GEOMETRY
UNIT 12 AGENDA
Probability
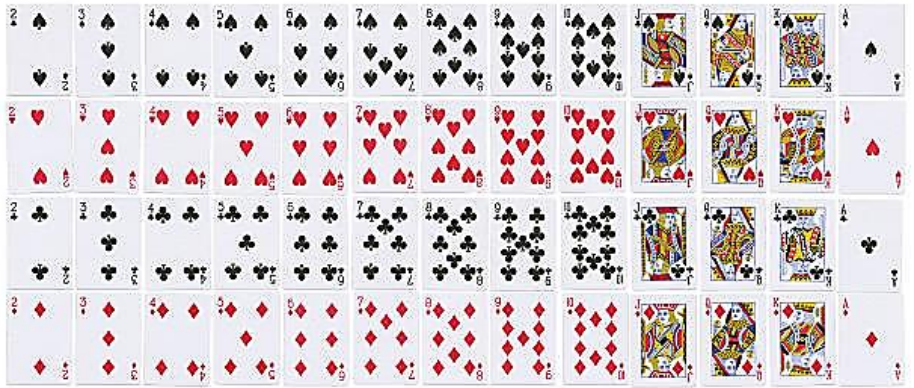
DATE	DAY	LESSON	PAGE	HOMEWORK
FRI 4/21	12.1	Counting Principle & Basic Probabilities Practice	1 – 2	DM 12.1 DUE THURSDAY
MON 4/24	12.2	Venn Diagrams & Set Notation	3 – 4	DM 12.1 DUE THURSDAY
TUES 4/25	12.3	Compound Probability: Mutually Exclusive vs Overlapping	5 – 7	DM 12.1 DUE THURSDAY
WED 4/26	12.4	Putting it all together/ Quiz Review	8 – 10	DM 12.1 DUE THURSDAY
THURS 4/27	12.5	**QUIZ! Good Luck!**		
FRI 4/28	12.6	Two Way Frequency Tables	11 – 12	DM 12.2 DUE FRIDAY
MON 5/1	12.7	Conditional Probability	13 – 15	DM 12.2 DUE FRIDAY
TUES 5/2	12.8	Independent vs Dependent events	16 – 19	DM 12.2 DUE FRIDAY
WED 5/3	12.9	Putting it All Together	20 – 21	DM 12.2 DUE FRIDAY
THURS 5/4	12.10	Test Review	22 – 25	DM 12.2 **& Test Review** DUE FRIDAY
FRI 5/5	12.11	**TEST! Good Luck!**		

Geometry DAY 12.1   Name: _____

Counting Principle & Basic Probability   Date: _____

The Fundamental Counting Principle

1. Your school cafeteria offers chicken or tuna sandwiches; chips or fruit; and milk, apple juice, or orange juice. If you purchase one sandwich, one side item, and one drink how many different lunches can you choose?

Tree Diagram:

Counting Principle:

2. At a sporting goods store, skateboards are available in 8 different deck designs. Each deck design is available with 4 different wheel assemblies. How many skateboard choices does the store offer?

3. A father takes his son, James, to Wendy's for lunch. He tells James he can get a 5 piece nuggets, a spicy chicken sandwich, or a single for the main entrée. For sides, he can get fries, a side salad, baked potato, or chili. And for drinks, he can get a frosty, coke, sprite, or an orange drink. How many options for meals does James have?

4. I-pods can vary the order in which songs are played. Your i-Pod currently only contains 8 songs. Find the number of orders in which the songs can be played. (this ends up being a factorial!!)

5. To decide on punishments, Dr. Bishop flips a coin (Heads- ISS, Tails- OSS). He flipped a coin 3 times on the first day of school. Draw a diagram.

Number of Outcomes _____

P(all ISS) _____

P(all OSS)   _____

P(1 ISS and 2 OSS) _____

P(2 ISS and 1 OSS) _____

Term	Definition	Example
Event	an action that has an outcome(s)	
Sample Space	the set of all possible outcomes	
Outcome	a single result in the sample space	

Term	Definition	Example
Random Event	Outcome is uncertain	
Probability	Likelihood that an event will occur	
Favorable Outcome	Number of times that a particular event occurs	

Formula

P(E) = _____
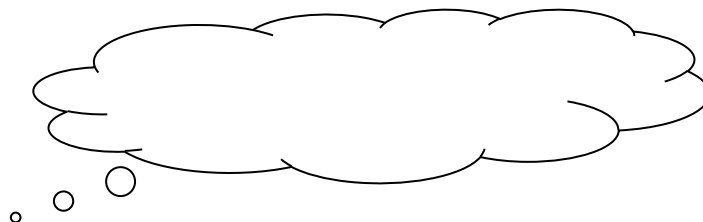
Let's Try Some!

1. A dice cube has 6 sides that are numbered 1 to 6. If the cube is thrown once, what is the probability of rolling an odd number?

2. If one letter is chosen at random from the word REFUSE, what is the probability the letter chosen will be an "E"?

3. The sides of a number cube have the numbers 2, 4, 8, 9, 4, and 7. If the cube is thrown once, what is the probability of rolling a 7?

4. A bag containing 12 red marbles, 10 green marbles, 2 yellow marbles, 19 blue marbles, and 9 purple marbles. What is the probability of pulling out a green marble?

5. In a survey of 3630 college students, 1162 stated that they cheated on an exam. If one of these college students is randomly selected, find the probability that he or she cheated on an exam.

