

		Math 2 - Honors
Day	Date	Unit 8 Topics
1	5/18/18	L1: Ways to Count – Venn Diagrams & Two Way Tables
2	5/21	L2: Intro to Probability
3	5/22	L3: Independent vs. Dependent Events
4	5/23	L4: Inclusive vs. Exclusive Events
5	5/24	L5: Experimental vs. Theoretical Probability
6	5/25	QUIZ

QUIZ DATE: _____

Math 2 – Honors

Unit 8 – Probability

Lesson 1 → Ways to Count

Name _____

Date _____ Pd _____

➤ Before we can calculate the probability of an event taking place, we must first be able to count the number of outcomes that are possible from a given experiment.

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

List the sample space, S , for each of the following:

1. Rolling one die.	2. Drawing one marble from a jar containing 1 green marble, 2 blue marbles, and 2 pink marbles.
3. Tossing two coins.	4. Drawing two cards from a set of cards containing the letters E, F, G, H , and I .

❖ Ways to Count the Size of the Sample Space:

- **Tree Diagram:** Visual way to show all the possible outcomes

1. A student is to roll a die and then flip a coin. How many possible outcomes will there be?

2. At Cougar Club meeting, there were four drinks you could choose from: OJ, Coke, Sprite, and water and three snacks you could choose from: peanuts, fruit, and cookies. Each student may only have one drink and one snack. How many possible outcomes are possible?

- **Fundamental Counting Principle:**

- ✓ Determines the number of possible outcomes when there are two or more characteristics.
- ✓ If an event has m possible outcomes and another independent event has n possible outcomes, then there are $m \cdot n$ possible outcomes for the two events together.

EX1: A student is to roll a die and then flip a coin. How many possible outcomes will there be?

EX2: At a Cougar Club meeting, there were four drinks you could choose from: OJ, Coke, Sprite, and water and three snacks you could choose from: peanuts, fruit, and cookies. Each student may only have one drink and one snack. How many combinations are possible?

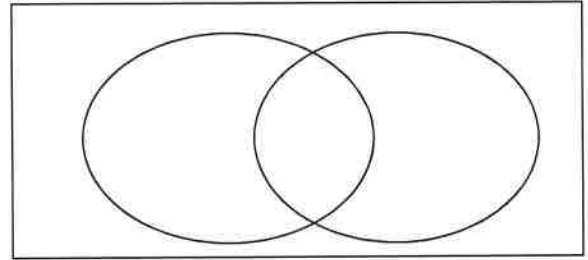
EX3: In a class of 60 students, 21 sign up for chorus, 29 sign up for band, and 5 take both. Fifteen students in the class are not enrolled in either band or chorus.

A. Put this information into a Venn diagram. If the sample space, S , is the set of all students in the class, let students in chorus be set A and students in band be set B .

B. What is $(A \cap B)$? _____

C. What is $(A \cup B)$? _____

D. What is $(A \cup B)^c$? _____



EX4: A survey of clowns revealed the following information:

- 24 wear funny shoes
- 20 wear both of these items
- 28 wear a big nose
- 2 wear neither of these things

A. Put this information into a Venn diagram. If the sample space, S , is the set of all clowns surveyed, let funny shoes be set A and noses be set B .

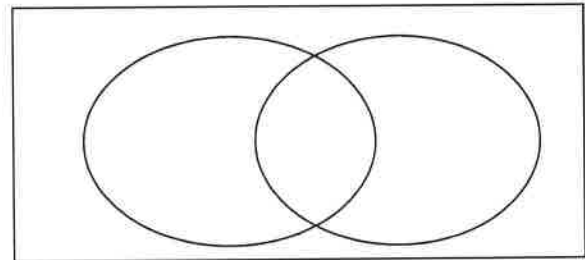
B. What is $(A \cap B)$? _____

C. What is $(A \cup B)$? _____

D. What is $(A \cup B)^c$? _____

E. How many clowns were surveyed? _____

F. How many clowns **did not** wear a big nose? _____



EX5: A survey of 80 sophomores at a certain college showed the following:

