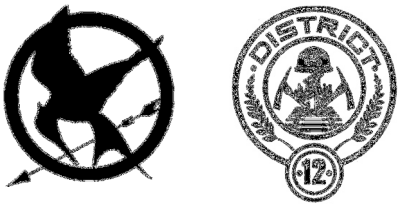
THE HUNGER GAMES

PROBABILITY



SIXTH GRADE MATHEMATICS

CHAPTER 6

PROBABILITY

TOPICS COVERED:

- Basic Probability
- Finding Outcomes
- Tree Diagrams and Tables with Independent Events
- Theoretical vs. Experimental Probability
- Simulations
- Create a Probability Game

A PROBABILITY UNIT BASED ON THE BEST-SELLING BOOK SERIES

Created by Lance Mangham, 6th grade teacher, Carroll ISD

HEADLINES – "DISTRICT 12 REAPING BEING HELD TODAY"

May the odds be ever in your favor…will they be today????

In the book The Hunger Games, 24 contestants compete for the title of Hunger Games Champion. The contestants are from age 12 to age 18. In their country of Panem there are 12 districts. One boy and one girl from each district are chosen to attend the Hunger Games. They are called tributes.

Below is a summary of the tributes.

DISTRICT											
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
BOY	BOY	BOY	BOY	BOY	BOY	BOY	BOY	BOY	BOY	BOY	BOY
GIRL	GIRL	GIRL	GIRL	GIRL	GIRL	GIRL	GIRL	GIRL	GIRL	GIRL	GIRL

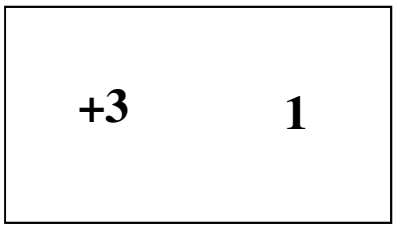
Use the table above to answer the following questions. Write probabilities as simplified fractions.
For #1-10, you choose one of the 24 contestants at random.

1.	P(boy) [What is the probability you will choose a boy?]	
2.	P(a person from district 12)	
3.	P(a girl from district 11)	
4.	P(a person not from district 2)	
5.	P(either a boy or a girl)	
6.	P(a person from district 13)	
7.	P(a person from a prime numbered district)	
8.	P(a boy from a composite numbered district)	
9.	P(a girl from district 4, 5, or 6)	
10.	P(a person from a district that is a multiple of 3)	

11.	Assume each contestant has an equal chance of winning. What is the probability the girl from district 12 will win?	
12.	If the Hunger Games were played 96 times, how many times would expect a boy from district 6 to win?	
13.	The final four contestants are the boys and girls from districts 3 and 4. Use a tree diagram to list all the possible orders the next two contestants may be eliminated.	

The Hunger Games Simulation

You received a piece of paper when you walked in to class today.



The **first number** (+1 to +6) represents how many years you are going to add to your current age for today's lesson.

My current age: _____ + my first number _____ = my age for this project _____

Members of my family: _____ (current members living in your house, including yourself)

The **second number** represents whether you received tesserae or not. In the Hunger Games, tesserae represents additional food resources for families in need.

0 = you are not starving and you did not receive tesserae
1 = you are starving and your family has received tesserae each year since you were 12

Directions for determining your entries into the reaping

PART 1: AGE

Age 12 = 1, Age 13 = 2, Age 14 = 3, Age 15 = 4, Age 16 = 5, Age 17 = 6, Age 18 = 7

PART 2: TESSERAE

You must add 1 extra entry for every family member (including yourself) that received tesserae. These extra entries are cumulative.

For example, if you are 14 years old, your baseline number of entries would be 3 (for age). Added to this number would be your tesserae. For example, if you have 5 members in your family, the entries for tesserae at age 14 would be 5x3=15.

Portions of this first project taken from: Hunger Games: What Are the Chances?, Sarah B. Bush and Karen S. Karp**,** *Mathematics Teaching in the Middle School*, Vol. 17, No. 7 (March 2012), pp. 426-435

1.	On the basis of your age and your tesserae status, determine the number of entries you will have in the reaping lottery this year. Show all work here:
2.	Place your entries in the boy drawing or girl drawing using the small pieces of paper. Then write your number of entries in the correct column on the board.
3.	Given the grand total number of entries in our district (class) and for your gender, what is the probability that your name will be selected? Express your answer as both a fraction and a percentage round to the nearest hundredth (ex. 5.82%). **Calculator**
4.	Suppose you were a student in another class period. Would your chances (or probability) of being selected for the Hunger Games be the same? Why, or why not?
5.	Write an algebraic equation representing a person's total number of entries, E, for a given year if you did not receive tesserae. Define your variables and write your equation below.
6.	Write an algebraic equation representing a person's total number of entries, E, for a given year if you did receive tesserae each year, starting at age 12, for all family members. Define your variables and write your equation below.

