

CCM6+7+ UNIT 11

PROBABILITY

Name _____ Teacher: Townsend

ESTIMATED ASSESSMENT DATES: _____

Unit 11 Vocabulary List	2
Simple Event Probability	3-7
Expected Outcomes—Making Predictions	8-9
Theoretical vs. Experimental Probability	10
Showing All Outcomes in different ways	11-12
Probability as Area	13
The Counting Principle to find the total outcomes	14-17
Compound Events--Independent and Dependent Probability	18-23
Probability Games	24-27
Study Guide	28-33

UNIT 11 ESSENTIAL VOCABULARY

Probability

Outcome

Sample Space

Simple Event

Theoretical Probability

Experimental Probability (Relative Frequency)

Tree Diagram

Punnett Square

Organized List

Counting Principle

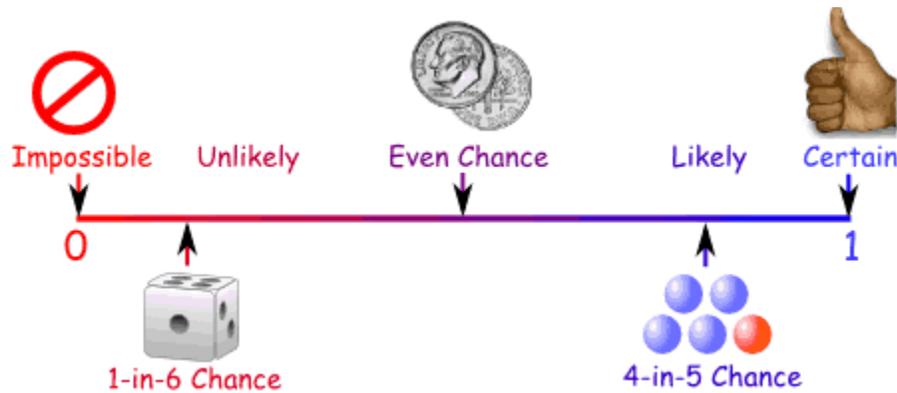
Compound Events

Independent Probability

Dependent Probability

What is Probability?

Probability is describing the chance that something will happen. Look at the diagram below. All probabilities range from 0 (Impossible) to 1 (Certain).



Finding the probability of something is finding the ratio:

$$\frac{\text{\# ways to get what you want}}{\text{Total \# outcomes possible}}$$

The total number of outcomes possible is called the **sample space**.

Look at the figures in the chart below. Determine the probability of something to happen.

	<p>What is the probability of picking out a striped marble?</p> <p>$P(\text{striped}) = \underline{\hspace{2cm}}$</p>	<p>What is the probability of flipping heads on a coin?</p> <p>$P(\text{heads}) = \underline{\hspace{2cm}}$</p>
	<p>What is the probability of spinning an odd number?</p> <p>$P(\text{odd}) = \underline{\hspace{2cm}}$</p>	<p>If you draw a card from these, what is the probability of getting a card with a face on it?</p> <p>$P(\text{face card}) = \underline{\hspace{2cm}}$</p>
	<p>What is the probability of rolling a prime number?</p> <p>$P(\text{prime}) = \underline{\hspace{2cm}}$</p>	<p>On a regular number cube, what is the probability of rolling a 7?</p> <p>$P(7) = \underline{\hspace{2cm}}$</p>
<p>On a regular number cube, what is the probability of rolling a multiple of 1?</p> <p>$P(\text{multiple of 1}) = \underline{\hspace{2cm}}$</p>	<p>Give an example of a probability that is unlikely but not impossible. Give your answer in words and as a number.</p>	

If possible, write a ratio to represent each probability below and then list the given letter above the number line. Problem A is done for you to use as an example. Next, determine if each event is impossible, unlikely, equally likely, likely, or certain. It will not be able to have a ratio represent each scenario but you CAN determine the likelihood of the event using the categories shown on the number line.

