Name: KEY!

Hour: _____

Unit O:

Probability

Glencoe Lesson 13-1: Representing Sample Spaces

Vocabulary

Sample Space: the set of all possible outcomes of an experiment

Tree Diagram: a way to show the sample space of an experiment

Fundamental Counting Principle: used to find the # of possible outcomes (multiply the # of possible outcomes from each stage or event)

Practice

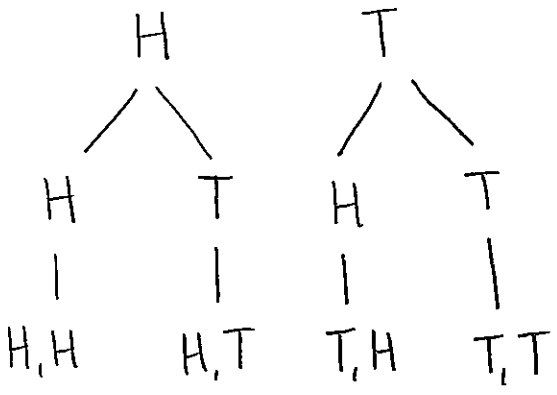
1. A coin is tossed twice. Represent the sample space for this experiment by making an organized list, a table, and a tree diagram.

Organized List: H, H T, T H, T T, H

Table

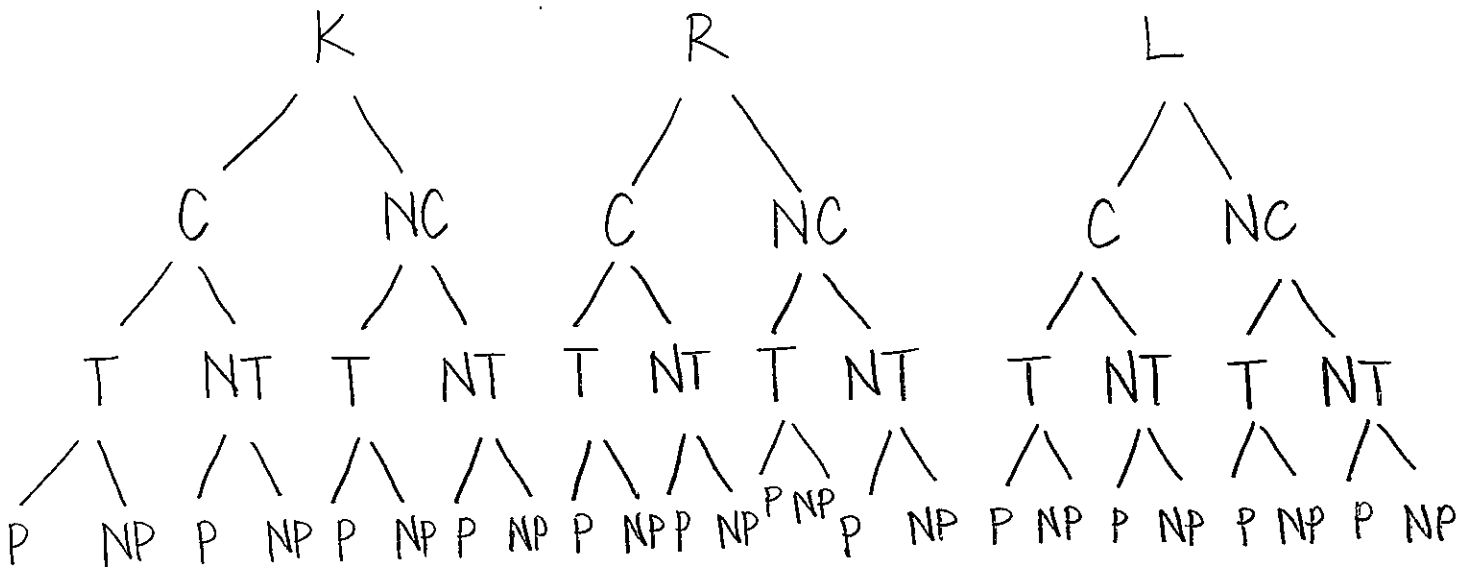
1st Coin \ 2nd Coin	H	T
H	H, H	H, T
T	T, H	T, T

Tree Diagram



2. To take a hamburger order, Kendra asks each customer the questions from the script shown. Draw a tree diagram to represent the sample space for hamburger orders.