36 take English

32 take History

32 take Political Science

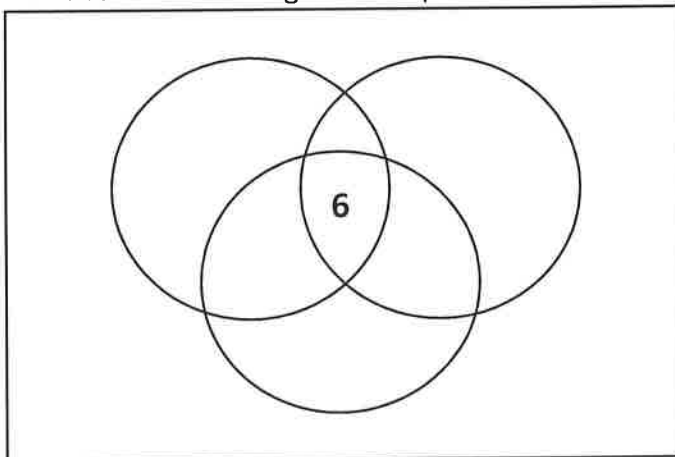
16 take History and English

16 take Political Science & History

14 take Political Science & English

6 take all three

➤ Draw a Venn Diagram to represent the number of students in each category (**Start in the Middle**):



How many students:

- A) Take English and neither of the other two courses?
- B) Take none of the three courses?
- C) Take History, but neither of the other two courses?
- D) Take Political Science and History but not English?
- E) Do not take Political Science?

Math 2 – Honors
Unit 8 – Probability
Lesson 1 → Ways to Count HOMEWORK

Name _____
Date _____ Pd _____

➤ *What is the size of the sample space for each situation?*

1. There are 2 entry doors and 3 staircases in your school. How many ways are there to enter the building and go to the second floor?
2. Ordering a sandwich with the following choices: wheat or rye bread, ham or turkey, swiss or cheddar cheese.
3. The months in which your birthday could fall.
4. A spinner has 4 equally likely regions numbered 1 to 4. The arrow is spun twice.
5. Tanya went shopping and bought the following items: one red t-shirt, one blue blouse, one white t-shirt, one floral blouse, one pair of khaki capri pants, one pair of black pants, one pair of white capri pants, and one pair of denim shorts. How many outfits are possible?
6. There are 3 trails leading to Camp A from your starting position. There are 3 trails from Camp A to Camp B. How many different routes are there from the starting position to Camp B?
7. A jar contains 2 red, 2 green and 1 blue beads. Two beads are drawn with replacement. How many outcomes are possible?
8. A team of 8 basketball players needs to select a captain and a co-captain. How many outcomes are possible?
9. A baseball team has 12 players. How many different batting orders of 9 players are possible?
10. A group of 45 people are going to run a race. The top three runners earn gold, silver and bronze medals. How many different ways can the medals be awarded?
11. How many different pairs of shoes can you get from a store that has eight different styles in three colors and 8 sizes?
12. How many 3-digit numbers can be formed by rearranging the digits in the number 916?
13. How many 6 figure codes can be created if the first set of 3 figures are letters and the second set of 3 figures are numbers 0 – 9? (assume letters/numbers can repeat)
14. Refer to question #13. Find the number of codes if the letters/numbers can **NOT** repeat.
15. How many **four-letter** sequences can be made from the letters in the word: **UPHOLD**?
16. If you can get 3 kinds of pens in 2 ink colors, how many different pens are available?
17. How many ways can you rearrange the word: **STEAL**?
18. There is a 12 question test with 4 multiple choice options for each question. How many ways can a student randomly fill in the answer choices?

➤ *Create a Venn Diagram for each situation to help answer the question.*

21. In a survey of a Math 2 class, it was found that 20 students preferred Crest, 14 students preferred Colgate, and 10 students use both brands. How many students participating in the survey use only Colgate?
22. There are 80 homes in a subdivision. 50 of the homes have vinyl siding. 20 homes have automatic sprinkler systems. 15 of the homes have both. How many of the homes have neither vinyl siding nor a sprinkler system?
23. An investigation of a number of automobile accidents revealed the following information: 18 accidents involved texting and excessive speed, 26 accidents involved texting, 12 accidents involved excessive speed but no texting, and 21 accidents involved neither texting nor excessive speed. How many accidents were investigated?
24. There are 82 people collecting signatures to protest the destruction of the rain forests. If there are 47 males and 28 teenagers, 13 of whom are females, then how many non-teenage females are collecting signatures?
25. A survey was conducted of the students who leave campus for lunch each day and the following data was obtained: 130 students eat at Wendy's, 180 students eat at Subway, 280 students eat at Cookout, 70 students eat at Wendy's and Subway, 120 students eat at Wendy's and Cookout, 90 students eat at Cookout and Subway, 60 students eat at all three restaurants. How many students do not go to all three restaurants?
26. Several students at WFHS were surveyed about their favorite subjects: 62 liked math, 47 liked English, 32 liked science, 17 liked math and science, 20 liked math and English, 12 liked science and English, 5 liked all three subjects, 50 students didn't like any subject. How many students were interviewed?