A. If you roll a die you will get a number less than 7.

$$\frac{6}{6} = 100\% \quad : \quad \underline{\text{certain}}$$

B. If you roll a die you will get an odd number.

$$\underline{\hspace{2cm}} : \underline{\hspace{2cm}}$$

C. Jodi has dance rehearsals on Tuesday afternoons. that Jodi is at the mall on a Tuesday afternoon?

$$\underline{\hspace{2cm}} : \underline{\hspace{2cm}}$$

D. A bag contains 12 pennies and 12 dimes. How likely is it that you will draw a dime from the bag?

$$\underline{\hspace{2cm}} : \underline{\hspace{2cm}}$$

E. You must be 15 years old to obtain a learner's permit to drive. Emily is 13 years old. How likely is it that Emily has her learner's permit?

$$\underline{\hspace{2cm}} : \underline{\hspace{2cm}}$$

F. The club volleyball team is made up of 7 How likely is it that the first player chosen at random will be a girl?

$$\underline{\hspace{2cm}} : \underline{\hspace{2cm}}$$

G. Card numbered 1-8 are in a box. How likely is it that you will pull out a number greater than 2?

$$\underline{\hspace{2cm}} : \underline{\hspace{2cm}}$$

H. How likely is it that the card you will pull out in problem G will be a number less than 4?

$$\underline{\hspace{2cm}} : \underline{\hspace{2cm}}$$

Why Did the King's Birthday Celebration Last So Long?

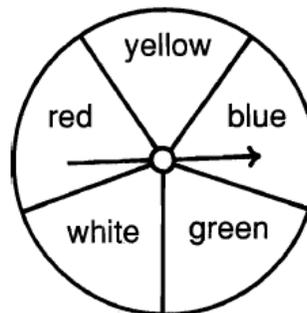
Do each exercise and find your answer in the Code Key. Notice the letter under it. Write this letter in the box containing the exercise number.



Code Key	$\frac{1}{100}$	$\frac{1}{5}$	$\frac{2}{5}$	$\frac{3}{5}$	$\frac{4}{5}$	1	$\frac{4}{13}$	$\frac{5}{13}$	$\frac{2}{7}$	$\frac{1}{8}$	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{7}{8}$
	R	T	S	N	I	K	P	E	W	Y	H	A	L	G

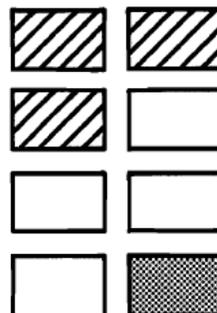
I. Find each probability if you spin the spinner once.

- ① P(red)
- ② P(green)
- ③ P(blue or white)
- ④ P(not yellow)
- ⑤ P(not red)
- ⑥ P(blue or red or yellow)



II. Find each probability if you choose one card at random.

- ⑦ P(striped)
- ⑧ P(white)
- ⑨ P(shaded)
- ⑩ P(white or shaded)
- ⑪ P(striped or white)
- ⑫ P(striped or shaded)
- ⑬ P(not striped)
- ⑭ P(not white)
- ⑮ P(striped or white or shaded)



III. Solve.

- ⑯ What is the probability of guessing the correct answer to a multiple choice question if there are 5 choices?
- ⑰ What is the probability of guessing the correct answer to a true-false question?
- ⑱ What is the probability that your birthday will fall on Saturday or Sunday?
- ⑲ What is the probability of winning a raffle if 500 tickets are sold and you buy 5 of them?
- ⑳ A class of 25 students has 15 girls and 10 boys. If one student is chosen at random, what is the probability it is a girl?
- ㉑ There are 26 letters in the alphabet. What is the probability that a letter chosen at random is in the word MATHEMATICS?

5	1	18	8	3	14	6	17	13	10	15	20	4	11	7	16	21	12	19	2	9
---	---	----	---	---	----	---	----	----	----	----	----	---	----	---	----	----	----	----	---	---

Simple Events – An event that consists of exactly one outcome. A simple event is the event of a single outcome.

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 fight until only 1 is left standing. The contestants range 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 the 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 girl)	
6	P(a person from district 13)	
7	P(a girl from district 4, 5, or 6)	
8	P(a person from a district that is a multiple of 3)	
9	P(a person from an even numbered district)	
10	P(a boy from an even numbered district)	

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.	<i>Why does Katniss' probability become greater as she gets farther into the Hunger Games?</i>		

Expected Outcomes

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.]

What is the probability that a tribute from District 11 would win?

Decimal	Fraction	Percent

Multiply the probability times the number of events. _____ \cdot 84 =

OR

Set up a proportion $\frac{1}{12} = \frac{x}{84}$

Suppose 24 tributes compete in a Hunger Games simulation.		
1.	If there is one simulation, what is the probability of a tribute from District 12 winning?	
2.	If you run the simulation 96 times, about how many times would you expect the boy from District 1 to win?	
3.	If you run the simulation 120 times, about how many times would you expect a tribute from a prime district to win?	
4.	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 for tributes consist of two from District 12, one from District 2, and one from District 5.		
5.	If there is one simulation, what is the probability that district 12 will win?	
6.	If you run the simulation 9 2times, about how many times will district 2 win?	
7.	If you run the simulation 144 times, about how many times will district 5 not win?	
Cinna puts the following color cards in a bag for Katniss to choose one for her next dress: green, yellow, orange, red, purple		
8.	If Katniss draws 65 times, about how many draws would be green?	
9.	If Katniss draws 180 times, about how many draws would not be red?	
10.	If Katniss draws 640 times, about how many draws would be green, red, or purple?	

