Practice problems - Counting   March 29, 2018

A **Random Experiment** is a process by which we observe something uncertain. examples: Tossing a coin, rolling a die, observe the number of shots missed in a basketball game, observe goals scored in a soccer match

An **outcome** is the result of a random experiment. example of random experiment is one coin toss - outcome is H or T.

Sample Space: is the set of **all** possible outcomes in an experiment. random experiment is one coin toss - sample space is $\{H, T\}$.

An **Event**: is a subset of the sample space.

A **set** is a collection of things. example $S = \{1, 2, 3, 4, 5, 6\}$ is a set - set of numbers 1 through 6. The elements of S are the numbers $1, 2, ..$ etc. We say $B \subset S$ (B is a subset of S), if every element in B is also in S. Example $B = \{1, 3\} \subset S$.

1. Write in English what the following symbols mean.

   (a) $\forall$

   (b) $\in$

   (c) $\ni$

   (d) $\exists$

   (e) $\implies$

   (f) $\iff$

   (g) $\to$

2. Write the following mathematical expressions in equivalent English sentences.

   (a) $\forall x \in \mathbf{Z}, \ni x > 0, \exists y \in \mathbf{Z}, \ni x + y = 0$. $\mathbf{Z}$ is the set of integers (positive and negative).

   (b) Using all the symbols above, create your own mathematical sentence. Then write it in English.

3. Prove: x, y are integers. If $x + y$ is even, then either x and y are both even or x and y are both odd.

   (a) Write the contrapositive statement

   (b) Do the proof directly, by contrapositive and by contradiction. Which method do you prefer? Why?

4. Let x, y be integers. If x divides y and x is even, then y is even.

   (a) Write the contrapositive statement

   (b) Do the proof directly, by contrapositive and by contradiction. Which method do you prefer? Why?