CSE3504 Homework 1

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1 Problem 1:

1.1 Let S = 1, 2, ,,,, 100. Define E_2 as the event that a number is divisible by 2, and E_3 as event that the number is divisible by 3.

- The cardinality of event E_2 is $100/2 = 50$ and event E_3 is $100/3 = 33$.
- Even numbers divisible by 3 are also divisible by 2, thus half of all numbers divisible by 3 are also divisible by 2. This means the cardinality between the intersection of E_2 and E_3 is $100/3 * 1/2 = 100/6 = 16$.

2 Problem 2:

2.1 Two teams A and B play a soccer match, and we are interested in the winner. The sample space can be defined as: S = a, b, d where "a" shows the outcome that A wins, "b" shows the outcome that B wins, and "d" shows the outcome that they draw. Suppose that we know that the probability that A wins is P(a) = 0.5 and the probability of a draw is P(d) = 0.25.

- The probability that B wins is $P(b) = 1 - P(a) - P(d) = 1 - .5 - .25 = .25$.
- The probability that B wins or a draw occurs is $P(bord) = 1 - P(a) = .5$.

3 Problem 3:

3.1 Three factories make .20, .30, and .50 of the computer chips for a company. The probability of a defective chip is 0.04, 0.03, and 0.02 for the three factories.

- The probability that a chip is defective is $.2 * .04 + .3 * .03 + .5 * .02 = .027$.

- If a chip is defective, the chances it came from factory one is $(.04 * .2)/.027 = .296$.

4 Problem 4:

4.1 A password consists of six characters. These characters are chosen from the 10 digits and 26 letters of the alphabet. Passwords are also case sensitive.

- There are 36^6 different combinations of passwords (lowercase and uppercase letters).
- Using the non-replacement formula $N!/(N-k)!$ you get $36!/30!$.
- A hacker guessing 100 million passwords per second would take $36^6/10^8 = 21.7s$.
- To choose a password with a letter and a number you would have to first select from 26 letters. There are a total of 36^5 passwords with no constraints and 26^5 passwords with no digits (there are 10 total digits). Thus, the number of valid passwords would be $26 * (36^5 - 26^5) = 1,263,204,800$.
- $27,868,297,600/100,000,000 = 12s$.

5

5.1

- pass