27. A survey of 64 informed voters revealed the following information:

45 believe that Elvis is still alive

49 believe that they have been abducted by space aliens

42 believe both of these things

How many voters believe **neither** of these things?

➤ Use a two-way table to help you answer each question.

28.

	8 th grade	9 th grade	Total
Soccer	40		145
Basketball			
Total		142	266

A) How many 8th grade students are there?

B) How many 9th grade students choose soccer?

C) How many students choose basketball?

29.

Students currently taking Math 2 (H)		Math 3 (H)	Math 3	Math 2	Total
	Male	45			85
	Female			14	
	Total		43	22	160

A) How many female students are there?

B) How many students will take Math 3 (H)?

C) How many male students will repeat Math 2?

30. Android vs. I Phone

	Android	iPhone	Total
Male	2		10
Female		17	18
Total			

A) How many students from this class prefer the Android?

B) How many students from this class prefer the iPhone?

C) How many students are female?

D) How many students are male?

E) How many female students prefer the Android?

F) How many male students prefer the iPhone?

Probability of an Event: $P(E) = \frac{\text{Number of Favorable Outcomes}}{\text{Total Number of Outcomes}}$

Your answer can be written as a _____ or as a _____.

Note that $P(A^c)$ is every outcome **except (or not)** A, so we can find $P(A^c)$ by finding _____.

- An experiment consists of tossing three coins.
 1. List the sample space for the outcomes of the experiment: _____
 2. Find the following probabilities:
 - a. $P(\text{all heads})$ _____
 - b. $P(\text{exactly two tails})$ _____
 - c. $P(\text{no heads})$ _____
 - d. $P(\text{at least one tail})$ _____

- A bag contains six red marbles, four blue marbles, two yellow marbles and 3 white marbles. One marble is drawn at random.
 3. List the sample space for this experiment: _____
 4. Find the following probabilities:
 - a. $P(\text{red})$ _____
 - b. $P(\text{blue or white})$ _____
 - c. $P(\text{not yellow})$ _____
 - d. $P(\text{red, blue or yellow})$ _____

- A card is drawn at random from a standard deck of cards.
 5. Find the following probabilities:
 - a. $P(\text{heart})$ _____
 - b. $P(\text{black card})$ _____
 - c. $P(2 \text{ or jack})$ _____
 - d. $P(\text{not a heart})$ _____

- Two dice are rolled. Complete the chart to show the possible outcome on each roll.

	1	2	3	4	5	6
1						
2						
3						
4						
5						
6						

- Then complete the chart to show the sum for each roll.

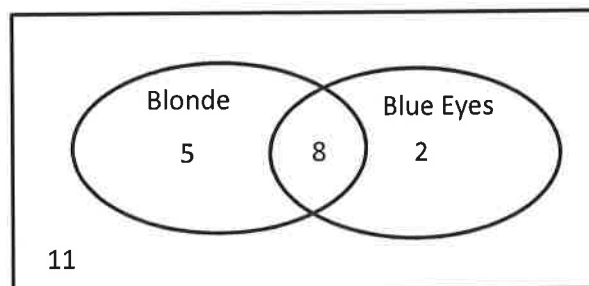
	1	2	3	4	5	6
1						
2						
3						
4						
5						
6						

6. Find the following probabilities:

- a. $P(\text{sum of } 8)$ _____
- b. $P(\text{sum of } 13)$ _____
- c. $P(\text{sum} > 9)$ _____
- d. $P(\text{sum} < 5)$ _____

- Given the Venn Diagram below, find the probability of the following if a student was selected at random:

- a. $P(\text{blonde hair})$ _____
- b. $P(\text{blonde hair and blue eyes})$ _____
- c. $P(\text{blonde hair or blue eyes})$ _____
- d. $P(\text{not blue eyes})$ _____



- The following two-way table represents the data students collected on gender and whether the student had pierced ears for the 178 people in the class.

Gender	Pierced Ears?		Total
	Yes	No	
Female	19	71	90
Male	84	4	88
Total	103	75	178

Let A : Male and Let B : Pierced Ears

- a. $P(B) =$ _____ b. $P(A \text{ and } B) =$ _____ c. $P(A \text{ or } B) =$ _____

- In an apartment complex, 40% of residents read USA Today. Only 25% read the New York Times. Five percent of the residents read both papers. Suppose we select a resident of the complex at random and record which of the two papers the person reads.

		USA Today		Total
		Yes	No	
NY Times	Yes			
	No			
	Total			

- a. $P(\text{person reads at least one of the two papers}) =$ _____
- b. $P(\text{person doesn't read either of the two papers}) =$ _____

➤ **Odds:** The odds of an event occurring are equal to the ratio of **favorable outcomes** to **unfavorable outcomes**.

$$\text{Odds} = \frac{\text{favorable outcomes}}{\text{unfavorable outcomes}} = \frac{\# \text{ times an event happens}}{\# \text{ of times an event does not happen}}$$

- Example: The weather forecast for Saturday says there is a 75% chance of rain.