When the Boy Tire Maker Married the Girl Tire Maker, What Did Everyone Say?

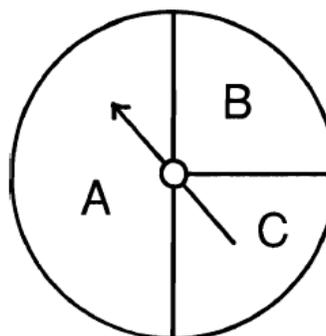
Do each exercise and find your answer at the bottom of the page. Write the letter of the exercise in the box above the answer.

1. Suppose you roll a regular 6-faced die.



- (A) How many equally likely outcomes are there?
- (E) If you roll the die once, what is the probability of rolling a 3?
- (H) If you roll the die 60 times, about how many times would you expect to get a 1?
- (I) If you roll the die 300 times, about how many times would you expect to get a 5?

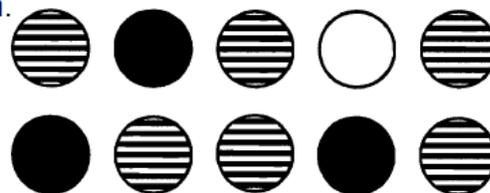
2. A spinner is shown at the right for which each outcome is **not** equally likely.



- (E) If you spin the spinner once, what is the probability that it will stop on A?
- (A) If you spin the spinner once, what is the probability that it will stop on B?
- (T) If you spin the spinner 50 times, about how many times would you expect it to stop on A?
- (Y) If you spin the spinner 80 times, about how many times would you expect it to stop on C?

3. Find each probability if you choose one marble at random.

- (E) P(black)
- (S) P(striped)
- (A) P(not black)
- (E) P(not white)
- (R) P(black or white)
- (M) P(yellow)



4. Solve.

- (N) If you flip a coin 150 times, about how many times would you expect to get heads?
- (K) If you randomly pick a date in April, how many equally likely outcomes are there?
- (C) The letters a, e, i, o, u, and y are vowels. If one letter of the alphabet is chosen at random, what is the probability it is a vowel?
- (P) A magician asks you to pick a card, any card, from a standard deck of 52 cards. What is the probability of picking an ace?

25	10	$\frac{9}{10}$	20	$\frac{1}{8}$	0	6	30	$\frac{1}{2}$	$\frac{2}{13}$	$\frac{7}{10}$	$\frac{1}{5}$	75	50	$\frac{3}{13}$	$\frac{1}{6}$	32	$\frac{3}{5}$	$\frac{1}{13}$	$\frac{1}{4}$	$\frac{2}{5}$	$\frac{3}{10}$

Experimental & Theoretical Probability

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 tribute's 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	1 st Simulation	2 nd Simulation	3 rd Simulation	4 th Simulation	5 th Simulation
Lady Gaga					
Justin Bieber					
Selena Gomez					
Harry Potter					
Kermit the Frog					
Luke Skywalker					
Tony Romo					
Michael Jordan					
Shrek					
Mrs. Bailey					
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?	

Showing ALL OUTCOMES

There are several ways you can find probabilities of compound events using organized lists, tables, tree diagrams and simulation.

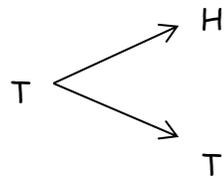
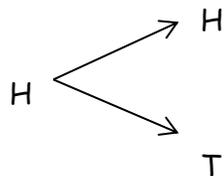
For example: What is the probability of flipping a coin and it landing on heads both times.