Set Notation	Pronunciation	Meaning	Venn Diagram	Answer
$A \cup B$	"A union B"	Everything in both sets; to unite; Used in OR problems		
$A \cap B$	"A intersect B"	Only what is in common with both sets; Used in AND problems		
$\overline{A}$ or A'	"A complement"	Everything NOT in set A		
$(A \cup B)'$	"not A union B"	Everything NOT in set A or set B		
$(A \cap B)'$	" not A intersect B"	Everything NOT in common between set A and set B		

Hector has entered the following names in the contact list of his new cellphone: Alicia, Brisa, Steve, Don, and Ellis.

1. Draw a Venn diagram to represent this situation.

B: The name begins with a vowel

E: The name ends with a vowel
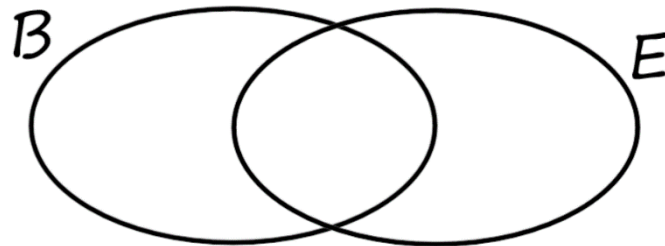
2. List the outcomes of B.

3. List the outcomes of E.

4. List the outcomes of $B \cap E$.

5. List the outcomes of $B \cup E$.

6. List the outcomes of B'.

7. List the outcomes of $(B \cup E)'$.

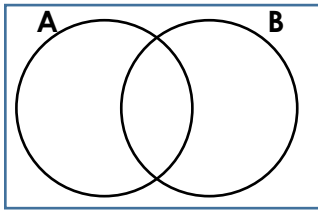YOU TRY: Find the union and intersection of the following sets:

1. A = {1, 2, 3, 4, 5}
    B = {1, 2, 9}

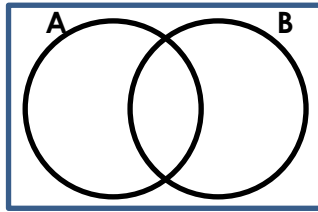2. M = {PS3, Xbox, Wii}
    N = {Wii, Xbox, PS3, PSP, DS}

3. S = {Tiger, Lion, Leopard, Cougar}
    T = {Wolf, Hyena, Rottweiler}
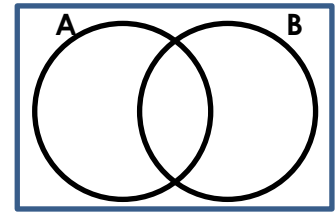
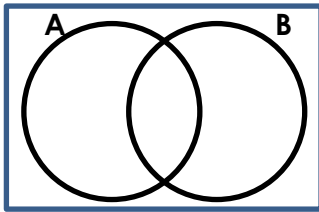**Shade in the appropriate area of the Venn Diagram.**

1. $A \cap B$

2. $A \cup B$
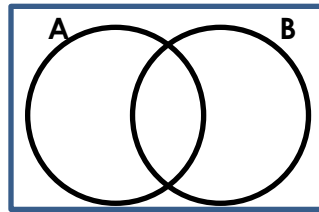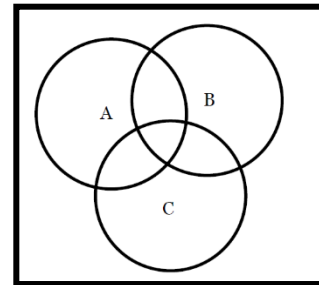
3. A'

A   B   A   B   A   B

4. $A \cap B'$

5. $(A \cup B)'$

6. $B \cup C$

A   B   A   B

A   B
C

Mr. Grisham took a poll of his student's favorite type of weather. The students had the choice of hot, cold, and/or rain/snow. The results are displayed in the Venn Diagram. Write your answer as a reduced fraction.

_____ 6. Find P(Cold).

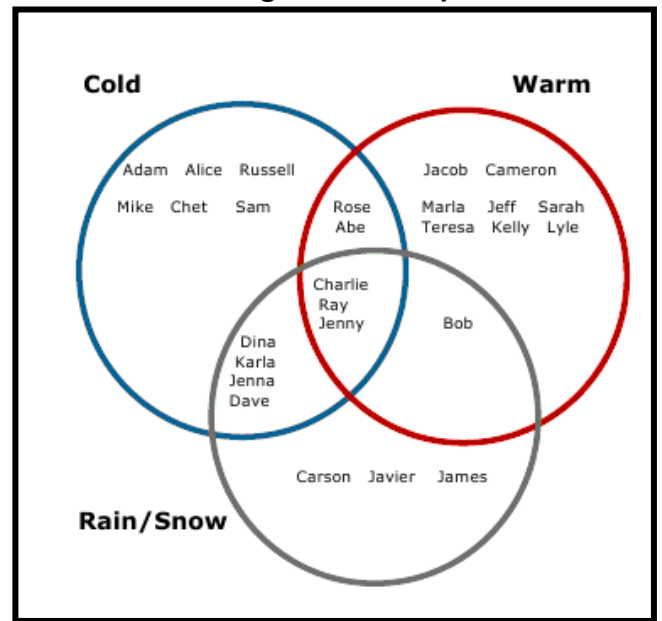_____ 7. Find P(Warm)'.

