram and determine if any of them are describing the same set.

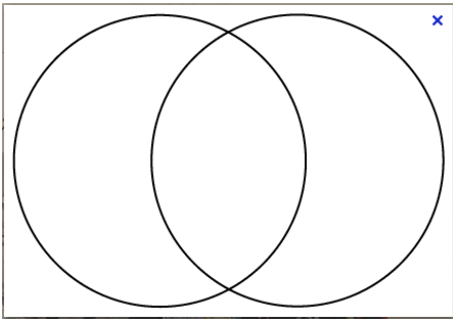
(a)  $S$



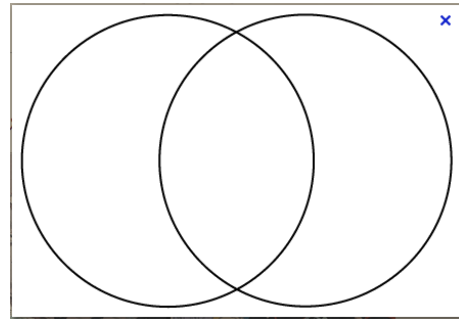
(b)  $\overline{A}$



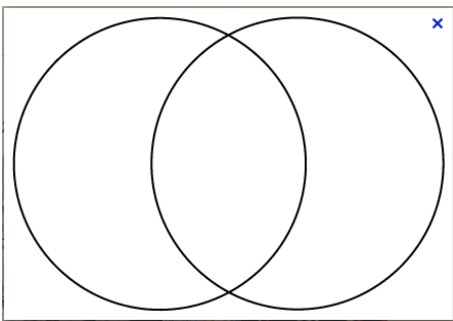
(c)  $\overline{S \cap T}$



(d)  $\overline{S \cup T}$



(e)  $\overline{S} \cap \overline{T}$



(f)  $\overline{S} \cup \overline{T}$