Table:

	H	T
H	HH	HT
T	TH	TT

$$HH = \frac{1}{4}$$

Tree Diagram:



$$HH = \frac{1}{4}$$

Organized List:

(H, T)

(H, H)

(T, H)

(T, T)

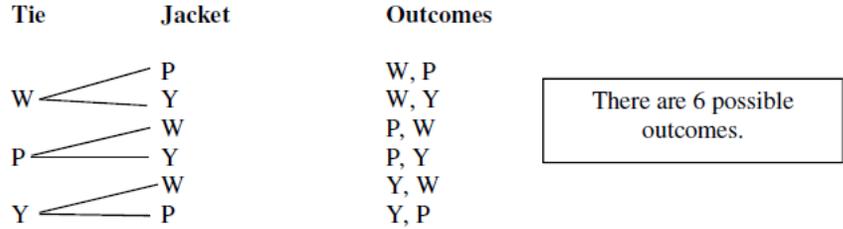
$$HH = \frac{1}{4}$$

After you use the diagrams you might notice a pattern to where you can multiply the probabilities together

$$\frac{1}{2} \cdot \frac{1}{2} = \frac{1}{4}$$

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

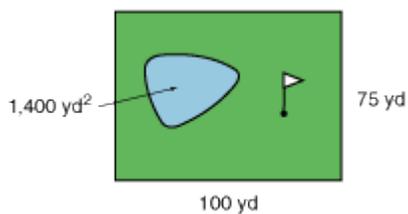
Example Haymitch will wear either a white, purple, or yellow tie with a white, purple, or yellow jacket. The tie and jacket cannot be the same color. How many different choices does Haymitch have?



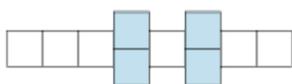
Create a tree diagram and give the total number of outcomes.

1. Flipping three coins	2. Flipping a Coin and Rolling a Number Cube	3. The product of rolling two dice
3. 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?	4. Peeta has three different types of icing that are chocolate, cream cheese, and butter cr�me. His cake flavors are red velvet, birthday cake, and strawberry. How many possible cake-icing outcomes are there?	6. Katniss is choosing her last meal before the Hunger Games. She has 3 choices for entr�e: soup, chicken, or beef. She can choose from 2 desserts and can drink water, tea, or milk. What are all the combinations she can make?

1. Find the probability that a golf ball will *not* land in the water shaded in the region below.



- A. $\frac{14}{75}$
 B. $\frac{61}{75}$
 C. $\frac{4}{5}$
 D. $\frac{21}{25}$
2. If someone throws a hopscotch stone onto a random square, what is the probability that it will land in the shaded region?



- A. $\frac{2}{5}$
 B. $\frac{1}{2}$
 C. $\frac{1}{3}$
 D. $\frac{4}{9}$
3. While you were riding in a hot-air balloon over a park, a sandbag fell off of the basket, but you don't know where in the park it fell. The entire park is 60,000 square feet. The playground in the park is 12,000 square feet. What is the probability that the sandbag is in the playground?

- A. $\frac{1}{6}$
 B. $\frac{2}{5}$
 C. $\frac{1}{5}$
 D. $\frac{1}{3}$

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

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: $11 \cdot 3 \cdot 4 = 132$ 132 pizza selections

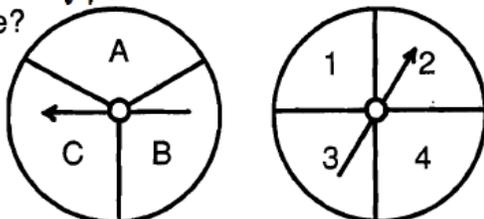
Use the Counting Principle to find the total number of outcomes in each situation.	
1.	The Hob nursery has 14 different colored tulip bulbs. Each color comes in dwarf, average, or giant size. How many different kinds of bulbs are there?
2.	The type of bicycle Prim wants comes in 12 different colors of 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 deserts. 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?
5.	Clove is flipping a penny, a nickel and a dime.
6.	Rue choosing one of three appetizers, one of four main dishes, one of six desserts, and one of four soft drinks.
7.	In how many different ways can Rue, Foxface, Clove, and Katniss place 1 st , 2 nd , and 3 rd for a costume contest?
8.	How many codes can Katniss make using 2 letters followed by a 1 digit number?

Why Was Jesse James In the Hospital?



Find each answer in the code at the bottom of the page. Write the letter of the problem above the answer each time it appears.

- (I) If you spin each of these spinners once, how many possible outcomes are there?



- (E) The students at Melmac Middle School are trying to choose a school mascot and a school color. The suggestions for mascot are lion, bear, and porpoise. The suggestions for color are red, blue, and gold. How many different combinations are there?

- (R) Mr. and Mrs. Quagmire are trying to decide on a name for their new baby girl. For a first name, they like either Melissa, Jennifer, Karen, Lisa, or Susan. For a middle name, they like either Anne or Jean. How many different choices do they have?

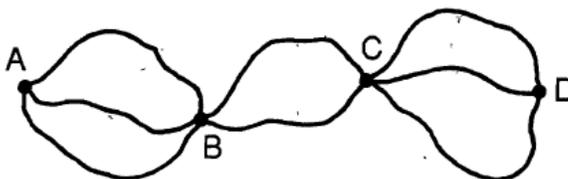
- (A) Elmo decided to take two classes during summer school. For first period, he can choose either math or English. For second period, he can choose either art, music, drama, or cooking. How many different schedules of two classes are possible?