- a. What is the probability that it will rain on Saturday? _____
- b. What is the probability that it will not rain on Saturday? _____
- c. If the favorable outcome in this problem is that it rains, then $\text{Odds}(\text{rain}) =$ _____

- Example: What are the **odds** of drawing an ace at random from a standard deck of cards?

1) Suppose you have a standard deck of 52 cards and you draw one card. Let

A : draw a 7 B : draw a Diamond
--

A. Find the probability of $A \cap B$ (7 of diamonds):

B. Find the probability of $A \cup B$ (7 or a diamond):

2) 2 dice are tossed.

A. What is the probability of obtaining a sum equal to 6?

B. What are the **odds** of obtaining a sum equal to 6?

C. What is the probability of obtaining a sum less than 6?

D. What is the probability of obtaining a sum of at least 6?

3) Suppose you have a jar of candies: 4 red, 5 purple, and 7 green.

Find the following probabilities of the following events:

A. Selecting a red candy

E. Selecting any color except a green candy

B. Selecting a purple candy

F. Find the **odds** of selecting a red candy

C. Selecting a yellow candy

G. Find the **odds** of selecting a purple or green candy

D. Selecting a green or red candy

4) A spinner has sections that are red, blue, yellow and green

A. What is the sample space for a single spin on the spinner?

B. What is the sample space for 2 spins on the spinner? (There should be 16 outcomes.)

C. If the spinner is equally likely to land on each color, what is the probability of landing on one red section in one spin?

D. What is the probability of landing on a primary color in one spin?

E. What is the probability of landing on green sections both times in two spins?

5) Consider the throw of a die experiment. Let

A : observe an even number B : observe a number \leq to 3
--

A. Find the probability of $A \cap B$ (even number which is less than or equal to 3):

B. Find the probability of $A \cup B$ (even number or a number less than or equal to 3):

C. Find the **odds** of A .

D. Find the **odds** of B .

6) The following two way table has information regarding the different sports some students got to choose:

	9 th	10 th	Total
Soccer	40		145
Basketball			
Total		142	266

- A. What is the probability of choosing a 10th grade student given that he plays basketball?
 B. What is the probability of choosing a soccer player given that he is a 9th grader?

7) A total of 540 customers, who frequented an ice cream shop, responded to a survey asking if they preferred chocolate or vanilla ice cream.

- 308 of the customers preferred chocolate ice cream
- 263 of the customers were female
- 152 of the customers were male who preferred vanilla ice cream

	Chocolate	Vanilla	Total
Male			
Female			
Total			

➤ What is the probability that a customer chosen at random is a male OR prefers vanilla ice cream?

8) Jack is a student in Wake Forest High School. He noticed that a lot of the students in his math class were also in his chemistry class. In fact, of the 60 students in his grade, 28 students were in his math class, 32 students were in his chemistry class, and 15 students were in both his math class and his chemistry class. He decided to calculate what the probability was of selecting a student at random who was either in his math class or his chemistry class, but not both. Draw a Venn diagram and help Jack with his calculation.

9) Brenda did a survey of the students in her classes about whether they liked to get a candy bar or a new math pencil as their reward for positive behavior. She asked all 71 students she taught, and 32 said they would like a candy bar, 25 said they wanted a new pencil, and 4 said they wanted both.

	Pencil	No Pencil	Total
Candy Bar			
No Candy Bar			
Total			

If Brenda were to select a student at random from her classes, what is the probability that the student chosen would want:

- A. a candy bar or a pencil?
 B. neither a candy bar nor a pencil?

Math 2 – Honors
Unit 8 – Probability
Lesson 3 → Independent & Dependent Events

Name _____
Date _____ Pd _____

- **Independent Events:** Two events are independent when one event has *no effect* on the probability of the other event occurring.
- **Dependent Events:** Two events are dependent if the outcome or probability of the first event *affects* the outcome or probability of the second.

Suppose a die is rolled and then a coin is tossed.

- Explain why these events are independent: _____

	1	2	3	4	5	6
Head						
Tail						

How can you find the total outcomes of the sample space **WITHOUT** writing it out? Remember the Fundamental Counting Principle.