7.	Katniss had 20 entries in the reaping, Peeta 5, Gale 42, and Prim 1. If there were 4,144 boy entries and 4,060 girl entries in District 12, what is the probability that each name would be drawn for the Hunger Games? (percentage, round to the nearest hundredth) **Calculator**
8.	What is the probability that both Peeta and Prim are drawn at the reaping? To determine to probability of both of these two events happening, you multiply each individual probability together. Show your expression and answer below. **Calculator**
9.	How many entries would you have if you were 18 years old, had 9 family members, and received tesserae for each of them every year since you were 12?
10.	Suppose you were in a math class of 24 students and each student randomly draws the name of a contestant from the Hunger Games. If your contestant wins the Hunger Games, you win a prize. Is this a fair game? Why or why not? Can you determine the probability of your contestant winning the Hunger Games? If so, write it as a fraction.
11.	How many orders are possible for the first, second, and third person eliminated?
12.	During the Hunger Games in the book, 24 contestants compete until one person is declared the winner. How many orders are possible in which the contestants could have been eliminated (assuming 1 contestant eliminated at a time)? **Calculator**
13.	Suppose as the Hunger Games tributes arrive at the capitol they each greet every other contestant one time. How many total greetings would there be? Use drawings or lists to help organize your thoughts. Show all your work.

See the end of this unit for cards to hand out for the initial project.

Activity 6-5: **Probability Vocabulary** Name:

Determine something has a probability of…

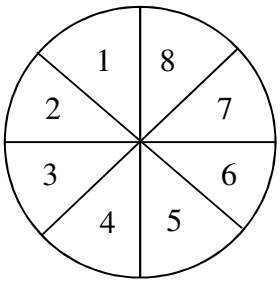
0%	
10%	
25%	
50%	
75%	
100%	

Probability	the chance that some event will happen
Outcome	one possible result of a probability event For example, 4 is an outcome when a die is rolled.
Event	a specific outcome or type of outcome
Sample space	the set of all possible outcomes For example, rolling a die the sample space is {1, 2, 3, 4, 5, 6}
Theoretical Probability	the ratio of the number of ways an event can occur to the number of possible outcomes (You are solving it mathematically.)
Experimental Probability	an estimated probability based on the relative frequency of positive outcomes occurring during an experiment (You are conducting an experiment.)
Random	outcomes occur at random if each outcome is equally likely to occur
Simple	A simple experiment consists of one action.
Composite	A composite experiment consists of more than one action.

The probability of an event is the ratio of the number of ways the event can occur to the number of possible outcomes.

$$P(event) = \frac{\text{number of ways an event can occur}}{\text{number of possible outcomes}}$$

Example #1: On the spinner there are eight equally likely outcomes. Find the probability of spinning a number less than 3.



$P(\text{less than } 3) = \frac{2}{8}$ or $\frac{1}{4}$

Example #2: Find $P(\text{greater than } 10)$. $P(\text{greater than } 10) = \frac{0}{8}$ or 0

Example #3: Find $P(\text{less than } 9)$. $P(\text{less than } 9) = \frac{8}{8}$ or 1

HUNGER GAMES COMPETITION

The chart below shows how many tributes were left at the end of each day of the 74th Annual Hunger Games.

	Tributes remaining		Tributes remaining		Tributes remaining
Start	24	**Day 6**	10	**Day 12**	5
End of Day 1	13	**Day 7**	10	**Day 13**	5
Day 2	12	**Day 8**	8	**Day 14**	4
Day 3	12	**Day 9**	6	**Day 15**	3
Day 4	12	**Day 10**	6	**Day 16**	3
Day 5	10	**Day 11**	6	**Day 17**	2

Assume that all of the contestants have equal abilities to win the Hunger Games. Use the table above to answer the following questions.

	Name	**Fraction**	**Percent (nearest whole percent)**
1.	Before the Hunger Games begin what is the probability that Katniss will win?		
2.	Before the Hunger Games begin what is the probability that Katniss won't win?		
3.	After day one, what is the probability that Katniss will win?		
4.	After day one, what is the probability that Katniss won't win?		
5.	At the end of day 5 what is the probability that Katniss will win?		
6.	At the end of day 8 what is the probability that Katniss will win?		
7.	At the end of day 14 what is the probability that Katniss will win?		
8.	At the end of day 16 what is the probability that Katniss will win?		
9.	At the end of day 16 what is the probability that Katniss won't win?		
10.	***Why does Katniss' probability become greater as she gets farther into the Hunger Games?***		

Activity 6-7: **Basic Probability** Name:

Suppose you choose one of the cards shown without looking. Find the probability of each event.