- (C) If a baseball team has 5 pitchers and 3 catchers, how many different pitcher-catcher combinations can be used?

- (H) Glitzy just bought 4 blouses, 5 skirts, and 2 blazers. If all the patterns and colors match, how many outfits can she make?

- (T) Pizza Mind Pizza Parlor has 8 kinds of pizza, 3 kinds of salad, and 4 kinds of beverage. If you order one item from each category, how many different meals can be ordered?

- (W) According to the map, how many different routes are there from A to D?



- (O) Shoe World sells shoes in 20 different styles. Each style comes in 4 colors and 9 sizes. If the store manager wants to have every possible combination, how many pairs must he keep in stock?

- (K) In Cornville, bicycle license plates have 2 letters followed by a 1-digit number. How many different license plates are possible?

- (S) When you order a sandwich at Nelly's Deli, you can choose from 4 kinds of bread and 7 kinds of meat. On any sandwich, you can have mayonnaise or mustard or both or neither. How many different sandwiches can be ordered?

CODING ANSWER

FINDING OUTCOMES when there aren't categories.

Here's an example:

There are 5 boxes of cereal in your cabinet at home. If you eat a different cereal each day, how many orderings of cereals could there be?

3 days so draw 3 blanks: _____

On the first day there are 5 options. Write a 5 in the first blank.

On the second day there are 4 options left. Write a 4 in the second blank.

On the third day there are 3 options left. Write a 3 in the third blank.

For the Counting Principle, what did you do with the numbers that were in each category?

Yes, you multiplied. Do that to the numbers in the blanks.

There are _____ possible orders of eating cereal those 3 days.

Here's another to try:

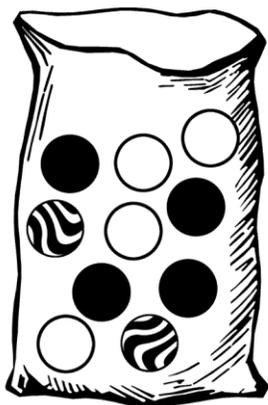
A standard license plate consists of 3 letters followed by 4 numbers. All letters are possible and can be repeated. The first digit cannot be a zero, but that is the only number restriction. How many different license plates can be created?

Compound Event Probability

To find the probability of multiple things happening, multiply the probabilities of each event.

What is the probability of flipping heads on a coin and rolling a 5 on a die?

What is the probability of pulling out a striped marble, putting it back, then pulling out a white marble?



These compound events are called **INDEPENDENT EVENTS**, since each event always has the same possible outcomes.

What if you draw a marble out of the bag above, keep it out, then draw a second marble out. What is the probability of drawing a striped then a white? (This is called “without replacement.” The above example when you put the marble back is called “with replacement.”)

In this example, after you pull the first marble out of the bag, the next pull has fewer options. Your options for the second pull **DEPEND ON** what was taken out on the first pull. These kinds of situations are called **DEPENDENT EVENTS**.

How do the denominators change for dependent events?

Determine if the situation involves independent or dependent probability, then calculate the probability of the event occurring.

1. A dresser drawer contains one pair of socks with each of the following colors: blue, brown, red, white and black. Each pair is folded together in a matching set. You reach into the sock drawer and choose a pair of socks without looking. You replace this pair and then choose another pair of socks. What is the probability that you will choose the red pair of socks both times?
2. A card is chosen at random from a standard deck of 52 playing cards. Without replacing it, a second card is chosen. What is the probability that the first card chosen is a queen and the second card chosen is a jack? (There are four of each type of card.)
3. Mr. Parietti needs two students to help him with a science demonstration for his class of 18 girls and 12 boys. He randomly chooses one student who comes to the front of the room. He then chooses a second student from those still seated. What is the probability that both students chosen are girls?
4. A jar contains 3 red, 5 green, 2 blue and 6 yellow marbles. A marble is chosen at random from the jar. After replacing it, a second marble is chosen. What is the probability of choosing a green and then a yellow marble?

Independent events

1. Bag A contains 9 red marbles and 3 green marbles. Bag B contains 9 black marbles and 6 orange marbles. Find the probability of selecting one green marble from bag A and one black marble from bag B.

2. Two seniors, one from each government class are randomly selected to travel to Washington, D.C. Wes is in a class of 18 students and Maureen is in a class of 20 students. Find the probability that both Wes and Maureen will be selected.