- Burger Size (K, R, or L)
- Cheese (C or NC)
- Tomato (T or NT)
- Pickles (P or NP)



3. Haley has selected a size and overall style for her class ring. Now she must choose from the ring options shown. How many different rings could Haley create in her chosen style and size?

$10 \times 2 \times 12 \times 5 \times 20 \times 20 \times 2$

$= 960,000$ possible outcomes

Ring Options	Number of Choices
metals	10
finishes	2
stone colors	12
stone cuts	5
side 1 activity logos	20
side 2 activity logos	20
band styles	2

Glencoe Lesson 13-2: Permutations & Combinations

Vocabulary

Permutation: an arrangement of objects in which ORDER MATTERS!

Formula: $_nP_r = \frac{n!}{(n-r)!}$ ↑ calculator

n = # of objects total
r = # being chosen

Combination: an arrangement of objects in which order does NOT matter.

Formula: $_nC_r = \frac{n!}{(n-r)! \cdot r!}$ ↑ calculator

Practice

1. Scott and Tony are members of the lacrosse team. If the 20 boys on the team are each assigned a jersey number from 1 to 20 at random, what is the probability that Scott's jersey number will be 1 and Tony's jersey number will be 2?

order matters

$_{20}P_2 = 380$, so $\frac{1}{380}$

2. A class is divided into teams each made up of 15 students. Each team is directed to select team members to be officers. If Sam, Erica, and Shane are on a team, and the positions are decided at random, what is the probability that they are selected as president, vice president, and secretary, respectively?

order matters!

$_{15}P_3 = 2{,}730$, so $\frac{1}{2{,}730}$

3. On a game show, you are given the letters DWITLAC and asked to unscramble them to name a school mascot. If you selected a permutation of these letters at random, what is the probability that they would spell the correct answer of WILDCAT?

order matters
7 letters

$_7P_7 = 5{,}040$ so $\frac{1}{5{,}040}$

4. For her birthday, Amanda can invite 6 of her 20 friends to join her at a theme park. If she chooses to invite friends at random, what is the probability that friends Beyonce, Justin, Katy, Gaga, Wayne, and Rhianna are chosen?

order does NOT matter

$_{20}C_6 = 38{,}760$ so $\frac{1}{38{,}760}$

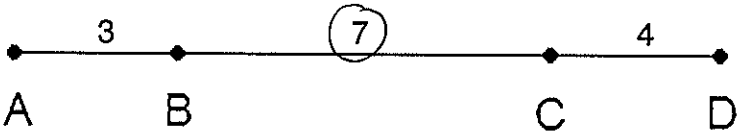
Glencoe Lesson 13-3: Geometric Probability

Vocabulary

Geometric Probability: probability that involves geometric measure such as length or area.

Practice

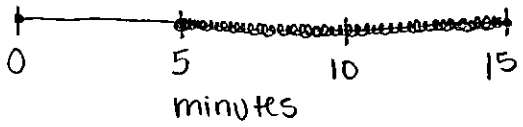
1. Point X is chosen at random on $\overline{AD}$. Find the probability that X is on $\overline{BC}$.



3+7+4 = 14

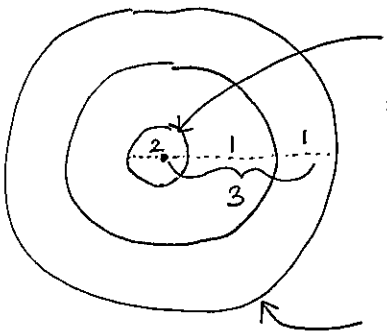
$\frac{BC}{AD} = \frac{7}{14} = \boxed{\frac{1}{2}}$

2. A Chicago Transit Authority train arrives or departs a station every 15 minutes on the Red Line. Assuming you arrive to the Red Line at a random time, what is the probability that you will have to wait 5 or more minutes for a train?