_____ 8. Find P(Cold ∩ Warm).

_____ 9. Find P(Warm ∩ Rain).

_____ 10. Find P(Warm ∩ Cold ∩ Rain).

_____ 11. Find P(Cold ∪ Warm).

Cold   **Warm**

Adam   Alice   Russell   Jacob   Cameron

Mike   Chet   Sam   Rose   Marla   Jeff   Sarah
                       Abe   Teresa Kelly Lyle

                  Charlie
                  Ray
                  Jenny   Bob
            Dina
            Karla
            Jenna
            Dave

            Carson   Javier   James
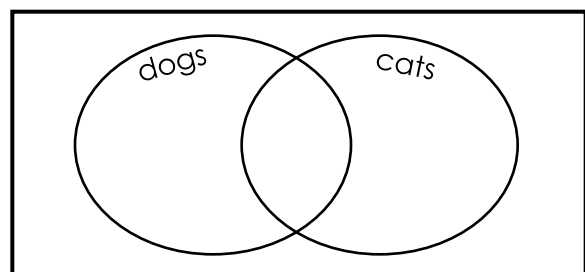
Rain/Snow

Fill in the venn diagram and answer the following questions. In your 30 student math class, 18 students have dogs, 14 students have cats, and 9 have both dogs and cats.

_____ 12. Find P(dogs).

_____ 13. Find P(dogs ∪ cats).

_____ 14. Find P(dogs ∩ cats)'.

dogs   cats

Name: _____ Date: _____

Compound Probability: Mutually Exclusive vs. Overlapping

Vocabulary:

✰ Compound Event

  ○ _____

✰ Mutually Exclusive

  ○ _____

✰ Overlapping

  ○ _____

Mutually Exclusive

The probability that one or the other of several events will occur is found by summing the individual probabilities of the events:

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

---

1. Find the probability that a girl's favorite department store is Macy's or Nordstrom.

   Find the probability that a girl's favorite store is not JC Penny's.

Macy's	0.25
Saks Fifth Ave.	0.20
Nordstrom	0.20
JC Penny's	0.10
Bloomingdale's	0.25

---

2. When rolling two dice, what is probability that your sum will be 4 or 5?

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

---

3. What is the probability of picking a queen or an ace from a deck of cards?

Standard Deck of 52 Playing Cards

Clubs	Spades	Hearts	Diamonds
A♣	A♠	A♥	A♦
2♣	2♠	2♥	2♦
3♣	3♠	3♥	3♦
4♣	4♠	4♥	4♦
5♣	5♠	5♥	5♦
6♣	6♠	6♥	6♦
7♣	7♠	7♥	7♦
8♣	8♠	8♥	8♦
9♣	9♠	9♥	9♦
10♣	10♠	10♥	10♦
Jack♣	Jack♠	Jack♥	Jack♦
Queen♣	Queen♠	Queen♥	Queen♦
King♣	King♠	King♥	King♦

Overlapping Events (Not Mutually Exclusive)

Probability that non-mutually exclusive events
A and B or both will occur expressed as:
P(A or B)

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

4. Find the probability that a person will drink both.

Survey of Office Workers

5. Find the $P(A \cup B)$.

Lewis High School
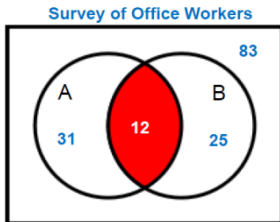
6. Find the probability of picking a king or a club in a deck of cards.
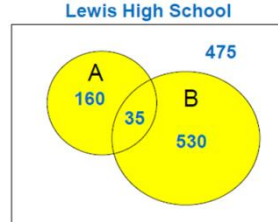
Standard Deck of 52 Playing Cards

Clubs	Spades	Hearts	Diamonds
A♣	A♠	A♥	A♦
2♣	2♠	2♥	2♦
3♣	3♠	3♥	3♦
4♣	4♠	4♥	4♦
5♣	5♠	5♥	5♦
6♣	6♠	6♥	6♦
7♣	7♠	7♥	7♦
8♣	8♠	8♥	8♦
9♣	9♠	9♥	9♦
10♣	10♠	10♥	10♦
Jack♣	Jack♠	Jack♥	Jack♦
Queen♣	Queen♠	Queen♥	Queen♦
King♣	King♠	King♥	King♦

7. Find the probability of picking a female or a person from Florida out of the committee members.

	Female	Male
Florida	8	4
Alabama	6	3
Georgia	7	3

8. When rolling 2 dice, what is the probability of getting an even sum or a number greater than 10?

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

9. Find the $P(\overline{A \cup B})$.

Lewis High School

10. Find the $P(A)'$.

Grayesville High Female Students
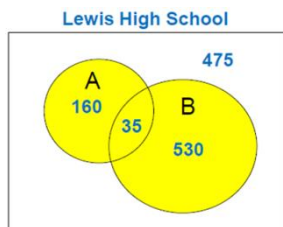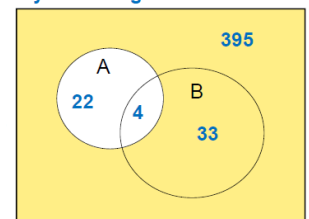
Practice Problems

Determine if the following events are mutually exclusive or overlapping.

_____ 1. The experiment is rolling a die.
          The 1st event: the number is greater than 3
   The 2nd event: the number is even.

_____ 2. The experiment is year in school.
          The 1st event: the person is a senior.
          The 2nd event: the person is a junior.

_____ 3. The experiment is answering multiple choice questions.
          The 1st event: the correct answer is chosen
          The 2nd event: the answer A is chosen.

_____ 4. The experiment is selecting a chocolate bar.
          The 1st event: the bar has nuts
          The 2nd event: the bar has caramel.