3. If there was only one government class, and Wes and Maureen were in that class of 38 students, what would be the probability that both Wes and Maureen would be selected as the two students to go to Washington? Is this still an example of independent events?

Dependent Events

4. A box contains 5 purple marbles, 3 green marbles and 2 orange marbles. Two consecutive draws are made from the box **without replacement** of the first draw. Find the probability of each event.

- a. P(orange first, green second)

- b. P(both marbles are purple)

- c. P(the first marble is purple, and the second is ANY color EXCEPT purple)

5. If you draw two cards from a standard deck of 52 cards without replacement, find:
 - a. P(King first, Jack second)

- b. P(face card first, ace second)

- c. P(2 aces)

6. A six-sided die is rolled and a spinner with five equal spaces labeled A-F is spun.

a. How many outcomes are there?

b. $P(1 \text{ and } A)$

c. $P(\text{odd and } B)$

d. $P(\text{composite and } C)$

e. $P(\text{prime and } D)$

f. $P(1 \text{ and } E)$

7. A card is drawn from the bag at the right.

a. How many outcomes are there?

b. $P(3 \text{ or } a \ 5)$

c. $P(\text{even or a prime})$

d. $P(3 \text{ or less than } 2)$

8. In a bag there are 2 red marbles, 3 white marbles and 5 blue marbles. Once a marble is selected, it is NOT replaced. Find the following probabilities:

a. $P(\text{red, then white})$

b. $P(\text{blue, then red})$

c. $P(\text{red, red, red})$

d. $P(\text{blue, blue, white})$

9. In a bag there are 2 red marbles, 3 white marbles and 5 blue marbles. Once a marble is selected, it IS replaced. Find the following probabilities:

a. $P(\text{white, blue})$

b. $P(\text{white, white})$

c. $P(\text{blue, white, red})$

d. $P(\text{blue, blue, blue})$

10. A jar contains 4 white chips, 5 purple chips, and 1 black chip. Chips are selected randomly one at a time, and are not replaced. Find the probability of the following.

a. $P(\text{purple then black})$

b. $P(\text{black then white})$

c. $P(\text{white then purple})$

d. $P(\text{purple then white})$

e. $P(2 \text{ whites})$

f. $P(2 \text{ purples})$

g. $P(2 \text{ black chips})$

h. $P(\text{white, then purple, then black})$

i. $P(3 \text{ whites})$

Sometimes you just need to list out the sample space to get the probability.

Let's say Amy and Bob are married and hope to have 3 children one day. What is the probability that they will have two girls and a boy (in any order)?

Here's another one:

You flip a coin four times. What is the probability that you'll get 3 heads and a tail (in any order)?

DICE DIFFERENCES

This game is for two players.

RULES

1. Decide who will be player A and who will be player B.
2. Decide who goes first and alternate turns.
3. On your turn, do the following:
 - Roll two dice.
 - If the values are different, subtract the lesser value from the greater value.
 - Record the difference in the boxes below (see sample game).
 - If the values are the same, write a zero.
4. Play at least 3 games.

SCORING

- Player A scores a point if the difference is 0, 1, or 2.
- Player B scores a point if the difference is 3, 4, or 5.
- The winner of the game is the first to score 10 points.

Sample game:

0	2	1	2	3	3	1	0	1	4
1	2	1	3						

Player A gets 10 points, so player A wins.

Player B got 4 points.

GAME 1:

Game 2:

Game 3:

Do you think this game is fair?

What makes a game fair?

Fill in the chart below by subtracting the numbers on top and side.

subtract	1	2	3	4	5	6
1	<i>0</i>					
2						
3						
4						
5						
6						

Write the probability of each outcome:

