AFM Notes, Unit 1 - Probability
1-4 Introduction to Probability

Name _____
Date 2-4-2020 Period 2

Probability theory was initially developed in 1654 in a series of letters between two French mathematicians, Blaise Pascal and Pierre de Fermat, as a means of determining the fairness of games. It is still used today to make sure that casino customers lose more money than they win, and in many other areas, including setting insurance rates.

At the heart of probability theory is randomness. Rolling a die, flipping a coin, drawing a card and spinning a game board spinner are all examples of random process.
In a random process no individual event is predictable, even though the long range pattern of many individual events often is predictable.

Types of Probability

Experimental - the probabilities based on real-world data. Ex. Tossing a die 60 times, collecting results.

Theoretical - the probabilities NOT based on real-world data. It is what should happen.
Ex. probability of rolling a 1 is 1/6.

Calculating Probabilities

When calculating the probability of something happening, the "something" is called an event and the probability of the event happening is written P(event).

Ex. 1a) The probability of rolling a 3 on a die would be written P(3) or P(rolling a 3)
Ex. 1b) The probability of winning the lottery would be written P(winning lottery)

Probabilities are always expressed as numbers between 0 & 1. The probability of an event that is certain to happen is 1, while the probability of an impossible event is 0.

To calculate a probability, you count the # of ways an event can occur and divide this number by the total # of possible outcomes.

Probability of an event: $P(E) = \frac{\#\text{ of ways an event can occur}}{\#\text{ of possible outcomes}}$

Notes 1-4

Introduction to Probability

Example of Theoretical Probability

Ex. 2) A bag contains 4 blue marbles, 6 green marbles and 3 yellow marbles. A marble is drawn at random from the bag.

a) What's the probability of drawing a green marble?

$P(\text{green}) = 6/13 = 0.462 = 46.2\%$

b) What's the probability of drawing a yellow marble?

$P(\text{Yellow}) = 3/13 = 0.231 = 23.1\%$

c) What's the probability of drawing a green OR yellow marble? OR => ADD

$P(G \text{ or } Y) = 6/13 + 3/13 = 9/13 = 0.692 = 69.2\%$

Example of Experimental Probability

Ex. 3) Suppose a study of car accidents and drivers who use mobile phones produced the following data:

	Had a car accident in the last year	Did not have a car accident in the last year	Totals
Driver using mobile phone	45	280	325
Driver not using mobile phone	25	405	430
Totals	70	685	755

This type of table is called a Frequency (Contingency) Table

The total number of people in the sample is 755. The row totals are 325 and 430.

The column totals are 70 and 685. Notice that 325 + 430 = 755, and 70 + 685 = 755.

Calculate the following probabilities using the table above:

a) P(a driver is a mobile phone user) = $\frac{325}{755} = 0.430 = 43\%$

b) P(a driver had no accident in the last year) = $\frac{685}{755} = 0.907 = 90.7\%$

c) P(a driver using a mobile phone had no accident in the last year) = $\frac{280}{325} = 0.862 = 86.2\%$

condition