Use the Venn diagram to answer the following questions.

_____ 5.   P(A)

_____ 6.   P(B)

_____ 7.   P(B)'

_____ 8.   P(A ∪ B)

_____ 9.   P(A ∩ B)
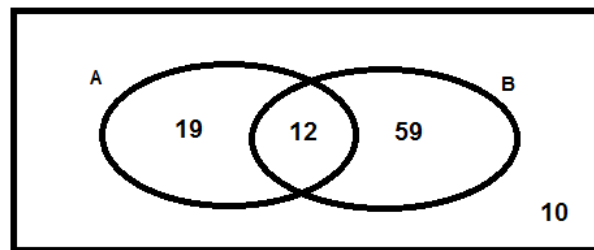
Use the data below to find each of the following probabilities.

Coolest Deals Sold at Ike's

Topping choice	Ice cream choice			
	Vanilla	Chocolate	Cookie dough	Mint chip
Sprinkles	9	12	16	14
Hot fudge	11	4	16	15
Caramel	10	12	18	15

_____ 10. P(Chocolate)

_____ 11. P(Chocolate)'

_____ 12. P(Sprinkles ∩ Cookie Dough)

_____ 13. P(Caramel ∪ Vanilla)

Geometry DAY 12.4   Name: _____
Quiz Review

Find the probability of the following scenarios.

1. A dice cube has 6 sides that are numbered 1 to 6. If the cube is thrown once, what is the probability of rolling at least a 4?

2. If one letter is chosen at random from the word MATHEMATICS, what is the probability the letter chosen will be an "T"?

3. A card is chosen out of a normal deck of cards. What is the probability that the card is a heart?

4. A bag containing 15 red marbles, 12 green marbles, 6 yellow marbles, 11 blue marbles, and 9 purple marbles. What is the probability of pulling out a yellow marble?

Suppose that you select a person at random from your school. Are these pairs of events mutually exclusive (ME) or overlapping(O)?

5. has ridden a roller coaster; has ridden a Ferris wheel   ME   O

6. has brown hair; has brown eyes   ME   O

7. is left-handed; is right-handed   ME   O

8. owns a classical music CD; owns a jazz music CD   ME   O

9. is a senior; is a junior   ME   O

10. has shoulder-length hair; is male   ME   O

Circle Mutually Exclusive or Overlapping for the following scenarios. Then find the probability.

11. What is the probability of rolling a die and landing on a 2 or a 5?   ME   O

12. What is the probability of rolling a die and landing on an even number or a number less than three?   ME   O

13. A card is drawn from a standard deck of 52 cards. What is the probability the card will be a red or an ace?   ME   O

14. What is the probability of pulling out a card from a standard deck that is a queen or a diamond?   ME   O

15. What is the probability of rolling a die and getting a 5 or an even number?   ME   O

16. Find the probability of pulling out a card from a standard deck that is red or a spade.   ME   O

Use the fundamental counting principle to answer the following questions.

17. You go to the local café for lunch and have a choice of 3 drinks, 3 sandwiches, 2 sides, and 4 desserts. If you get one of each category, how many different lunches could be made?

18. You toss a nickel 5 times. How many different outcomes are there?

19. How many outfits are possible with a choice of 6 shirts, 5 pairs of pants, and 4 pairs of shoes?

20. You are having dessert. You have a choice between chocolate cake, vanilla cake, apple pie, peach pie, and cherry pie to eat. To drink you have a choice between juice, milk, and coffee. How many combinations of one drink and one dessert are possible?

21. You are ordering a pizza, and want one type of meat and one type of vegetable on it. How many different types of pizza are possible if there are 6 choices for meat and 10 choices for vegetables?

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22. A group of senior citizens have won free vacation packages. The vacation to Bermuda is chosen by 25% of them, 60% choose Alaska, and 15% choose Costa Rica. What is the probability that one randomly chosen senior citizen chooses to vacation in Bermuda or Costa Rica?
*Hint: P(A ∪B) = P(A) + P(B)   Keep your answer as a percent.*

Use the general addition rule to compute the probability that if you roll two six-sided dice,

23. you get odd sum or a sum greater than 10.

24. you get even sum or a sum of 11.

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

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25. Of the 220 people who came into the Italian deli on Friday, 104 bought pizza and 82 used a credit card. Half of the people who bought pizza used a credit card. What is the probability that a customer bought pizza or used a credit card?
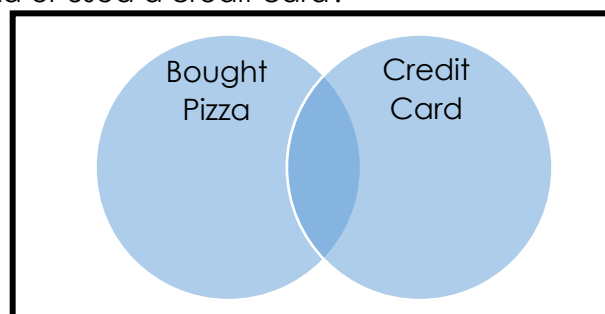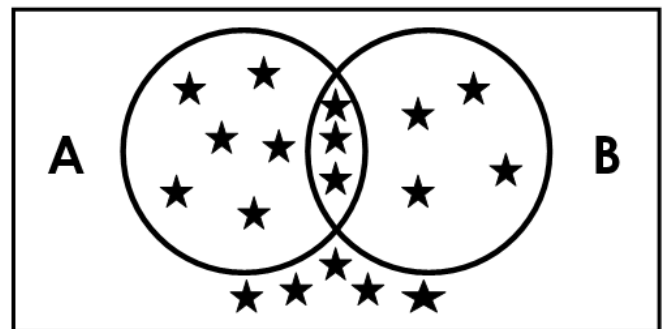
A group of 60 students were asked if they played field hockey (F), basketball (B) or soccer (S). The diagram below displays the results. Use the information given to find the following probabilities.
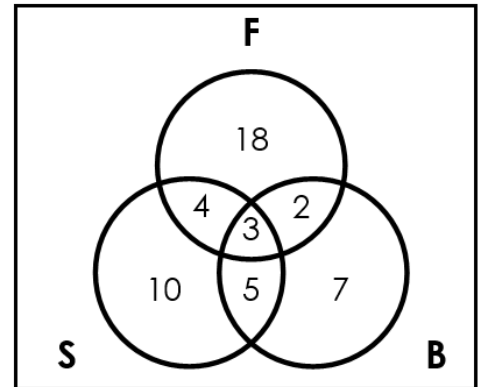
_____ 26. $P(B \cap S)$