- How many outcomes are there for rolling the die? _____
- How many outcomes are there for tossing the coin? _____
- How many outcomes are there in the sample space of rolling the die and tossing the coin? _____
- Use the table above to find the following probabilities:
 1. $P(\text{rolling a } 3) =$ _____
 2. $P(\text{Tails}) =$ _____
 3. $P(\text{rolling a } 3 \text{ AND getting tails}) =$ _____
 4. $P(\text{rolling an even \#}) =$ _____
 5. $P(\text{heads}) =$ _____
 6. $P(\text{rolling an even AND getting heads}) =$ _____

MULTIPLICATION RULE of Probability for Independent Events

The probability of two independent events occurring can be found by the following formula:

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

Examples:

- At City High School, 30% of students have part-time jobs and 25% of students are on the honor roll. What is the probability that a student chosen at random has a part-time job and is on the honor roll?
Write your answer in context.

- The following table represents data collected from a grade 12 class: **Plans after High School**

Gender	University	Community College	Total
Males	28	56	84
Females	43	37	80
Total	71	93	164

✓ Suppose 1 student was chosen at **random** from the grade 12 class.

(a) What is the probability that the student is female? _____

(b) What is the probability that the student is going to a university? _____

(c) What is the probability that the student is female and going to a university? _____

✓ Now suppose 2 people each randomly chose 1 student from the grade 12 class. Assume that it's possible for them to choose the same student.

(c) What is the probability that the first person chooses a student who is female and the second person chooses a student who is going to university? _____

- Suppose a card is chosen at random from a deck of cards, **replaced**, and then a second card is chosen.

(a) Would these events be independent? How do we know? _____

(b) What is the probability that both cards are 7s? _____

Recall Dependent Events: Two events are dependent if the outcome or probability of the first event affects the outcome or probability of the second.

Example 4: Determine whether the events are **independent** or **dependent**:

- Selecting a marble from a container and selecting a jack from a deck of cards. _____
- Rolling a number less than 4 on a die and rolling a number that is even on a second die. _____
- Choosing a jack from a deck of cards and choosing another jack, without replacement. _____
- Winning a hockey game and scoring a goal. _____

MULTIPLICATION RULE of Probability for Dependent Events

The probability of two dependent events occurring can be found by the following formula:

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

Example 5: A random sample of parts coming off a machine is done by an inspector. He found 5 out of 100 parts are bad on average. If the inspector were to do a new sample, what is the probability that he picks a bad part and then picks another bad part if he doesn't replace the first part?

Example 6: Independent vs. Dependent Probabilities

INDEPENDENT

A box contains 4 red marbles and 6 purple marbles. You are going to choose 3 marbles with replacement. What is the probability of drawing 2 purple marbles and 1 red marble in succession (aka in order)?

DEPENDENT

A box contains 4 red marbles and 6 purple marbles. You are going to choose 3 marbles without replacement. What is the probability of drawing 2 purple marbles and 1 red marble in succession (aka in order)?

What is the probability of first drawing all 4 red marbles in succession and then drawing all 6 purple marbles in succession *without replacement*?

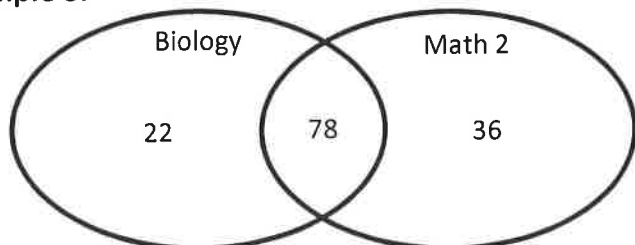
*** Two events (A & B) are independent if $P(A) = P(A/B)$ "read as the probability of A given that B has happened."

Example 7:

	Orders salad	Orders sandwich	Total
Drinks water	8	16	24
Drinks diet soda	6	12	18
Total	14	28	42

Are the events **A: drinking water** and **B: ordering salad** independent?

Example 8:



Are taking **A: Biology** and taking **B: Math 2** independent?

Math 2 – Honors
Unit 8 – Probability
Lesson 3 → Independent & Dependent Events HOMEWORK