$\frac{10}{15} = \boxed{\frac{2}{3}}$

3. Suppose a skydiver must land on a target of three concentric circles. If the diameter of the center circle is 2 yards and the circles are spaced 1 yard apart, what is the probability that the skydiver will land in the center circle?

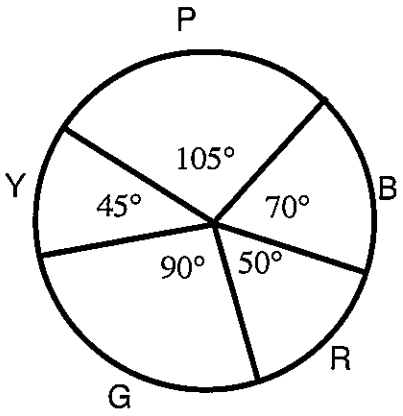


$\pi \cdot r^2$
$= \pi \cdot 1^2$
$= 1\pi$

$\pi \cdot r^2$
$= \pi \cdot 3^2$
$= 9\pi$

$\frac{1\pi}{9\pi} = \boxed{\frac{1}{9}}$

4. Use the spinner to find each probability.



A. P(landing on yellow)

$\frac{45}{360} = 12.5\%$

B. P(landing on purple)

$\frac{105}{360} = 29\%$

C. P(lading on neither red nor blue)

$\frac{105+45+90}{360} = \frac{240}{360} = 67\%$

Glencoe Lesson 13-4: Simulations

Vocabulary

Probability Model: a mathematical model used to match a random phenomenon.

Simulation: the use of a probability model to recreate a situation again & again so we can estimate.

Expected Value: the average value of a random variable that one expects after repeating infinitely many times.

Theoretical Probability: in theory what you expect to see happen in an experiment

Experimental Probability: what you actually see when doing an experiment.

Practice

1. Pick a MarioKart character from below (circle). Don't share your choice with anyone!

Luigi

Mario

Donkey Kong

Yoshi

Bowser

Toad

Boo

Waluigi

Donkey Kong Jr.

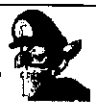
Wario

Peach

Toadette

2. Fill in the table for the MarioKart Race completed in class. Mark an "X" in each box as each character moves ahead in the race.

MARIO KART RACES

 1. Luigi	 2. Mario	 3. Donkey Kong	 4. Yoshi	 5. Wario	 6. Bowser	 7. Toad	 8. Boo	 9. Waluigi	 10. Toadette	 11. Peach	 12. Donkey Kong, Jr.

*get info. from one of your classmates!

Which character won the race? _____

Glencoe Lesson 13-5:
Probabilities of Independent and Dependent Events

Vocabulary

Independent Events: the probability of one event does NOT affect the probability of the other

Formula: $P(A \text{ and } B) = P(A) \cdot P(B)$

Dependent Events: the probability of one event DOES affect the probability of the other

Formula: $P(A \text{ and } B) = P(A) \cdot P(B|A)$

Conditional Probability: $P(B|A)$ - probability that event B occurs given that A has already occurred.

Probability Tree: a tree diagram w/ probabilities.

Practice

For #1-3 determine whether the events are independent or dependent.

1. One coin is tossed, and then a second coin is tossed.

independent

2. Mrs. Merritt has a can of popsicle sticks with each student's name on it. She chooses one student's name, ~~replaces the stick~~, and then draws another name.
↳ without replacing it

dependent

3. Wednesday's lottery numbers and Saturday's lottery numbers.

independent

4. Katy Perry and her friends are going to a concert. They put 5 slips of yellow paper and 3 slips of blue paper in a bag. If a person draws a yellow slip, he or she will ride in the van to the concert. A blue slip means he or she rides in the car.