_____ 27. $P(F \cup B)$

_____ 28. $P(F)'$

_____ 29. $P(F \cup B \cup S)$

_____ 30. $P(F \cup B \cup S)'$

F

18

4   2

3

10   5   7

S   B

Given the Venn Diagram below with set A and set B determine the following:

_____ 31. $P(A \cap B)$

_____ 32. $P(A \cup B)$

_____ 33. $P(\overline{A} \cup B)$

_____ 34. $P(A \cap \overline{B})$

A   B

---

35. Suppose 80% of people can swim. Suppose 70% of people can whistle. Suppose 55% of people can do both. What percentage of people can swim or whistle? _Keep your answer as a percent._

36. At Pope, 60% of the students carry a backpack or a wallet. 40% carry a backpack, and 30% carry a wallet. If a student is selected at random, find the probability that the student carries both a backpack and a wallet. _Keep your answer as a percent._

Geometry
Two-Way Frequency Tables

Name: _____

Date: _____

_____ is a useful tool
for examining relationships between categorical variables.

Participation in School Activities			
School Club	**Gender**		
	Male	Female	**Totals**
Band	12	21	33
Chorus	15	17	32
Chess	16	3	19
Latin	7	9	16
Yearbook	28	7	35
Totals	**78**	**57**	**135**

1. How many males are in the chorus?   _____

2. How many females are in Latin?   _____

3. How many students are in the Chess Club?   _____

4. What is the total number of females?   _____

5. What is the total number of students in the clubs?   _____

Participation in School Activities			
School Club	**Gender**		
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Yearbook	28	7	35
Totals	**78**	**57**	**135**

_____ an entry in the body of a
two-way frequency table.

_____ an entry in the "Total" row or
"Total" column in a two-way frequency table.

Example:

Gender	Preferred Sport		
	Baseball	**Soccer**	**Basketball**
Male	49	52	16
Female	23	64	33

a. What is the joint frequency of male students who prefer soccer? _____

b. Which marginal frequency is the largest?   _____

Example: Sixty-six freshmen responded to a survey with 32 saying that they would be attending the school dance. Of the 84 sophomores that responded, 46 said they would attend. Organize the data into a two-way table and answer the following questions.

Class	Attending	Not Attending	Totals
Freshman			
Sophomore			
Totals			

a. How many students responded to the survey?

b. How many of the students that were surveyed were attending the dance?

c. How many of the surveyed sophomores are not attending the dance?

d. What kind of frequency is the 32?

e. What kind of frequency is the 78?

Example: The data to the right has been collected from the **Pope HS Pep Club**. Fill in the totals and use this to answer the following questions! 😊

	Male	Female	TOTAL
Freshmen	10	15	
Sophomores	12	20	
Juniors	21	22	
Seniors	35	43	
TOTAL			

We are now going to find probabilities!

Let's try one together: What percent of students in the Pep Club are freshman girls?

To solve this, take the total number of freshman girls divided by the grand total of students in the Pep Club. This gives you the **probability**. If you want to find the **percent**, then multiply by 100!

$$\frac{15}{178} = 0.084 \cdot 100 = 8.4\%$$

Let's try some (using the same frequency table above)!

a. What percent of students in the Pep Club are sophomores?

b. What is the probability that random student chosen from the Pep Club is a male?

c. What percent of students are female juniors?

d. What is the probability that a student chosen is a male senior?

Practice: Complete the two- way frequency table below and answer the questions.

	Attending Prom	Not Attending Prom	Total
Juniors		23	79
Seniors			
Total	134		172

1. How many seniors were surveyed about prom? Is this a joint or marginal frequency?

2. How many students are not attending prom this year? Is this a joint or marginal frequency?

3. How many students responded to the survey about prom?

4. What is the probability that a randomly selected student is a junior not attending prom?

5. P(attending prom)?

6. P(senior')?

7. What percentage of students surveyed are juniors who are attending prom?

8. P(not attending prom ∪ seniors)?

9. P(not attending prom ∩ seniors)?

Name: _____

Date: _____

What is conditional probability?

~ _____

~ _____

Conditional Probability Formula: |

"The probability of event B, **given** event A"

Examples:

1. The table shows the results of a class survey: "do you own a pet?"
Find P(own a pet | female).

	Yes	No
Female	8	6
Male	5	7

2. The table shows the results of a class survey: "did you wash the dishes last night?
Find P(wash the dishes | male).

	Yes	No
Female	7	6
Male	7	8

3. Using the data in the table, find the probability that a sample of not recycled waste as plastic.
P(plastic | not recycled).