Name _____
Date _____ Pd _____

- Determine which of the following are examples of *Independent* or *Dependent* events.
 - Rolling a 5 on one die and rolling a 5 on a second die.
 - Choosing a cookie from the cookie jar and choosing a jack from a deck of cards.
 - Selecting a book from the library and selecting a book that is a mystery novel.
 - Going to the beach and playing in the ocean.
 - Getting unleaded gasoline for your car and getting diesel fuel for your car.
 - Choosing an 8 from a deck of cards, replacing it, and choosing a face card.
 - Choosing a jack from a deck of cards and choosing another jack, without replacement.
 - Being lunchtime and eating a sandwich.
- An elementary class consists of 12 boys and 10 girls. Six of the boys and 5 of the girls are wearing jeans. Are the events “wearing jeans” and gender independent?
- A coin and a die are tossed. Calculate the probability of getting a tails and a 5.
- In Tania's homeroom class, 9% of the students were born in March and 40% of the students have a blood type of O+. What is the probability of a student chosen at random from Tania's homeroom class being born in March and having a blood type of O+?
- If a baseball player gets a hit in 31% of his at-bats, what is the probability that the baseball player will get a hit in 5 at-bats in a row?
- What is the probability of tossing 2 coins one after the other and getting 1 head and 1 tail?
- 2 cards are chosen from a deck of cards. The first card is replaced before choosing the second card. What is the probability that they both will be clubs?
- 2 cards are chosen from a deck of cards. The first card is replaced before choosing the second card. What is the probability that they both will be face cards?
- If the probability of receiving at least 1 piece of mail on any particular day is 22%, what is the probability of *not* receiving any mail for 3 days in a row?
- Johnathan is rolling 2 dice and needs to roll a sum of 11 to win the game he is playing. What is the probability that Johnathan wins the game?

11. Thomas bought a bag of jelly beans that contained 10 red jelly beans, 15 blue jelly beans, and 12 green jelly beans. What is the probability of Thomas reaching into the bag and pulling out a blue or green jelly bean and then reaching in again and pulling out a red jelly bean? Assume that the first jelly bean is not replaced.
12. For question 11, what if the order was reversed? In other words, what is the probability of Thomas reaching into the bag and pulling out a red jelly bean and then reaching in again and pulling out a blue or green jelly bean *without replacement*?
13. What is the probability of drawing 2 face cards one after the other from a standard deck of cards *without replacement*?
14. There are 3 quarters, 7 dimes, 13 nickels, and 27 pennies in Jonah's piggy bank. If Jonah chooses 2 of the coins at random one after the other, what is the probability that the first coin chosen is a nickel and the second coin chosen is a quarter? Assume that the first coin is not replaced.
15. For question 14, what is the probability that neither of the 2 coins that Jonah chooses are dimes? Assume that the first coin is not replaced.
16. Jenny bought a half-dozen doughnuts, and she plans to randomly select 1 doughnut each morning and eat it for breakfast until all the doughnuts are gone. If there are 3 glazed, 1 jelly, and 2 plain doughnuts, what is the probability that the last doughnut Jenny eats is a jelly doughnut?
17. Steve will draw 2 cards one after the other from a standard deck of cards *without replacement*. What is the probability that his 2 cards will consist of a heart and a diamond?
18. A large lending institution gives both adjustable and fixed rate mortgages on residential property. It breaks residential property into three categories: single-family, condo, and multi-family. The accompanying table, sometimes called a joint probability table displays the probabilities for the problem:

	Single-Family	Condo	Multi-Family	Total
Adjustable	.40	.21	.09	
Fixed	.10	.09	.11	
Total				

- Are owning a condo and having an adjustable mortgage independent?

➤ **Mutually Exclusive Events:** two or more events that **cannot** occur at the same time.

- Suppose you are rolling a die. What is the probability that you roll an odd number or you roll a 2? _____
- Can these both occur at the same time? Why or why not? _____.
- The probability of two mutually **exclusive** events occurring at the same time, $P(A \text{ and } B)$, is _____.
- To find the probability of one of two **mutually exclusive** events occurring, use the following formula:

$$P(A \text{ or } B) = P(A) + P(B) \quad P(A \cup B) = P(A) \text{ or } P(B)$$

Examples:

- If you randomly chose one of the integers 1 – 10, what is the probability of choosing either an odd number or an even number?
 - Are these mutually exclusive events? Why or why not? _____
 - Complete the following statement: $P(\text{odd or even}) = P(\text{_____}) + P(\text{_____})$
 - Now fill in with numbers: $P(\text{odd or even}) = \text{_____} + \text{_____} = \text{_____}$
 - Does this answer make sense? _____

- Two fair dice are rolled. What is the probability of getting a sum less than 7 or a sum equal to 10? Are these events mutually exclusive? _____

Sometimes using a table of outcomes is useful. Complete the following table using the **sums** of two dice:

	1	2	3	4	5	6
1	2	3	4	5	6	7
2	3	4				
3	4					
4						
5						
6						

- $P(\text{getting a sum less than 7 OR sum of 10}) = P(\text{_____}) + P(\text{_____})$
- Now fill in with numbers: $P(\text{getting a sum less than 7 OR sum of 10}) = \text{_____}$

➤ **Mutually Inclusive Events:** two or more events that **can** occur at the same time.