1.	P(12)		2.	P(even)	
3.	P(2 digits)		4.	P(prime)	
5.	P(odd)		6.	P(less than 8)	
7.	P(greater than 40)		8.	P(divisible by 3)	

3	6	9	12
15	18	21	24
27	30	33	36

John has 15 baseball caps. 4 are red, 6 are blue, 3 are yellow, and 2 are white. If he chooses one of them without looking, find each probability.

9.	P(yellow)		10.	P(red or blue)		11.	P(black)	
12.	P(white)		13.	P(red or white)		14.	P(yellow or white)	

Mr. Underwood keeps his socks in random order in his top dresser drawer. There are two brown socks, eight black socks, four gray socks, and two blue socks in his drawer. He reaches into the drawer and, without looking, grabs one sock. Find the probability of each event.

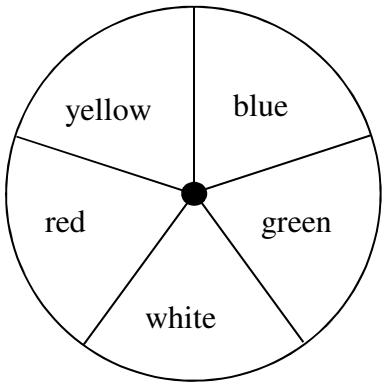
15.	P(gray)		16.	P(blue)		17.	P(black)	
18.	P(white)		19.	P(brown or black)		20.	P(gray or blue)	

Mrs. Shabanaj found 10 identical cans without labels in her cupboard. She knew that she originally had two cans of peas, five cans of corn, one can of carrots, and two cans of beans. She opens one can. Find the probability of each event.

21.	P(carrots)		22.	P(corn)	
23.	P(beets)		24.	P(peas)	
25.	P(corn or beans)		26.	P(carrots or peas)	

Find the probability if you spin the spinner once.

27.	P(red)		28.	P(green)	
29.	P(blue or white)		30.	P(not yellow)	
31.	P(not red)		32.	P(blue or red or yellow)	



If the Hunger Games were played 84 times, about how many times would you expect a tribute from District 11 would win? [Assume equal chances for all districts.]

To figure out about how many times without doing the experiment, you can set up a proportion. First, you must determine the probability District 11 will win. That would be $\frac{1}{12}$. Multiply the probability times the number of events.

$$\frac{1}{12} = \frac{x}{84}$$

Solving for x you get 7. Therefore, you would expect District 11 to win 7 times.

Suppose 24 tributes compete in a Hunger Games simulation.

1.	How many equally likely outcomes are there?	
2.	If there is one simulation, what is the probability of a tribute from District 12 winning?	
3.	If you run the simulation 96 times, about how many times would you expect the boy from District 1 to win?	
4.	If you run the simulation 120 times, about how many times would you expect a tribute from a prime district to win?	
5.	If you run the simulation 80 times, about how many times would you expect a girl tribute from district 4, 5, or 6 to win?	

In the Hunger Games simulation the final four tributes consist of two from District 12, one from District 2, and one from District 5.

6.	If there is one simulation, what is the probability that district 12 will win?	
7.	If you run the simulation 92 times, about how many times will district 2 win?	
8.	If you run the simulation 144 times, about how many times will district 5 not win?	
9.	If you run the simulation 80 times, about how many times will a person from a composite district win?	

Cinna puts the following color cards (in equal quantities) in a bag for Katniss to choose one for her next dress: green, yellow, orange, red, purple.

10.	If Katniss draws 65 times, about how many draws would be green?	
11.	If Katniss draws 180 times, about how many draws would not be orange or red?	
12.	If Katniss draws 640 times, about how many draws would be green, red, or purple?	
13.	If Katniss draws 36 green and yellow cards, about how many total cards are there?	

Activity 6-9: **Theoretical vs. Experimental Probability** Name:

Theoretical probability – determined mathematically
Experimental probability – determined by conducting an experiment

CELEBRITY HUNGER GAMES EXPERIMENT

Based on the book, a tribute has a bit more than a 50% chance of advancing to the next day. After the first day a tributes chance of advancing any given day rises to about 85-90%.