	Recycled	Not Recycled
Paper	34.9	48.9
Metal	6.5	10.1
Glass	2.9	9.1
Plastic	1.1	20.4
Other	15.3	67.8

4. A math teacher gave her class two tests. 25% of the class passed both tests and 42% of the class passed the first test. What percent of those who passed the first test also passed the second test?

The chart below summarizes the employees working at a certain company, by gender and degree level.

	Degree	No Degree	Total
Male	11	8	19
Female	7	5	12
Total	18	13	31

Randomly choose one person.

5. P(degree)

6. P(no degree)

7. P(male ∩ no degree)

8. P(female **U** no degree)

9. P(degree | female)

10. P(no degree | male)

Let's Practice!

1. At Pope High School, the probability that a student takes Band and French is 0.087. The probability that a student takes Band is 0.68. What is the probability that a student takes French given that the student is taking Band?

The frequencies of the marbles in a bag are shown in the table. Write answers as reduced fractions.

	GREEN	BLUE
LARGE	2	4
SMALL	8	12

_____ 2. Find P(small)

_____ 3. Find P(green | large)

Mrs. Koehler surveyed 430 men and 200 women about their vehicles. Of those surveyed, 160 men and 85 women said they own a blue vehicle.   Write answers as reduced fractions.

	Blue	Not Blue
Men		
Women		

_____ 4. If a randomly chosen person is a man, what is the probability of that person having a blue car?

_____ 5. P(Blue)'

_____ 6. P(Women | Not Blue)

_____ 7. P(Men ∩ Not Blue)

Student Survey

A student conducted a survey with a randomly selected group of students. She asked freshmen, sophomores, juniors, and seniors to tell her whether or not they liked the school cafeteria food. The results were as follows:

	Freshmen	Sophomores	Juniors	Seniors	Total
Liked food	85	50	77	82	
Did not like food	44	92	56	78	
Total					

Use the table above to answer the questions 8 – 14.

8. What is the probability that a randomly selected student is a sophomore?

9. What is the probability that randomly selected student is a sophomore and likes the food?

10. What is the probability that a randomly selected student is a freshman or does not like the food?

11. What is the probability that a student does not like the food, given that student is a freshman.

12. If the randomly selected student does not like the food, what is the probability that they are a freshman?

13. P(senior | did not like the food)

14. P(liked food | freshmen)

Name: _____ Date: _____

Independent and Dependent Events

Independent Events

- Event A occurring does NOT affect the probability of Event B occurring.

- $P(A \text{ and } B) = P(A \cap B) = P(A) \bullet P(B)$

1. A coin is tossed and a 6-sided die is rolled. Find the probability of landing on the head side of the coin and rolling a 3 on the die.

2. A card is chosen at random from a deck of 52 cards. It is then replaced and a second card is chosen. What is the probability of choosing a jack and an eight?

3. 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 a yellow marble?

4. A school survey found that 9 out of 10 students like pizza. If three students are chosen at random with replacement, what is the probability that all three students like pizza?

Dependent Events

- Event A occurring AFFECTS the probability of Event B occurring.

- Usually you will see the words "WITHOUT REPLACING."

- $P(A \text{ and } B) = P(A \cap B) = P(A) \bullet P(B|A)$

5. A jar contains 3 red, 5 green, 2 blue and 6 yellow marbles. A marble is chosen at random from the jar. A second marble is chosen without replacing the first one. What is the probability of choosing a green and a yellow marble?

6. An aquarium contains 6 male goldfish and 4 female goldfish. You randomly select a fish from the tank, do not replace it, and then randomly select a second fish. What is the probability that both fish are male?

7. A random sample of parts coming off a machine is done by an inspector. He found that 5 out of 100 parts are bad on average. If he 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?

How to Determine If 2 Events Are Independent:

- Substitute in what you know in to **P(A ∩ B) = P(A) ● P(B)** and check to see if left side equals right side.
  - o If it's equal, then it's independent.
  - o If it's not equal, then it's not independent (or dependent).

8. Let event M = taking a math class. Let event S = taking a science class. Then, M and S = taking a math class and a science class. Suppose **P(M) = 0.6**, **P(S) = 0.5**, and **P(M and S) = 0.3**. Are M and S independent?

9. In a class, 60% of the students are female. 50% of all students in the class have long hair. 45% of the students are female and have long hair. Of the female students, 75% have long hair. Let F be the event that the student is female. Let L be the event that the student has long hair. One student is picked randomly. Are the events of being female and having long hair independent?

Name: _____ Date: _____

Independent and Dependent Events

1. A bag contains 5 red, 3 green, 4 blue, and 8 yellow marbles. Find the probability of randomly selecting a green marble, and then a yellow marble if the first marble is replaced.

   _____

2. A sock drawer contains 5 pairs of each color socks: white, green and blue. What is the probability of randomly selecting a pair of blue socks, replacing it, and then randomly selecting a pair of white socks?

   _____

3. In a standard deck of cards, what is the probability of picking a diamond and then another diamond without replacement?

   _____

4. Randy has 4 pennies, 2 nickles, and 3 dimes in his pocket. If he randomly chooses 2 coins, what is the probability that they are both dimes if he doesn't replace the first one?

   _____

5. Two students are chosen at random from a class of 30. What is the probability that both you and your friend are chosen?

   _____

6. A test includes several multiple choice questions, each with 5 choices. Suppose you don't know the answers for three of these questions, so you guess. What is the probability of getting all three correct?