- Suppose you are rolling a six-sided die. What is the probability that you roll an odd number or a number less than 4?
- Can these both occur at the same time? If so, when? _____
- To find the probability of one of two mutually inclusive events occurring, use the following formula:

$$P(\mathbf{A \text{ or } B}) = P(\mathbf{A \cup B}) = P(\mathbf{A}) + P(\mathbf{B}) - P(\mathbf{A \cap B})$$

- Calculate the probability of the above experiment use the rule: _____

Examples:

1. What is the probability of choosing a card from a deck of cards that is a club OR a ten?
 $P(\text{choosing a club or a ten}) =$

2. What is the probability of choosing a number from 1 to 10 that is less than 5 OR odd?

3. A bag contains 26 tiles with a letter on each, one tile for each letter of the alphabet. What is the probability of reaching into the bag and randomly choosing a tile with one of the first 10 letters of the alphabet on it OR randomly choosing a tile with a vowel on it?

A B C D E
F G H I J K
L M N O P
Q R S T U
V W X Y Z

4. A bag contains 26 tiles with a letter on each, one tile for each letter of the alphabet. What is the probability of reaching into the bag and randomly choosing a tile with one of the last 5 letters of the alphabet on it OR randomly choosing a tile with a vowel on it?

➤ Determine if the scenarios in #1-4 involve **exclusive** or **inclusive** events:

1. A spinner has an equal chance of landing on each of its eight numbered regions. After spinning, it lands in region 3 or 6.
2. A bag contains six yellow jerseys numbered one to six. The bag also contains four purple jerseys numbered one to four. You randomly pick a jersey. It is purple or has a number greater than 5.
3. A magazine contains 12 pages. You open to a random page. The page number is eight or ten.
4. A box of chocolates contains six milk chocolates and four dark chocolates. Two of the milk chocolates and three of the dark chocolates have peanuts inside. You randomly select and eat a chocolate. It is a milk chocolate and has no peanuts inside.

➤ Find each probability:

5. A magazine contains fourteen pages. You open to a random page. What is the probability of selecting a page number of three or seven?
6. A basket contains three apples, three peaches, and four pears. You randomly select a piece of fruit. What is the probability of selecting an apple or a peach?
7. You roll a fair six-sided die. What is the probability the die shows an even number or a number greater than three?
8. A box contains three red playing cards numbered one to three. The box also contains five black playing cards numbered one to five. You randomly pick a playing card. What is the probability of picking a card that is black or has an odd number on it?
9. CD's are in $\frac{1}{4}$ of all of the bags that are distributed at a party and DVD's are in $\frac{1}{3}$ of the bags. Assuming that all of the bags contain one item and that none of the bags contain both items, what is the probability of randomly choosing a bag that contains either a CD or a DVD?
10. A store gave away T-shirts with their store logo on them. Red T-shirts were chosen by 25% of the customers, blue T-shirts were chosen 60% of the customers, and black T-shirts were chosen by 15% of the customers. What is the probability that one randomly selected customer chose a red or black T-shirt?

11. Using a standard die, what is the probability of rolling a 2 **or** a 5?
12. Using a standard die, what is the probability of rolling an odd number or a number greater than 4?
13. A bag contains 4 blue marbles, 3 red marbles and 2 yellow marbles. If a marble is randomly selected, what is the probability of selecting a red or a blue marble?
14. A card is drawn from a standard deck of cards. What is the probability of selecting an ace **or** a face card?
15. Using a standard die, what is the probability of rolling an even number **or** a number less than 3?
16. One card is drawn from a standard deck. Find each probability:
- A. $P(\text{Queen or Black card})$
 - B. $P(\text{Five or a Club})$
 - C. $P(\text{Face card or a Red card})$
 - D. $P(\text{a Spade or a Diamond})$
17. On a certain day, the chance of rain is 40% in Chicago and 20% in Los Angeles. What is the probability that it will rain in Chicago **or** in Los Angeles on that day?
18. If a die is thrown, what is the probability that it will show a 3 or a multiple of 2?

Math 2 – Honors
Unit 9 – Probability
Lesson 5 → Theoretical vs. Experimental Probability

Name _____
Date _____ Pd _____

Theoretical Probability is what should happen in an ideal situation. $P(E) = \frac{\text{\# of favorable outcomes}}{\text{total \# of possible outcomes}}$

- What is expected to happen
- $P(\text{Tossing a coin and getting a head}) = \frac{1}{2}$

Experimental Probability is what actually happens when you do an experiment. $P(E) = \frac{\text{\# of times event occurs}}{\text{total \# of trials}}$

- Result of an experiment or a survey
- Tossing a coin 10 times and recording 3 heads and 7 tails:
 $P(\text{Getting a head}) = \frac{3}{10}$ $P(\text{Getting a tail}) = \frac{7}{10}$

Examples:





- 1) A baseball collector checked 350 cards in a case on the shelf and found that 85 of them were damaged. Find the **experimental** probability of the cards being damaged.