Suppose Katy draws a slip. Not liking the outcome, she puts it back and draws a second time. What is the probability that on each draw her slip is blue? indep.

$$P(B \text{ and } B) = P(B) \cdot P(B)$$

$$= \frac{3}{8} \cdot \frac{3}{8}$$

$$= \boxed{\frac{9}{64} \text{ or } 14\%}$$

5. Refer to #4 above. Suppose Katy draws a slip and does not put it back. Then her friend Lady Gaga draws a slip. What is the probability that both draw a yellow slip? dependent

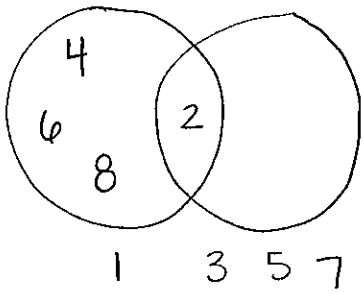
$$P(Y \text{ and } Y) = P(Y) \cdot P(Y|Y)$$

$$= \frac{5}{8} \cdot \frac{4}{7}$$

$$= \boxed{\frac{5}{14} \text{ or } 36\%}$$

6. Mrs. Merritt's class is holding a debate. The 8 students participating randomly draw cards numbered with consecutive integers from 1 to 8.
*Students who draw odd numbers will be on the Proposition Team.
*Students who draw even numbers will be on the Opposition Team.
If Jose is on the Opposition Team, what is the probability that he drew the number 2? conditional prob.

$$P(2|\text{even}) = \boxed{\frac{1}{4}}$$



Glencoe Lesson 13-6: Probabilities of Mutually Exclusive Events

Vocabulary

Mutually Exclusive: When two events can NOT occur at the same time

Formula: $P(A \text{ or } B) = P(A) + P(B)$

Complement: all of the outcomes in the sample space not included in the outcomes of an event

Formula: $P(\text{not } A) = 1 - P(A)$

Practice

For #1 and 2, determine whether the events are *mutually exclusive* or *not mutually exclusive* and explain your reasoning.

1. A Jenison High School, freshmen, sophomores, juniors, and seniors can all run for Student Council president. Travis wants either a junior or senior candidate to win the election. Maddie wants either a sophomore or a female to win, but says, "If the winner is sophomore Kendra Jones, I'll be thrilled!"

   A. A junior winning the election or a senior winning the election.

   Mutually exclusive

   B. A sophomore winning the election or a female winning the election.

   not mutually exclusive

2. Drawing an ace or a club from a standard deck of cards.

   not mutually exclusive

3. Logan makes a playlist that consists of songs from three different albums by his favorite artist. If he lets his iPod select the songs from this list at random, what is the probability that the first song played is from Album 1 or Album 2?

mutually exclusive

$P(A1 \text{ or } A2) =$

$P(A1) + P(A2)$

$\frac{10}{35} + \frac{12}{35} = \boxed{\frac{22}{35}}$

Logan's Playlist	
Album	**# of Songs**
1	10
2	12
3	13

35 total

4. The table shows the number and type of paintings Madison has created. If she randomly selects a painting to submit to an art contest, what is the probability that she selects a portrait or an oil painting? *not mutually exclusive*

$P(\text{oil or portrait})$

$= P(\text{oil}) + P(\text{portrait}) - P(\text{oil \& portrait})$

$= \frac{6}{30} + \frac{10}{30} - \frac{3}{30}$

$= \boxed{\frac{13}{30}}$

Media	Still Life	Portrait	Landscape
watercolor	4	5	3
oil	1	3	2
acrylic	3	2	1
pastel	1	0	5

30 total

5. Brody bought 20 raffle tickets, hoping to win the $100 gift card to his favorite store. If a total of 300 tickets were sold, what is the probability that Brody will not win the gift card?

$300 - 20 = 280$

$\frac{280}{300} = \boxed{\frac{14}{15}}$