Day 1: Roll two die. If you roll a 8, 9, 10, 11, or 12 the tribute is eliminated.
After day 1: Roll two dice. If you roll a 3, 11, or 12 the tribute is eliminated. If the final tributes are eliminated on the same day, re-roll for that day.

Simulate the 12 person Celebrity Hunger Games five times. In each column record the day the tribute was eliminated.

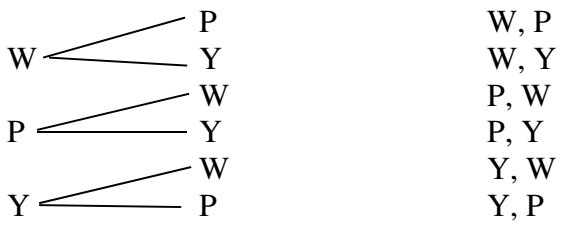
Player	1st Simulation	2nd Simulation	3rd Simulation	4th Simulation	5th Simulation
Lady Gaga					
Justin Bieber					
Selena Gomez					
Harry Potter					
Kermit the Frog					
Luke Skywalker					
Tony Romo					
Michael Jordan					
Shrek					
Mrs. Buckmaster					
Taylor Swift					
Katniss Everdeen					
WINNER					

1.	What was the theoretical probability Taylor Swift would win?	
2.	What was the experimental probability Taylor Swift would win?	
3.	What was the theoretical probability Kermit the Frog would not win?	
4.	What was the experimental probability Kermit the Frog would not win?	
5.	What was the theoretical probability a male (human) would win?	
6.	What was the experimental probability a male (human) would win?	
7.	Why are theoretical and experimental probabilities not necessarily the same?	

Activity 6-10: **Tree Diagrams** Name:

You can draw a tree diagram to find the number of possible combinations or outcomes.

Example Haymitch will wear either a white, purple, or yellow tie with a white, purple, or yellow jacket. The tie and jacket cannot be the same color. How many different choices does Haymitch have?



There are 6 possible outcomes.

Create a tree diagram with titles, create a list of the outcomes possible, and give the total number of outcomes.

1.	Katniss bought 3 pins: one with a star, a butterfly, and a mockingjay. She has a blue dress and a green dress. How many dress/pins combinations are possible?
2.	Cinna is trying to figure out what Katniss should wear for the interview. She can wear a blue, pink, purple, or red. Then she can either wear gold, silver, black, or white high heels. What are all the different combinations?
3.	The Final Four tributes in the Hunger Games were: Foxface, Cato, Peeta, and Katniss. What are all the possible combinations of the top 2?
4.	Katniss and Gale take a quick trip to the Hob. Katniss has a choice to buy a rabbit, a leg of a wild dog, or a bowl of soup. She also has a choice of a free item with the meat: a district 12 token, an arrow, or a knife. What are all the combinations?
5.	Caesar Flickerman is making his yearly Hunger Games interview with the tributes. Caesar can dye his eyebrows mockingjay blue, amber red, or mockingjay pin gold. He can dye his hair President Snow white or Capitol rainbow. What are the combinations for Caesar?
6.	Katniss is at the cornucopia. She can get a square of plastic, a backpack, some bows and arrows, or a tent. Then she can either run the opposite direction of either Cato, Thresh, or Peeta. Next, she can be allies with the Careers or Rue. List all the possible outcomes.
7.	Katniss wanted to get rid of the Careers by throwing a tracker-jacker nest on them, destroying their food supply, or singing for them and damaging their ears. After this she is going to either leave them, throw them in a river, or go find Peeta. List the outcomes.
8.	The people who live in the Capitol are betting on who will win the Hunger Games. The tributes are Beth and Liz. After one wins, she will either be famous and rich, become known as the greatest person in the world, or be forgotten in a week. During the Games she would have run away, tried to fight, or lived in the trees. What is the probability of Liz winning, being known as the greatest person in the world, and living in the trees?

Activity 6-11: **Tree Diagrams and Outcomes** Name: _____

Create a tree diagram with titles, create a list of the outcomes possible, and give the total number of outcomes.

1. Katniss has 3 bows to choose from: bronze, silver, and gold. She also has 3 arrows: sharp, pointy, and dull. How many different combinations can she make?

2. Katniss Everdeen is in the Hunger Games and needs to choose an ally and a bow. She's decided either Peeta, Rue, Foxface, or Thresh will be her ally. She will use either a longbow, crossbow, or a recurve bow. How many different combinations can she make?

