Math 215 - Worksheet 5

October 19, 2018

1. Suppose you roll a pair of differently-colored six-sided dice.

(a) How many total outcomes are there? (Note e.g. ▪,⬚ and ⬚,⬚ are different outcomes)

(b) How many of these outcomes give a sum of 12?

(c) A sum of 10?

(d) What is the most likely sum to roll?

2. State abbreviations—-such as IL, NJ, or NV—-are pairs of letters from the English alphabet, which has 26 letters total.

(a) How many such pairs are there total?

(b) How many pairs do not repeat the same letter?

(c) How many pairs do not contain two vowels?

3. For this problem we consider strings of length 5 constructed using only letters from {A,B,C,D,E,F,G,H}. (Example: EGDEA)

(a) How many such strings are there total?

(b) How many such strings can be made if repeated letters are not allowed?

(c) What if the letters have to be in increasing (alphabetical) order? (Example: ABEGH)

4. Suppose $f : A \to B$ is a bijection, and that A is a proper subset of B. Show A is infinite.

5. Show there is an injection $f : A \to B$ if and only if there is a surjection $g : B \to A$.

6. Let X, Y be finite sets, and consider the set of injections between them,

$$\mathrm{Inj}(X, Y) = \{f \mid f \text{ is an injection } f : X \to Y\}.$$

In terms of $|X|$ and $|Y|$, what is $|\mathrm{Inj}(X, Y)|$?