Name: 2/28/20

REVIEW EXERCISES

A) In how many ways can three students be selected for a committee if there are 11 students from which to select? $_{11}C_3$

B) A hockey player needs new skates, a new helmet, and a new stick. Hockey Central has 5 brands of skates, 6 brands of helmets, and 8 brands of sticks. In how many different ways can the player select one of each item? $5 \times 6 \times 8 = 240$ ways

C) On a TV game show, three contestants must each pick a box which they believe contains the day's grand prize. In how many different ways can this be done if there are 10 boxes from which to choose, each box contains a different prize, and each contestant must pick a different box? $_{10}P_3$

Probability: 2-1 Calculating Basic Probabilities

Probabilities give us an idea of how likely it is for a certain event to happen. For example, when a coin is flipped, the chance that it comes up heads is 50%. Probabilities can be expressed in decimal, fraction, percent, or ratio form. We could have said the probability of flipping heads is 0.5, 1/2 , 50% or 1:2. Each of these conveys the idea that we should expect to get a heads half of the time. Probabilities only give us an idea of what to expect in the long run. However, they do not tell us what will happen in the short term.

Suppose we flip a coin 10 times in a row and get heads each time. The next coin flip is still a random event because while we cannot tell for certain what the next flip will be, we can be certain that about 50% of all tosses over a long set of tosses will be heads. Some people think that we are on a roll so we are more likely to get another head. Others will say that getting tails is more likely because we are past due for tails. The truth is that we cannot tell what will happen on the next flip. The only thing we know for certain is that there is a 50% chance that the coin will be heads on its next flip. If we continue to flip this same coin hundreds of times, we would expect the percent of heads to get closer and closer to 50%. Chance Behavior is not predictable in the short term; however, it has long term predictability. The *Law of Large Numbers* tells us that despite the results on a small number of flips, we will eventually get closer to the theoretical probability. The outcomes in any random event will always get close to the theoretical probability if the event is repeated a large number of times. We might roll a die 4 times in a row and get a 6 each time, however, if we rolled this die hundreds of times, the percent of time that we get a 6 will get closer and closer to the theoretical probability of 1/6.

In probability, there are outcomes that are sure to happen and there are outcomes that are impossible. If we are once again dealing with a standard 52 card deck, the chance of being dealt either a red card or a black card if one card is dealt is 100%. The chance of being dealt a blue card is 0% since there are no blue cards in a standard deck. All random events have probabilities between 0 and 1. In addition, the sum total of the probabilities for all possible outcomes in the sample space is equal to 1. In other words, if an event occurs, there is a 100% chance that one of the possible outcomes will happen. The list below summarizes these rules. a) The probability of a sure thing is 1. b) The probability of an impossible outcome is 0. c) The sum of the probabilities of all possible outcomes is 1. d) The probability for any random event must be somewhere from 0 to 1.

EXAMPLE 1: In the game of pool, there are a total of 15 balls. Balls numbered 1-8 are solid and balls 9-15 are striped. There are two pool balls of each color, for example, there are two yellow pool balls. One of those are solid and one of those are striped. The only exception to this is that there is only 1 black pool ball, the eight ball, and it ~~is solid.~~

Suppose the pool balls were put in a bag and a single pool ball is pulled out of the bag. What is the probability that the ball:

a) is yellow? $\frac{2}{15}$ want / TOTAL $\approx 13\%$

b) is striped? $\frac{7}{15}$

c) has a number on it that is greater than 10? $\frac{5}{15}$

d) is not striped? $\frac{8}{15}$

EXAMPLE 2: Using a standard deck of playing cards, what is the probability of getting

a.) A red card? $\frac{26}{52} \rightarrow 50\%$

b.) A spade? $\frac{13}{52} \rightarrow 25\%$

c.) A King of Hearts or Jack of Diamonds? $\frac{1}{52} + \frac{1}{52} = \frac{2}{52}$

d.) Not a Club? $\frac{39}{52} \rightarrow 75\%$

52 Cards Deck
26 red, 26 black
4 suits: 13 Heart, 13 spade, 13 Diamond, 13 Clubs
Face Cards: 4 Jacks, 4 Queens, 4 Kings
*4 Aces

EXAMPLE 3: Using the ENTIRE ALPHABET, what is the probability of:

a.) Randomly Selecting a vowel? $\frac{5}{26}$ AEIOU

b.) Selecting anything but C? $\frac{25}{26}$

c.) Selecting a Consonant? $\frac{21}{26}$