Name_____

Honors Geometry **Ch 13 Notes Packet**

Sec 13.1: Representing Sample Spaces

After this section you will have completed the following Common Core State Standard(s):

- **S.CP.9: (+) Use permutations and combinations to compute probabilities of compound events and solve problems.**

And will be improving your skills in the following Mathematical Practice(s):

1. Make sense of problems and persevere in solving them
2. Reason abstractly and quantitatively
6. Attend to precision
7. Look for and make use of structure

Specifically, you should be able to:

- **Represent sample spaces**
- **Use the Fundamental Counting Principle to count outcomes**

An _____ is a situation involving chance that leads to a result called an _____ – which is the result of a single performance or _____ of an experiment. An _____ is one or more outcomes of an experiment. _____ is the measure of how likely an event is to occur.

The _____ of an experiment is the set of all possible outcomes that can be shown in multiple ways: _____, _____ or _____.

Experiments can be _____ or _____ _____

Fundamental Counting Principle: The number of possible outcomes in a sample space can be found by _____ the number of possible outcomes from each stage/ event using:

n_1=

n_2=

n_k=

Examples:

1. Frigid Rock Ice Cream Shoppe has base flavors of chocolate and vanilla ice cream (Ch or V). The sauces that may be selected are fudge, caramel and raspberry sauce (F, C or R). Topping choices are nuts, sprinkles, berries, Oreos and peanut butter cups (N, S, B, O or P). How many possible outcomes are there? Draw a tree diagram to visualize.

2. How many different outfits could you create from 8 shirts, 5 pants, and 3 pairs of shoes?

Sec 13.2: Probability with Permutations and Combinations

After this section you will have completed the following Common Core State Standard(s):

- **S.CP.9: (+) Use permutations and combinations to compute probabilities of compound events and solve problems.**

And will be improving your skills in the following Mathematical Practice(s):

1. Make sense of problems and persevere in solving them
2. Reason abstractly and quantitatively
4. Model with mathematics
6. Attend to precision

Specifically, you should be able to:

- **Use permutations with probability**
- **Use combinations with probability**

A _____ of a positive integer n _____, is the product of positive integers less than or equal to n.

A _____ is an arrangement of objects in which _____is important. The number of ways of arranging n objects is:

The number of permutations of n total distinct objects taken r at a time is:

Permutations with Repetition: If an object is repeated r times, then you have to _____ your total number of permutations by _____ for each object that is repeated that many times. In other words, the number of distinguishable permutations of n objects where one object is repeated _____ times and another is repeated _____ times is:

In _____ objects are arranged in a _____ or _____. Since rotating the circle does not change the order (thus does not create a new arrangement), you must divide the total _____ by _____.

A _____ is an arrangement of objects in which order _____.

Examples:

1. If there are 8 runners in a race, how many different ways could the 1st, 2nd, and 3rd place medals be awarded?

2. How many different ways can you arrange the letters in the word BEEKEEPER?

3. If there are 12 different horses around the outside a merry-go-round, how many different ways can they be arranged?

4. What is the probability of being dealt a "royal flush" (10,J,Q,K,A of the same suit) from a standard deck of 52 cards?

Sec 13.3: Geometric Probability

After this section you will have completed the following Common Core State Standard(s):

- **S.MD.7: (+) Analyze decisions and strategies using probability concepts (e.g., product testing, medical testing, pulling a hockey goalie at the end of a game).**

And will be improving your skills in the following Mathematical Practice(s):

1. **Make sense of problems and persevere in solving them**
2. **Reason abstractly and quantitatively**
3. **Construct viable arguments and critique the reasoning of others**
4. **Model with mathematics**

Specifically, you should be able to:

- **Find probabilities using length**
- **Find probabilities using area**

_____ probability is the probability of what is "supposed to happen" in a given event:

Probability that involves a geometric measure like _____ or _____ is called _____

Length Probability Ratio: If line segment WZ contains line segment XY and a point on segment WZ is chosen _____, then the probability that the point chosen is on segment XY is –

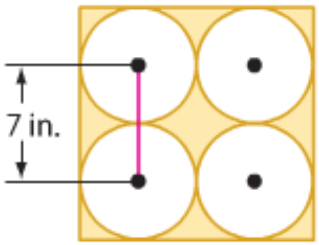
Area Probability Ratio: If region A contains region B and point E from region A is chosen _____, then the probability that point E is in region B is –

Examples:

1. The city bus that you take to work is scheduled to come every 15 minutes. The ride to work is 31 minutes. If you arrive at the bus stop at 8:24am what is the probability that you will be at work at 9:00am?

2. A bus arrives at a certain bus stop every 23 minutes and then waits there for 2 minutes. What is the probability that you have to wait more than 10 minutes for the bus?

3. Find the probability that a point chosen at random lies in the shaded region.



Sec 13.4: Simulations

After this section you will have completed the following Common Core State Standard(s):

- **S.MD.6: (+) Use probabilities to make fair decisions (e.g., drawing by lots, using a random number generator).**
- **G.MG.3: Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).★**

And will be improving your skills in the following Mathematical Practice(s):

1. Make sense of problems and persevere in solving them

4. Model with mathematics

Specifically, you should be able to:

- **Design simulations to estimate probabilities**
- **Summarize data from simulations**

A _____ is a mathematical model used to match a random phenomenon. A _____ is using a probability model to recreate a situation repeatedly so that one can estimate the likelihood of the possible outcomes.