   _____

7. Using the letters in the state ARKANSAS. Find the probability of picking an **S** and then an **A** without replacement.

   _____

8. Using the letters in the state ARKANSAS. Find the probability of picking a **K** and then a **N** without replacement.

   _____

9. Using the letters in the state ARKANSAS. Find the probability of picking a **R** and then a **S** without replacement.

   _____

Determining if 2 Events are Independent

Check the following events and determine if they are independent.   **P(A ∩ B) = P(A) ● P(B)**

10. P(A) = 0.45   P(B) = 0.30   P(A ∩ B) = 0.75

Conclusion: _____

> Check your calculations here.
> Show ALL work.

11. P(A) = 0.12   P(B) = 0.56   P(A ∩ B) = 0.0672

Conclusion: _____

> Check your calculations here.
> Show ALL work.

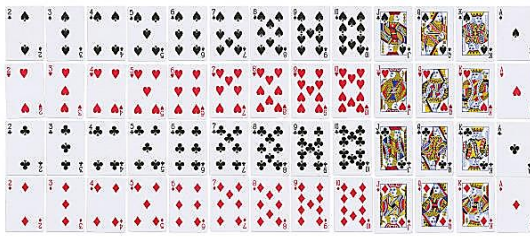12. $P(A) = \dfrac{4}{5}$ $P(B) = \dfrac{3}{8}$ $P(A \cap B) = \dfrac{7}{40}$

Conclusion: _____

> Check your calculations here.
> Show ALL work.

13. $P(A) = \dfrac{7}{9}$ $P(B) = \dfrac{3}{4}$ $P(A \cap B) = \dfrac{7}{12}$

Conclusion: _____

> Check your calculations here.
> Show ALL work.

Name: _____

Date: _____ Period: _____

1. You randomly draw **a** card. Find the following probabilities and state if they are mutually exclusive or overlapping.

A. P(red or Ace) =

B. P(4 or Jack) =

C. P(face card or Club)

D. P(even card or queen) =

2. You randomly draw **TWO** cards, **WITH** replacement. (these are independent events!) Find the following probabilities.
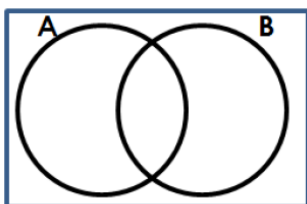
A. P(red and then red) =
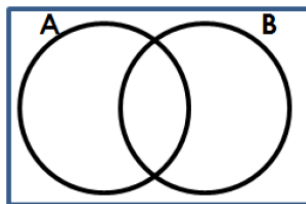
B. P(red and then ace) =

C. P(4 and then 5) =

D. P(face card and then heart) =

3. You randomly draw **TWO** cards, **WITHOUT** replacement. (these are dependent events!) Find the following probabilities.

A. P(red and then red) =

B. P(red and then black) =

C. P(4 and then 5) =

D. P(face card and then a 2) =

4. Shade in the appropriate area of the Venn Diagram.

A. (A ∩ B')

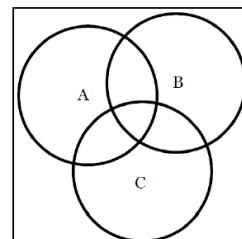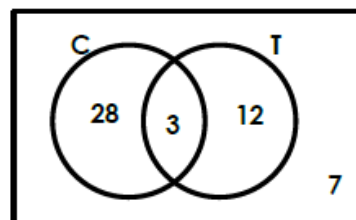B. (A ∪ B)'

C. (A' ∪ B ∪ C)

5. The Venn Diagram given shows the number of students in theatre (T) and in chorus (C).

A. P(T) =

B. P(C ∩ T) =

C. P(C') =

28   3   12

7

6. A random survey was taken to gather information about grade level and car ownership status of students at a school. This table shows the results of the survey. Write your answer as a reduced fraction.

Car Ownership by Grade

	Owns a Car	Does Not Own a Car	TOTAL
Junior	6	10	16
Senior	12	8	20
TOTAL	18	18	36

_____ A. Is the number 10 a joint or marginal frequency?

_____ B. Find the probability that a randomly selected student owns a car.

_____ C. Find the probability that a randomly selected student will be a junior, given that the student owns a car.

_____ D. P(owns a car │ junior)

7. Determine whether the following probabilities are mutually exclusive (ME), overlapping (O), independent (I), or dependent (D). Use the following scenario. You have a bag of 20 marbles: 6 red, 10 yellow, and 4 purple.

_____ A. You draw two marbles, with replacement. What is the probability you draw two purple marbles?

_____ B. What is the probability that you draw one marble that is a yellow or a red?

_____ C. You draw two marbles, without replacement. What is the probability that you draw a yellow marble and then a red marble?

Use the following scenario for numbers 8 & 9. You have a bag of marbles. There are 10 pink marbles, 5 green marbles, 2 yellow, 8 orange, and 5 purple marbles.