3. Katniss and Peeta are in training center for the Hunger Games. They can visit archery, knot tying, or camouflage before lunch break. Afterwards, they can go to spear throwing, knife throwing, or weigh lifting. How many different ways can they visit the stations?

4. Katniss has to choose between marigolds, zinnia, roses, and tulips to adorn Rue. She also has to choose if she wants red, white, black, or gold. If she chooses zinnia she can't choose black or gold. She can't choose roses with gold. How many choices does she have?

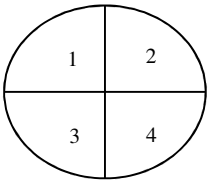
5. In the Hunger Games Katniss has 3 possible sponsors: a rich man, a Capitol woman, or anonymous. They can buy either a knife, a lamp, bread, or an exploding pineapple. What is the probability Katniss' first gift is an exploding pineapple given from an anonymous person?

6. Peeta Mellark has three different types of icing that are chocolate, cream cheese, and butter crème. He needs cake batter to go with the icing. His choices are red velvet, birthday cake, and strawberry. How many possible icing-batter outcomes are there?

7. If a coin is tossed three times to help determine which animal to unleash in the arena, which lists all the possible outcomes?

A. HT, TH, HH, TT
B. HHT, HTH, HTT, THH, THT, TTH
C. HHH, TTT, HHT, HTT
D. HHH, HHT, HTH, HTT, THH, THT, TTH, TTT

8. Cinna spins the spinner below to choose which dress for Katniss to wear. He will then flip a coin to determine which pair of shoes to go with it.



Which shows all the possible outcomes that could result?

A.

Spinner	1	2	3	4	1	2	3	4
Coin	H	T	H	T	H	T	H	T

B.

Spinner	1	2	3	4
Coin	H	T	H	T

C.

Spinner	1	2	3	4	1	2	3	4
Coin	H	H	H	H	T	T	T	T

D.

Spinner	1	2	3	4	1	2	3	4
Coin	H	H	T	T	H	H	T	T

The Counting Principle uses multiplication to find the number of possible outcomes.

If event M can occur in m ways and is followed by event N that can occur in *n* ways, then the event M followed by N can occur in m • n ways.

Example The Capitol's Best Pizza serves 11 different kinds of pizza with 3 choices of crust and in 4 different sizes. How many different selections are possible?

Apply the Counting Principle: $11 \bullet 3 \bullet 4 = 132$ 132 pizza selections

Use the Counting Principle to find the total number of outcomes in each situation.

1.	The Hob nursery has 14 different colored tulip bulbs. Each color comes in dwarf, average, or giant size. How many different kinds of bulbs are there?	
2.	The type of bicycle Prim wants comes in 12 different colors of trim. There is also a choice of curved or straight handlebars. How many possible selections are there?	
3.	At a tribute banquet, guests were given a choice of 4 entrees, 3 vegetables, soup or salad, 4 beverages, and 4 desserts. How many different selections were possible?	
4.	Gale is setting the combination lock on his briefcase. If he can choose any digit 0-9 for each of the 6 digits in the combination, how many possible combinations are there?	

Use the Counting Principle to find the total number of outcomes in each situation.

5.	Mrs. Everdeen choosing a paint color from among 6 color choices, and choosing a wallpaper pattern from among 5 choices	
6.	Clove flipping a penny, a nickel, and a dime	
7.	Marvel choosing the last three digits in a five-digit zip code if the first digit is 6, the second digit is 1, and no digit is used more than once	
8.	Glimmer choosing one of three science courses, one of five math courses, one of two English courses, and one of four social studies courses	
9.	Rue choosing from one of three appetizers, one of four main dishes, one of six desserts, and one of four soft drinks	
10.	Cashmere choosing a book with a mystery, science-fiction, romance, or adventure theme, choosing one of five different authors for each theme, and choosing paperback or hardcover for the type of book	
11.	Brutus choosing a 7 digit phone number if the first three-digit combination can be one of 8 choices and if the last four digits can be any combination of digits from 1 to 9 without any repeated digits	
12.	In the 1980's telephone area codes in the US contain three digits, they did not begin with a 1 or 0, and the middle digit was always a 0 or a 1. Mags said, "If that is true, each state in the USA could have less than 5 area codes and yet all the area codes could be used up." Is Mags correct?	