To design a simulation:

1-

2-

3-

4-

A _____ is a variable that can assume a set of values, each with fixed _____.

The _____ (aka _____ _____ is the _____ value of a random variable that you would expect after repeating the simulation an infinite number of times (theoretically).

To find the Expected Value:

1-

2-

3-

The _____ states that as the number of trials of a simulation increases, the _____ will approach the _____.

Examples:

1. Suppose a fast food company gives out a random letter from the word "P,R,I,Z,E" with each purchase and if you collect one of each you get a prize. Design and run a simulation to estimate how many items someone would have to buy to get one of each letter.

2. Suppose another fast food company has a contest where you have a 4% chance of winning a $5 gift card and a 1% chance of winning a $10 gift card. What is the expected value of the situation? Explain what this means.

Sec 13.5: Probabilities of Independent and Dependent Events

After this section you will have completed the following Common Core State Standard(s):

- **S.CP.1: Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not").**
- **S.CP.2: Understand that two events *A* and *B* are independent if the probability of *A* and *B* occurring together is the product of their probabilities, and use this characterization to determine if they are independent.**
- **S.CP.3: Understand the conditional probability of *A* given *B* as *P*(*A* and *B*)/*P*(*B*), and interpret independence of *A* and *B* as saying that the conditional probability of *A* given *B* is the same as the probability of *A*, and the conditional probability of *B* given *A* is the same as the probability of *B*.**
- **S.CP.5: Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations. *For example, compare the chance of having lung cancer if you are a smoker with the chance of being a smoker if you have lung cancer.***
- **S.CP.6: Find the conditional probability of *A* given *B* as the fraction of *B*'s outcomes that also belong to *A,* and interpret the answer in terms of the model.**
- **S.CP.8: (+) Apply the general Multiplication Rule in a uniform probability model, P(A and B) = P(A)P(B|A) = P(B)P(A|B), and interpret the answer in terms of the model.**

And will be improving your skills in the following Mathematical Practice(s):

1. Make sense of problems and persevere in solving them
2. Reason abstractly and quantitatively
4. Model with mathematics
5. Use appropriate tools strategically

Specifically, you should be able to:

- **Find probabilities of independent and dependent events**
- **Find probabilities of events given the occurrence of other events**

A _____ (or _____) event consists of 2 or more simple events that can be _____ or _____.

- Two events are _____ when the probability of one event does not affect the probability of the other event.

Probability of 2 Independent Events:

- Two events are _____ when the probability of one event in some way changes the probability of the other event.

Probability of 2 Dependent Events:

where _____ represents the _____
probability of B given A has occurred.

A tree diagram used with probabilities is a _____

Using the equation for dependent events you can solve for a conditional probability formula:

Examples:

1. What is the probability of flipping a coin heads 3 times in a row?

2. What is the probability of getting a flush (5 of the same suit) from a standard deck of cards?

3. The probability that a student owns an Xbox is 60%, the probability that they own a PS4 is 45%, the probability that own both is 10%. What is the probability that a student owns an Xbox given that they own a PS4?

Supplementary 13.5 Topics:

A _____ frequency table or _____ is used to show frequencies and examine relationships between data classified according to two variables.

Entries in a table can display data as frequency counts or as relative frequencies.

_____ frequencies are shown in the totals columns while _____ frequencies are in the interior body of the table.

A _____ frequency table shows the ratio of subgroup observations to the total observations and is often expressed as a percent.

To the right, the two-way table shows the favorite leisure activities for 50 adults - 20 men and 30 women. Because entries in the table are frequency counts, the table is a frequency table.

	Dance	Sports	TV	Total
Men	2	10	8	
Women	16	6	8	
Total				

1. Find the probability that a person's favorite activity is dance given that they are a man?

2. Find the probability that a person is a woman given that their favorite activity is sports?

3. Find the probability that a person likes sports and is a man?

4. Find the probability that a person likes TV and is a woman?

Write the table as a relative frequency table.

Find:

1. P(favorite is dance)

2. P(man and favorite is TV)

3. P(woman, given favorite is sports)

4. P(favorite is dance, given woman)

Sec 13.6: Probabilities of Mutually Exclusive Events

After this section you will have completed the following Common Core State Standard(s):

- **S.CP.1: Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not").**
- **S.CP.7: Apply the Addition Rule, P(A or B) = P(A) + P(B) – P(A and B), and interpret the answer in terms of the model.**

And will be improving your skills in the following Mathematical Practice(s):

1. Make sense of problems and persevere in solving them
2. Reason abstractly and quantitatively
4. Model with mathematics

Specifically, you should be able to:

- **Find probabilities of events that are mutually exclusive and events that are not mutually exclusive.**
- **Find probabilities of complements**

If 2 events cannot happen at the same time they are considered _____.

Probability of Mutually Exclusive Events:

Probability if Non-Mutually Exclusive Events:

The _____ of an event X consist of all the outcomes in the sample space that are not included outcomes of event X—that is, the probability of X NOT happening.

Probability of the Complement of an Event:

Sometimes it is easier to calculate the complement of an event and then use it to solve for the probability event itself.

Examples:

1. What is the probability of rolling a sum of 2 or 11 on two dice?

2. What is the probability of picking a queen or heart from a deck of cards?

3. What is the probability of getting at least one heads when flipping a coin 5 times?