

# Worksheet on the game SET

September 2, 2015

## 1 Warmup

1. Let  $S = \{3\}$ . Is  $3 \in S$ ? Is  $3 \subset S$ ?
2. Find an object  $x$  such that  $x \subset \{x\}$  is true.
3. Let  $S$  be the set of sets that do not contain themselves. In notation,

$$S = \{X : X \notin X\}.$$

- (a) Give an example of an element of  $S$ .
- (b) Give an example of something not in  $S$ .
- (c) Is  $S \in S$ ?

## 2 Counting and Sets and SETs

Grab a copy of the card game SET. Each card has four attributes: colour (red, green, purple), number (1,2, or 3 items), shape (oval, squiggle, or diamond), and shading (empty, hatched, or solid). There's exactly one card in the deck that has each possible combination of attributes (e.g. there's exactly one red single solid oval). Let  $S$  be the set of cards in a SET deck. For each of the following questions, write out set builder notation for the set you are counting, and then calculate its size.

1. How many cards are there in the deck?
2. How many cards are green?
3. How many cards are either red or purple?
4. How many cards are both green and diamonds?
5. How many cards are green, diamonds, and solid?
6. How many cards are either green or diamonds? Hint: Draw a Venn diagram.

7. How many cards are either green or diamonds but not both?
8. In the game, a “SET” (they use the word differently than we do, so we’ll capitalize it when we refer to their definition) is a collection of exactly three cards such that, for each attribute, the cards are *all the same* or else *all different*. For example,



*green*

*purple*

*red*

is a SET, because they are all different colours (you can’t see this on the photocopy), all different numbers, all different shapes, all hatched (same). Another way to define a SET is to say that there is no attribute that is shared by exactly two cards. The game is played simply by putting lots of cards on the table and screaming “SET!” whenever you see a SET (and then grabbing it). Play SET for a few minutes. Verify each other’s SETs.

9. How many SETs are possible?
10. How many SETs have all attributes different?
11. How many SETs have three different, one same?
12. How many SETs have two different, two same?
13. How many SETs have one different, three same?
14. How many SETs have all attributes the same?
15. Try to build the largest collection of cards that you can that has no SETs in it. How large a collection can you build?