A difference of 5: _____

A difference of 4: _____

A difference of 3: _____

A difference of 2: _____

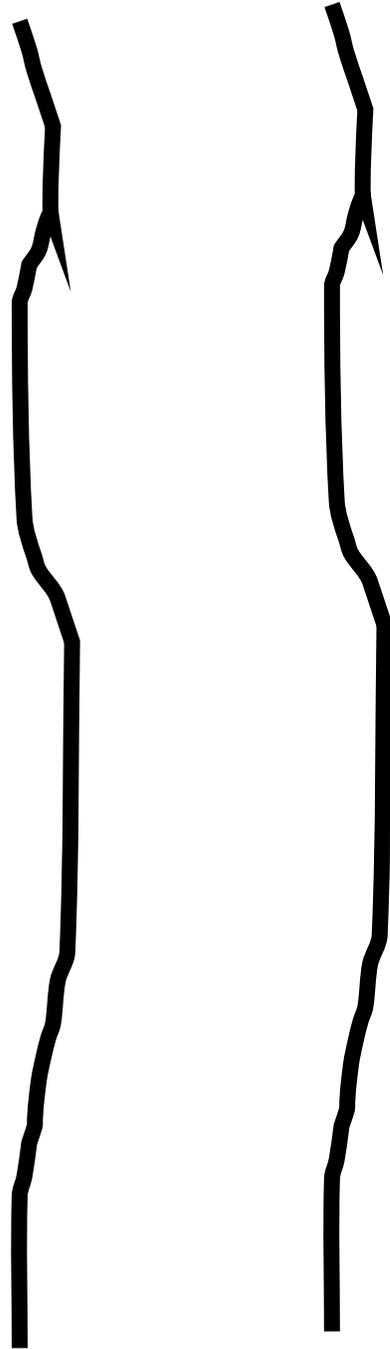
A difference of 1: _____

A difference of 0: _____

How could you change the rules to make this game fair?

CROSSING THE RIVER GAME BOARD

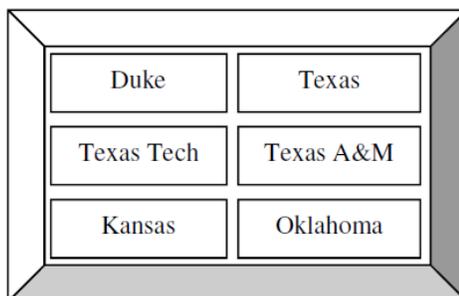
2
3
4
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12



2
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UNIT 7 STUDY GUIDE

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



1.	P(Duke)		2.	P(Not Kansas)	
3.	P(Texas or Texas A&M)		4.	P(a school with a letter "E")	
5.	P(a college in Texas)		6.	P(a school not containing the letter "T")	

Mrs. Loewen has a collection of 30 hats. 12 are brown, 6 are blue, 8 are red, and 4 are white. She picks one out of her collection without looking. Find the probability of each event.

7.	P(White)		8.	P(Not White)	
9.	P(Brown OR Red)		10.	P(Brown OR Gray)	

11.	What is the probability that your birthday will be on a day of the week starting with the letter "T"?	
12.	There are 26 letters in the alphabet. What is the probability that a letter chosen at random is in the word "SURVIVOR"?	
13.	If you draw a card out of a normal deck (52 cards) 91 times (and always then return it), how many times would you expect to get a red 5, 6, 7, or 8?	
14.	If you roll a die 24 times, about how many times would you expect to get a number greater than 2?	

For each situation make a **tree diagram below** to show all of the possible outcomes.

		Number of outcomes
15.	Choosing oatmeal, chocolate chip, or peanut butter cookies and then taking 1 or 2 of them	
16.	Math, LA, SS, and Science: Choosing one as your favorite subject and one as your least favorite	

17-22. In Survivor everyone has an equal chance of winning. The last 50 times we have played, you have won 7 times. Use the Venn Diagram below to correctly place all of the items. You may just write the letter.

A. $\frac{7}{50}$

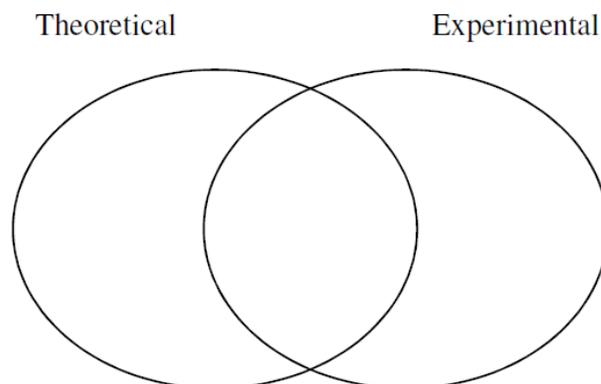
B. $\frac{1}{\text{people in your class}}$

C. a form of probability

D. best number to use to help predict how many times you will win in the next 1000 games

E. based on actual results from playing the game

F. less than 15%



Find the total number of possible outcomes in each situation. You may use either a tree diagram or The Counting Principle. *Show your work as your notebook paper even if you think you can solve it in your head!*

23.	Choosing between 8 different flavors of potato chips which all come in small, medium, or large sizes.	
24.	Building Mr. Potato Head with a choice of 4 different ears, 6 eyes, 5 noses, and either a happy or a sad mouth.	
25.	Choosing a 4-digit password using the numbers 1 to 9 without repeating any digits.	
26.	Creating someone's face out of clay in art class and choosing between of 5 different types of ears, 3 types of eyes, 4 different noses, and either a happy or a sad mouth.	
27.	At McDonald's you have a choice of 5 different Kids' Meals that can come with 7 different sodas. In each meal you get one prize: a yo-yo, a car, or a pen.	
28.	Choosing out of 10 names a first, second, and third prize winner for a door prize.	

