DUE DATE
B DAY Feb 23rd

Unit 9 Study Guide—Probability

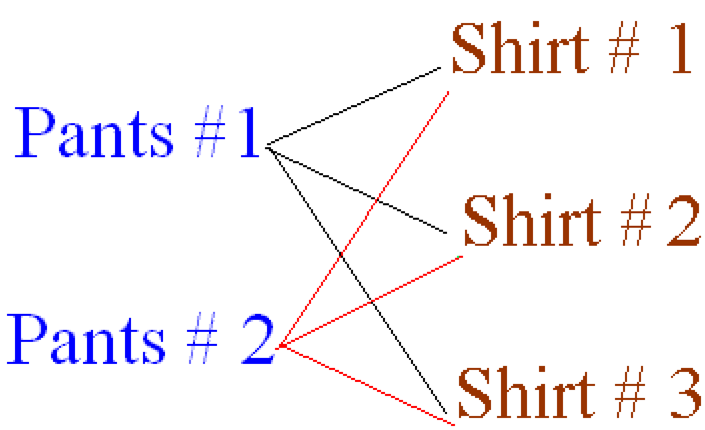
Name_________________________ ***Period_______*** ***Score ______***

Section 9-1: Probability and the Fundamental Counting Principle

Fundamental Counting Principle: A method used to calculate all of the _____________________ when given multiple choices or events.

When presented with many options, one way of figuring out all of the possible combinations is to make a ________________________.

Example:
You are trying to decide what to wear to school and have narrowed it down to **2 pairs of pants** and **3 shirts**. How many different outfits can be made with these choices?



As you can see on the diagram, you can wear pants #1 with shirt # 1. That's one of your choices.

Count all the branches to see how many choices you have. **Since you have six branches, you have 6 choices.**

However, notice that a quick multiplication of $\mathbf{2 \cdot 3}$ (number of pants multiplied by the number of shirts) will give you the same answer.

In summary, __________________ your number of choices will give you the total # of ________________.

Probability: The chance of an event happening.

$$P(event) = \frac{\#of\ \ favorable\ outcomes}{\#of\ \ possible\ outcomes}$$

Example:
A glass jar contains 6 red, 5 green 8 blue and 3 yellow marbles. If a single marble is chosen at random from the jar, find the probability of the following.

Probabilities:
Probability of choosing red?

$$P(red) = \frac{\#\,of\ red\ marbles}{total\ \#\,of\ marbles} = \frac{6}{22} = \frac{3}{11}$$ or **27%** chance of choosing red

Probability of choosing green?

$$P(green) = \frac{\#\,of\ green\ marbles}{total\ \#\,of\ marbles} = \frac{5}{22}$$ or **23%** chance of choosing green

Probability of choosing blue?

$$P(blue) = \frac{\#\,of\ blue\ marbles}{total\ \#\,of\ marbles} = \frac{8}{22} = \boxed{}$$ or $\boxed{\%}$ chance of choosing blue

Probability of choosing yellow?

$$P(yellow) = \frac{\#\,of\ yellow\ marbles}{total\ \#\,of\ marbles} = \boxed{}$$ or $\boxed{\%}$ chance of choosing yellow

***Also, **"complement"** means "__________"
Using the same jar of marbles from above, find the following probability.

$$P(complement\ of\ blue) = \frac{\#\,of\ marbles\ that\ are\ not\ blue}{total\ \#\,of\ marbles} = \frac{14}{22} = \frac{7}{11}$$ or **64%** chance of not choosing blue

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Section 9-2: Theoretical vs. Experimental

Theoretical Probability: Probability you expect (or guess) to have **without** doing an ______________.

An outcome is a possible event that could happen. When rolling a number cube, there are six possible outcomes.

An event is what we want to have happen. It is also known as the __________________ outcome.

Complementary events are events that cannot happen at the same time. You find their probability by adding the probability of the event happening and not happening and setting it equal to 1. P(happening) + P(not happening) = 1.

The Theoretical Probability of an event is a ratio that compares the number of favorable outcomes to the number of total possible outcomes.

$$P(event) = \frac{number\ of\ favorable\ outcomes}{number\ of\ possible\ outcomes}$$

Examples:
You have a spinner with 4 sections on it, one section is blue, one is red, and two are green.
What is the probability you will spin a green?

$$\frac{there\ are\ two\ green\ sections}{there\ are\ 4\ total\ sections} = \frac{2}{4} = \frac{1}{2}\ which\ is\ also\ 50\%$$

What is the probability you will spin a blue?

$$\frac{one\ blue\ section}{four\ total\ sections} = \frac{1}{4}\ which\ is\ also\ 25\%$$

Experimental Probability: Probability based on the information collected from ___________________ .

Another name for experiment would be simulation. The more tries with the experiment, the closer it is to the theoretical probability.

Examples:
Suppose you toss a coin 50 times. It comes up heads 35 times.

$$\frac{number\ of\ times\ heads\ occured}{number\ times\ the\ coin\ was\ tossed} = \frac{35}{50} = \frac{7}{10}\ which\ is\ also\ 70\%$$

Section 9-3: With or Without Replacement

In this section, we discuss the probability of multiple events occurring at the same time.

For example: If we were to flip a coin and roll a six-sided die, what is the probability that we would get Tails on the coin **and** a 6 on the die?

> Since the result obtained from flipping a coin will not affect the result of rolling a die, these events are called "Independent."

First we want to find the probability of each independent event.

The probability of getting tails is P(T) = $\frac{1}{2}$

The probability of rolling a six is P(6) = $\frac{1}{6}$

Next we want to find the probability that both of these events will happen. We calculate this by simply multiplying each of the individual probabilities together.

$$P(T, 6) = P(T) \bullet P(6) = \frac{1}{2} \bullet \frac{1}{6} = \frac{1}{12}$$

We will discuss finding the probability of multiple events **"with replacement"** or **"without replacement."**

<u>Probability With Replacement</u>:

A jar contains a total of 12 marbles: 1 orange, 2 green, 4 red, and 5 blue. A marble is randomly selected from the jar and then **replaced**. Then a second marble is randomly selected. What is the probability of selecting a green marble and then a blue marble?

First Step: Find the probability of each event.

$$P(G) = \frac{2}{12} = \frac{1}{6} \text{ and } P(B) = \frac{5}{12}$$

Second Step: Find the probability of both events by multiplying.

$$P(G, B) = P(G) \bullet P(B) = \frac{1}{6} \bullet \frac{5}{12} = \frac{5}{72}$$

So the probability of selecting a green marble, **replacing it**, then selecting a blue marble is $\frac{5}{72}$.

<u>Probability Without Replacement:</u>

A jar contains a total of 12 marbles: 1 orange, 2 green, 4 red, and 5 blue. A marble is randomly selected from the jar **without replacing** it. Then a second marble is randomly selected. What is the probability of selecting a green marble and then a blue marble?

First Step: Find the probability of each event.

$P(G) = \frac{2}{12} = \frac{1}{6}$, but this time $P(B) = \frac{5}{11}$ since there were only 11 marbles left in the jar to choose from.

Second Step: Find the probability of both events by multiplying.

$$P(G, B) = P(G) \bullet P(B) = \frac{1}{6} \bullet \frac{5}{11} = \frac{5}{66}$$

So the probability of selecting a green marble, **not replacing it**, then selecting a blue marble is $\frac{5}{66}$.

Portions of this study guide were made with information from:
www.basic-mathematics.com
www.mathgoodies.com