**8. You randomly draw TWO marbles, WITH replacement. Find the following probabilities.**

_____ A. P(pink and then pink)

_____ B. P(green and then orange)

9. You randomly draw TWO marbles, WITHOUT replacement. Find the following probabilities.

_____ A. P(pink and then pink)

_____ B. P(green and then orange)

10. The probability that a student at Pope High School plays soccer is 0,20. The probability that a student plays basketball is 0.25. The probability that students play both soccer and basketball is 0.05. **Are playing soccer and playing basketball independent?**

1. Out of 140 HS teachers, 50 go to the gym regularly, and 17 are Math teachers.
5 of the Math teachers go to the gym regularly. How many HS teachers teach Math or go to the gym regularly? (*Hint:* A Venn diagram might help by drawing it below)
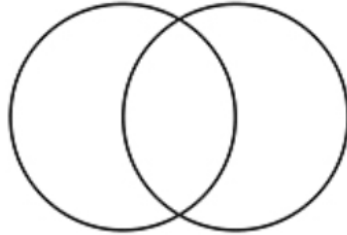
d. What is the probability of teachers that teach Math but *do not* go to the gym?

e. What is the probability of teachers who *neither* teach Math *nor* go to the gym?

2. On this season of *Make Me a Superstar*, there are 16 contestants. 7 contestants are male, 5 contestants are blond, and 2 of the male contestants are blonde.

a. Complete the Venn Diagram shown by writing how many contestants are in each group.
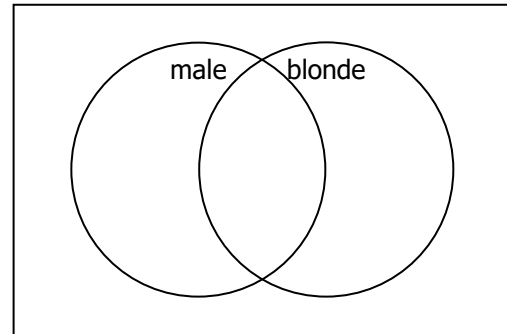
male   blonde

b. How many female contestants are there?

c. P(blonde ∩ females)?

d. How many contestants are neither female nor blonde?

e. P(female ∪ blonde')?

3. You randomly pick one card from the box

Red	Blue	Yellow	Green
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9
10	10	10	10

    a. *Event A: Get blue.   Event B: Get a number greater than 6.*
      ① Are events A and B mutually exclusive? Explain.

      ② P(A *and* B) =   ③ P(A *or* B) =

    b. *C: Get a yellow.   D: Get red.*
      ① Are events C and D mutually exclusive? Explain.

      ② P(C *and* D) =   ③ P(C *or* D) =

4. Imagine drawing two cards from the box, one after the other.

    a. *You replace the card between draws.*
    A: Get a ten on the first draw.   B: Get a nine on the second draw.

      ① Are events A and B independent or dependent? Explain.

      ② P(A *and* B) =

    b. *You do <u>not</u> replace the card between draws.*
    C: Get a ten on the first draw.   D: Get a nine on the second draw.

      ① Are events C and D independent or dependent? Explain.

      ② P(C *and* D) =

5. You randomly draw a card. What is the probability…

    a. it is red?   **b.** it is less than 3?

    c. it is either green or an 8?   **d.** it is green and greater than 8?

    e. it is blue or less than 8?   **f.** it is blue' and it's less than 8?

6. Identify the outcomes of each trial as Independent (I), Dependent (D), Mutually Exclusive (ME), or Overlapping (O) events.

    a.   Roll a 6-sided cube and pick a card from a 52-card deck.

    a. Select one day of the year: Get a day in March and Halloween.

    b. Roll a 6-sided cube: Get a prime number and get a number greater than 3.

    c. Pick a marble. Without replacing the first marble, pick a second marble.

    d. Draw one card from a deck of 52 playing cards: Get a heart and get a black card.

    e. Pick a marble. Pick a second marble after replacing the first marble.

7.   A letter is chosen at random from the word **MISSISSIPPI**. Find the following:

  a. P(vowel)   b. P(S)   c. P(consonant)   d. P(M)   e. P(I)   f. P(S´)

Use a standard 52-card deck to answer questions #8 – 13.

8. P(heart)   9. P(queen U ace)   10. P(heart´)

11. P(club ∩ king)   12. P(face card I spade)   13. P(diamond I club)

Use the table to the right to answer questions #14 – 23.

	Packers	Bears	Total
Teachers	9	5	14
Students	21	13	34
Total	30	18	48

14. P(Packers fan)   15. P(Packers fan ∩ Student)

16. P(Student)   17. P(Student U Bears fan)   18. P(Bears fan ∩ Teacher)

19. P(Teacher U Packers fan)   20. P(Bears fan I Student)   21. P(Teacher I Packers fan)

22. What is the frequency of teachers who like the Packers? What kind of frequency is this?

23. What is the frequency of all of the students? What kind of frequency is this?

24. A bag of marbles contains 5 large blue, 8 large green, 7 small white, and 2 small green marbles.

    a. P(large U green)   b. P(white ∩ blue)   c. P(blue U green)   d. P(white ∩ small)

25. A bag of marbles contains 8 blue, 12 green, and 3 white marbles.

    a. If the first marble is replaced, determine P(green and then green).

    b. If the first marble is not replaced, determine P(green and then green).

    c. If the first marble is replaced, determine P(green and then blue).

    d. If the first marble is not replaced, determine P(green and then blue).

24. A standard six-sided die is rolled. Find the probability of the given event. (prime #s: 2, 3, 5. 7, 11, . . .}

    a. P(Rolling a multiple of 3 | Greater than 2)   b. P(Rolling a 3 | odd number)

    c. P(Rolling a 6 U a prime number)   d. P (Rolling at least a 3 ∩ even number)

25. Events A and B are independent, P(A) = 0.8 and P(B) = 0.7. What is P(A and B)?

26. Events A and B are independent. Find P(A) if P(B) = 75% and P(A and B) = 15%.

27. Are the following events independent? P(A) = 0.5, P(B) = 0.8, P(A and B) = 0.45