Activity 6-13: **Roulette Wheel Probability** Name:

Roulette Wheel – 50 spaces

Space	Number on wheel	Money won	Space	Number on wheel	Money won
1	22	$3,000	Flag	1	$50,000
2	14	$4,500	Joker	1	$50,000
5	7	$9,000	Not a 1	28	$2,300
10	3	$20,000	Not a Flag or a Joker	48	$1,400
20	2	$30,000			

Spin #	My bet	Actual spin	Money won	Total $
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				

Activity 6-14: **Odds** Name:

HUNGER GAMES ODDS

Based on past results, one can make an educated guess at the odds the boys and girls coming from each district have of winning. Boys tend to win more than girls and Districts 1, 2, and 4 win the most often.

Odds against winning the Hunger Games

[Odds against = number of failures to number of successes]

District Number	Male Odds	Female Odds	District Number	Male Odds	Female Odds
1	7-1	18-1	7	25-1	50-1
2	8-1	15-1	8	30-1	45-1
3	25-1	70-1	9	40-1	60-1
4	7-1	14-1	10	35-1	50-1
5	20-1	40-1	11	25-1	60-1
6	24-1	70-1	12	37-1	74-1

1.	Which tribute(s) has the best odds of winning?	
2.	As a fraction, what is the probability this tribute will win?	
3.	As a decimal (nearest thousandth), what is the probability this tribute will win?	
4.	Which tribute has the worst odds of winning?	
5.	As a fraction, what is the probability this tribute will win?	
6.	As a decimal (nearest thousandth), what is the probability this tribute will win?	
7.	Write your answer to #6 as a percentage.	
8.	Which tribute has a probability of winning of $\frac{1}{15}$?	
9.	Which female tribute has the best odds of winning?	
10.	Which tribute(s) has about a 5% chance of winning?	
11.	Which tribute is closest to a 2% chance of winning, without going under 2%?	
12.	Which tribute has a probability of losing of $\frac{35}{36}$?	
13.	List all of the tributes in order from most likely to win to least likely to win.	

Created by Lance Mangham, 6th grade teacher, Carroll ISD

PROBABILITY PROJECT

Mr. Mangham needs a probability project/assignment/activity for his future math classes to complete when they are finishing up their probability unit. Below are the requirements. Please read them carefully.

- You may work individually or in a team of up to 4 people (the bigger the team, the better your final product should be).

- What you create will be a concluding probability project/assignment/activity so you do not need to teach any of the concepts. The students just have to use the concepts they already know in some way.

- Your creation must relate to one of our themes:

  The Hunger Games — Star Wars
  Food & Restaurants — Fantasy Football
  Southlake's World of Wildlife Wonders

- You must address **each of these concepts** in some way.

Theoretical Probability	Experimental Probability	Tree Diagrams	Counting Principle

- What you create is totally up to you.

- You must work at a good pace. You have this class period to get the majority of the project completed. This assignment will be turned in Tuesday. You are going to want to keep things relatively simple. I understand it will not look like you spent 10 hours completing this assignment. It may look more like a rough copy than final copy.

- Your grade is based on:
  - Did you address the probability concepts at an appropriate math level?
  - Will students find your activity fun, interesting, and educational?
  - Do you believe Mr. Mangham can actually use your project in his class?

74TH ANNUAL HUNGER GAMES FACTS

District 1 – Luxury
Male: Marvel – Spear
Female: Glimmer – Unknown

District 2 – Masonry
Male: Cato – Sword, Machete
Female: Clove – Throwing Knives

District 5 – Power
Female: Foxface – Stealth

District 11 – Agriculture
Male: Thresh – Rock
Female: Rue – Slingshot

District 12 – Mining
Female: Katniss – Bow/Arrow
Male: Peeta – Spear/Camouflage

HUNGER GAMES DISTRICT GROUPS

Food Supply Districts
District 4 – Fishing
District 9 – Grain
District 10 – Livestock
District 11 – Agriculture

Special Skills Districts
District 2 – Masonry
District 8 – Textiles

Limited Resource Districts
District 7 – Lumber
District 12 – Mining

Extra Benefits Districts
District 1 – Luxury
District 3 – Technology
District 5 – Power
District 6 – Transportation

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+1 0	+1 1	+1 0
+1 1	+1 0	+1 1
+1 0	+1 1	+2 0

+2 0	+2 0	+2 1
+2 0	+2 1	+2 0
+2 1	+3 0	+3 0

+3 0	+3 1	+3 0
+3 1	+4 0	+4 1
+4 0	+4 1	+5 0

+5 0	+5 0	+5 1
+6 0	+6 0	+6 0
+6 1		

75th Annual Hunger Games

District	Female Tribute	Male Tribute
District 1	Cashmere	Gloss
District 2	Enobaria	Brutus
District 3	Wiress	Beetee
District 4	Mags	Finnick Odair
District 5	Unnamed Tribute	Unnamed Tribute
District 6	"Female Morphling"	"Male Morphling"
District 7	Johanna Mason	Blight
District 8	Cecelia	Woof
District 9	Unnamed Tribute	Unnamed Tribute
District 10	Unnamed Tribute	Unnamed Tribute
District 11	Seeder	Chaff
District 12	Katniss Everdeen	Peeta Mellark

A. If you rolled dice of two different colors, for example white and green, 36 times, how often would you expect the number on the white die to be less than the number on the green one? Predict, then do the experiment and record your results. Compare the prediction to the results. What possible rolls would show the number on the white die to be less than that on the green die? Write a fraction to show the number of times out of 36 that the number on the white die was less than that on the green die.