- 2) Jimmy rolls a die 30 times. He records that the number 6 was rolled 9 times.
 - A. According to Jimmy's records, what is the **experimental probability** of rolling a 6?
 - B. What is the **theoretical probability** of rolling a 6?

- 3) Antonia has 9 pairs (18) of white socks and 7 pairs (14) of black socks. Without looking, she pulls a black sock from the drawer. What is the probability that the next sock she pulls out will also be black?

- 4) Lenny tosses a nickel 50 times. It lands heads up 32 times and tails 18 times.
 - A. What is the **experimental** probability that the nickel lands tails?
 - B. What is the **theoretical** probability of a nickel landing on tails?

5) Amanda used a standard deck of 52 cards and selected a card at random. She recorded the suit of the card she picked, and then replaced the card. The results are in the table below.

Diamonds	
Hearts	
Spades	
Clubs	

- Based on her results, what is the **experimental** probability of selecting a heart?
- What is the **theoretical** probability of selecting a heart?
- Based on her results, what is the **experimental** probability of selecting a diamond or a spade?
- What is the **theoretical** probability of selecting a diamond or a spade?

6) Dale conducted a survey of the students in his classes to observe the distribution of eye color. The table shows the results of his survey.

Eye color	Blue	Brown	Green	Hazel
Number	12	58	2	8

- Find the experimental probability distribution for each eye color.

$$P(\text{blue}) = \underline{\hspace{2cm}} \quad P(\text{brown}) = \underline{\hspace{2cm}} \quad P(\text{green}) = \underline{\hspace{2cm}} \quad P(\text{hazel}) = \underline{\hspace{2cm}}$$

- Based on the survey, what is the **experimental** probability that a student in Dale's class has blue or green eyes?
- Based on the survey, what is the **experimental** probability that a student in Dale's class does not have green or hazel eyes?
- If the distribution of eye color in Dale's grade is similar to the distribution in his classes, about how many of the 360 students in his grade would be expected to have brown eyes?

Math 2 – Honors
Unit 8 – Probability
QUIZ Review #1

Name _____
 Date _____ Pd _____

1. Given the table below of students surveyed determine the following:

	Wearing Yellow	Not Wearing Yellow	Total
Blue Eyes	10	2	
Not Blue Eyes	30	20	
Total			

- A. $P(\text{Wearing Yellow}) =$ _____
- B. $P(\text{Blue Eyes}) =$ _____
- C. $P(\text{Not Wearing Yellow}) =$ _____
- D. $P(\text{Blue Eyes and Wearing Yellow}) =$ _____
- E. $\text{Odds}(\text{Blue Eyes}) =$ _____
- F. $\text{Odds}(\text{Not Wearing Yellow}) =$ _____

2. Given the table below of students surveyed determine the following:

	Plays Team Sport	Does not Play Team Sport	Total
Plays Instrument	8	3	
Does Not Play Instrument		7	
Total	10		

- A. $P(\text{Plays Sport}) =$ _____
- B. $P(\text{Plays Instrument}) =$ _____
- C. $P(\text{Does Not Play Sport}) =$ _____
- D. $P(\text{Plays Sport and Instrument}) =$ _____
- E. $\text{Odds}(\text{Plays a Sport}) =$ _____
- F. $\text{Odds}(\text{Plays Nothing}) =$ _____

3. Suppose you have a jar of candies: 4 red, 5 purple and 7 green. Find the odds of the following events:

- A. Find the **odds** of selecting a purple or green candy.
- B. Find the **odds** of selecting a red candy.

6. Suppose you have a bag with 3 white balls, 7 green balls and 5 red balls. You randomly select one:

- A. What are the **odds** of selecting a red ball?
- B. What are the **odds** of not selecting a red ball?

4. A single coin is tossed.

- A. What is the probability of tossing a head?
- B. What are the odds of tossing a head?
- C. What are the odds of tossing a tail?

7. You roll a die.

- A. What are the odds of rolling a number > 3 ?
- B. What are odds of rolling a multiple of 2?
- C. What are the odds of rolling a number that is not a 4?
- D. What are the odds of rolling a number divisible by 3?
- E. What is the probability that the number rolled is a 9?

5. Mel has 5 quarters and six dimes in his pocket. He pulls out a coin.

- A. What are the odds in favor of the coin being a quarter?
- B. What are odds in favor of the coin being a dime?