29.	<p>There are 3 red marbles, 3 blue marbles, and 1 green marble in a bag. A marble is drawn at random and not replaced. Then a second marble is drawn.</p> <p>Which choice shows all the possible outcomes?</p> <p>A. red/blue, red/green, blue/red, blue/green, green/red, green/blue</p> <p>B. red/red, red/blue, red/green, blue/red, blue/blue, blue/green, green/red, green/blue, green/green</p> <p>C. red/blue, red/green, blue/red, blue/green, green/red, green/green</p> <p>D. red/red, red/blue, red/green, blue/red, blue/blue, blue/green, green/red, green/blue</p>	
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You flip a coin and role a regular six-sided die. Find the probability of each event.



1.	P(tails, 5)		2.	P(heads, not 3)	
3.	P(heads, even number)		4.	P(not tails, less than 7)	

The following cards are cut and placed in a box:

S	U	R	V	I	V	O	R	S
---	---	---	---	---	---	---	---	---

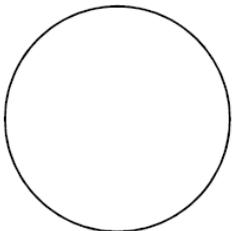
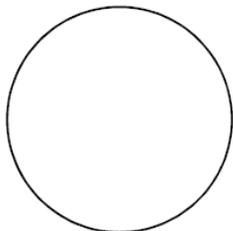
Mr. Mangham draws two or three cards and does not replace them. Find the probability of each event.

5.	P(V, V)		6.	P(S, R)	
7.	P(Vowel, Consonant)		8.	P(I, O)	
9.	P(S, I, S)		10.	P(U, I, O)	

11. When you spin the two spinners below your chance of spinning a “B” and then a “T” is exactly $\frac{1}{3}$.

Design the two spinners. Each spinner must have at least 5 equally likely outcomes and contain at least two different letters.

$$P(B,T) = \frac{1}{3}$$

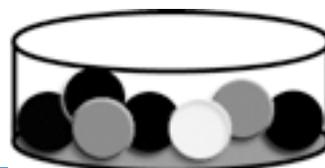
	
Probability:	Probability:

Example 1:

There are three choices of jellybeans – grape, cherry and orange. If the probability of getting a grape is $\frac{3}{10}$ and the probability of getting cherry is $\frac{1}{5}$, what is the probability of getting orange?

Example 2:

The container below contains 2 gray, 1 white, and 4 black marbles. Without looking, if Eric chooses a marble from the container, will the probability be closer to 0 or to 1 that Eric will select a white marble? A gray marble? A black marble? Justify each of your predictions.



Example 3:

Suppose we toss a coin 50 times and have 27 heads and 23 tails. We define a head as a success.

RELATIVE FREQUENCY – How often something happens divided by all outcomes.

Example: if your team has won 9 games from a total of 12 games played:

* the Frequency of winning is 9

* the Relative Frequency of winning is $9/12 = 75\%$

The relative frequency of heads is: _____

The theoretical frequency of heads is: _____

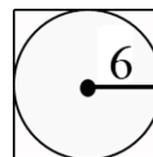
Example 4:

A bag contains 100 marbles, some red and some purple. Suppose a student, without looking, chooses a marble out of the bag, records the color, and then places that marble back in the bag. The student has recorded 9 red marbles and 11 purple marbles. Using these results, predict the number of red marbles in the bag.

Example 5:

If Mary chooses a point in the square, what is the probability that it is not in the circle?

Write your answer as a percent rounded to the nearest whole percent.



Example 6:

Jason is tossing a fair coin. He tosses the coin ten times and it lands on heads eight times. If Jason tosses the coin an eleventh time, what is the probability that it will land on heads?

Example 7:

How many ways could the 3 students, Amy, Brenda, and Carla, come in 1st, 2nd and 3rd place?

Example 8:

A fair coin will be tossed three times. What is the probability that two tails and one heads in any order will result?

Example 9:

Show all possible arrangements of the letters in the word FRED using a tree diagram. If each of the letters is on a tile and drawn at random, what is the probability of drawing the letters F-R-E-D in that order?

What is the probability that a “word” will have an F as the first letter?