PREDICTION _____

Roll No.	Green	White	Roll No.	Green	White
1			19		
2			20		
3			21		
4			22		
5			23		
6			24		
7			25		
8			26		
9			27		
10			28		
11			29		
12			30		
13			31		
14			32		
15			33		
16			34		
17			35		
18			36		

Possible rolls that show the number on the white die to be less than that on the green die:

	Experimental Probability	Theoretical Probability
White die less than green die		

Activity 6-17: **Castle Warwick & Castle Howard** Name:

You will do 25 trials to help determine the probability that the water route is open.

For trial one, flip a coin. If the coin is heads then gate 1 is open – tails gate 1 is closed. Flip the coin again. Heads then gate 2 is open, tails gate 2 is closed. Repeat for gates 3,4, and 5. Then determine if there is an open path between the castles.

Repeat the trial 25 times and record your data.

Trials	Gates					Path open/closed
	1	2	3	4	5	
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						

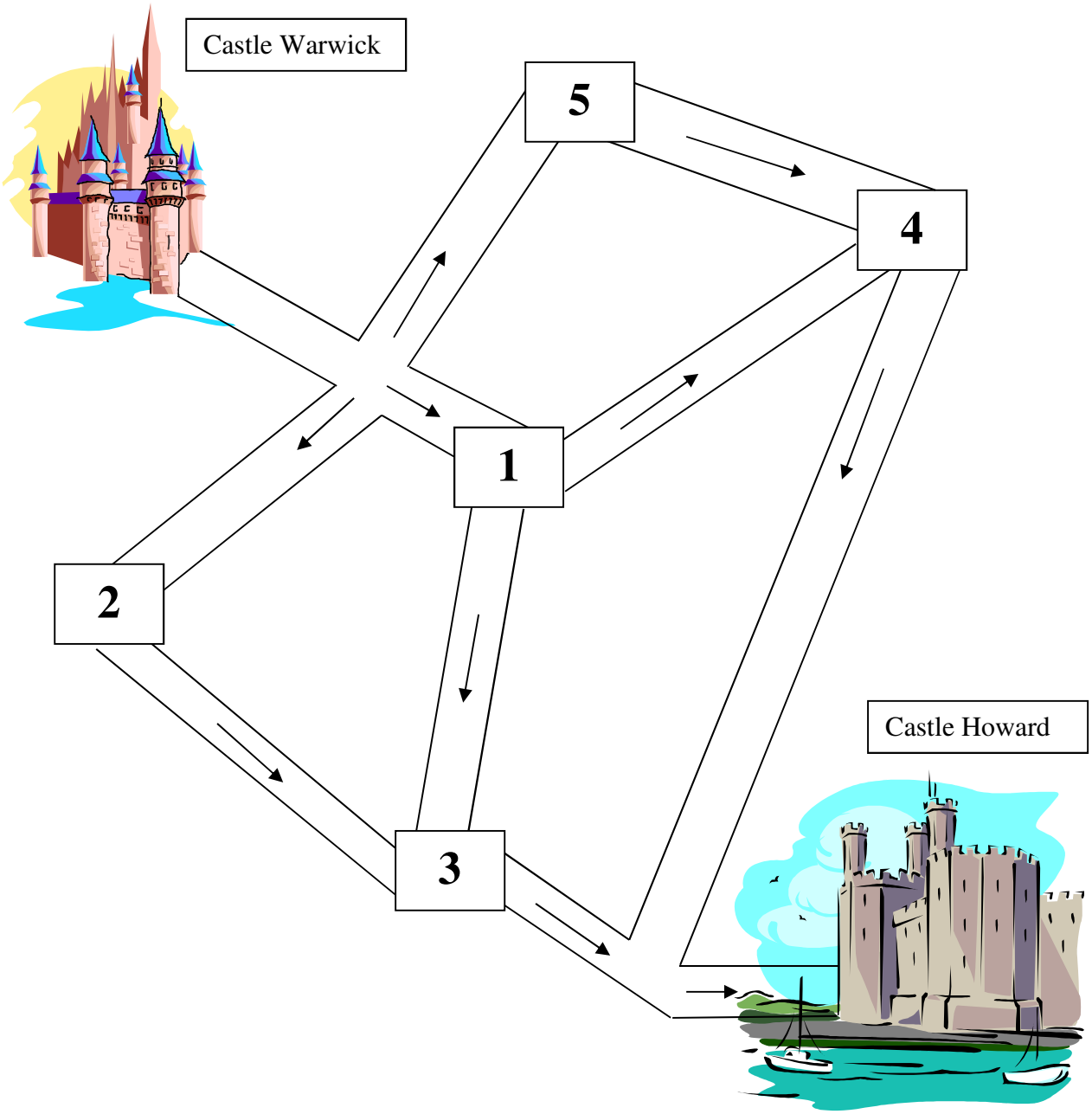
TOTAL YES = _____ TOTAL NO = _____

Probability of Yes is _____ Probability of No is _____

Activity 6-18: **Castle Warwick & Castle Howard** Name:

Our hero Lancelot is trapped at Castle Warwick. The only escape is to reach Castle Howard through a system of canals. The problem is that the system of canals has five gatehouses, each run by a cranky gatekeeper who shows up for work about half the time. So the probability that a gate is open on a given day is one half. The arrows show the way the water flows through the canals.

What is the probability that a water route from Castle Warwick to Castle Howard is open so that Lancelot can escape on the day chosen? (We assume that our hero will find it if a route is open.)



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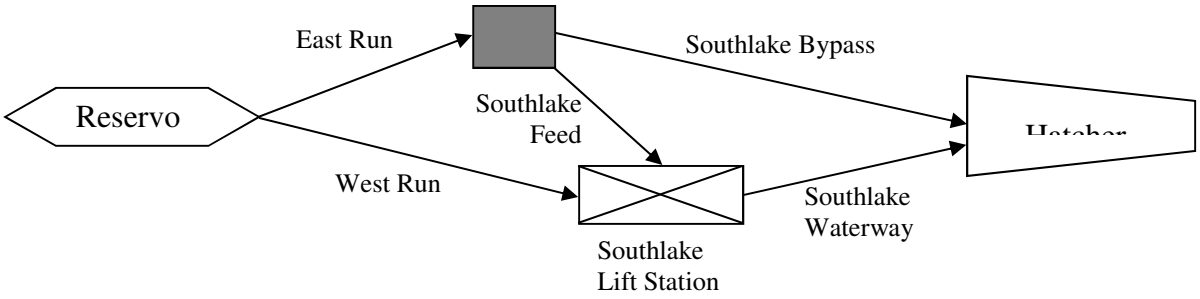
Activity 6-19: **Waterway Simulation** Name:

Sometimes it is easier to determine the probability of something by conducting an experiment or **simulation**. A simulation acts out the event so that you can see outcomes.

Real-World Event	Simulation
having a baby boy or baby girl	flip a coin
history of making 2 out of every 3 free throws	spinning a 3-section spinner with 2 sections the same color
win one of twelve prizes	roll a die and flip a coin

The diagram below shows a system of waterways that brings fresh water from a reservoir to a fish hatchery. Because of problems with beavers building dams across waterways, each has been closed half of the time. What is the probability that the hatchery will still be able to get water even if some of the waterways are closed?



To simulate whether each waterway is open or closed, flip the two-colored chips.

YELLOW = YES, OPEN
RED = NO, CLOSED

Trial	East Run	West Run	Southlake Feed	Southlake Bypass	Southlake Waterway	Will water flow to the hatchery?
1	Y	N	N	Y	N	Yes
2						
(create the rest of the chart on notebook paper…a total of 30 trials will take place)						

1. Based on 30 trials, what is the probability that the hatchery will be able to get water?

2. Duke is playing Texas in basketball. Duke trails by one point, but had a player fouled as time expired. The 75% free-throw shooter will go to the free throw line for a one-and-one. One-and-one means if the player misses the first free throw, he does not get another. If he makes the first free-throw, he gets to shoot one more. Determine a method to simulate a 75% free throw shooter and conduct 30 experiments to determine:
A. the probability Texas wins the game in regulation
B. the probability the game will go to overtime
C. the probability Duke wins the game is regulation

Show, state, or include your method to simulate the 75%. Create a table showing the results of the 1st free throw, 2nd free throw, and the game outcome. Do all work on a separate sheet of paper.