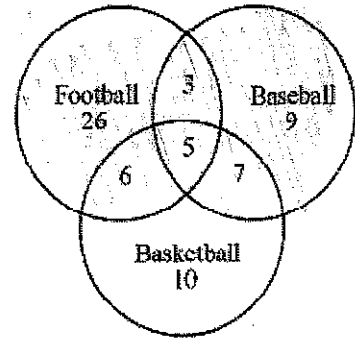


# Probability

**Goal 1: I can use Venn Diagrams and Set Notation to Solve Problems.**

1. Refer to the Venn Diagram below. What is the probability that a student plays football or baseball?



union  
 $\frac{56}{66}$

- A.  $\frac{7}{10}$
- B.  $\frac{28}{33}$
- C.  $\frac{3}{5}$
- D.  $\frac{7}{16}$

2. Some cars in a parking lot have the following license plate identifications.

5HEX32      4EAE32      8TAS12      2AAU62      4JSA48

One of the license plates is chosen at random. Consider the following events:

- V: All the letters of the chosen license plate are vowels
- E: All the digits of the chosen license plate are even integers

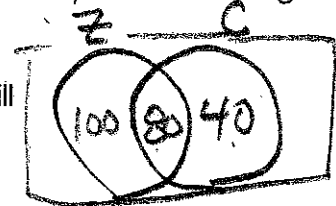
How many outcomes are in the event  $V \cap E$ ?

- A. 4
- B. 3
- C. 2
- D. 1

↑  
intersect

3. West End High School has 640 students. All the students responded to a survey about what sights they have visited in Washington, DC. Some of the results are as follows:

- 80 students have visited both the National Zoo **and** Capitol Hill
- 180 students have visited the National Zoo
- 220 students have visit the National Zoo **or** Capitol Hill

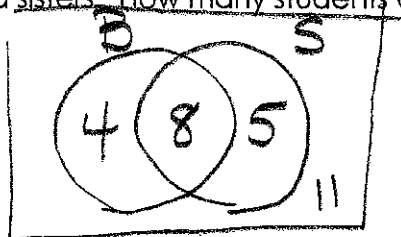


Based on the survey, how many students have visited **only** Capitol Hill?

- A. 300
- B. 80
- C. 100
- D. 40

4. Out of 28 students, 12 have at least one brother and 13 have at least one sister. Eight students have both brothers and sisters. How many students do not have either a brother or a sister?

- A. 8
- B. 5
- C. 11
- D. 4

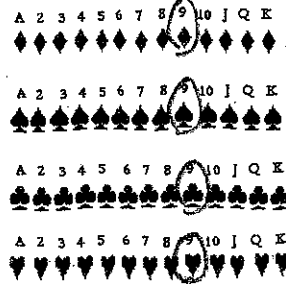


**Goal 2: I can calculate mutually exclusive and overlapping probabilities.**

5. If you have a deck of cards, what is the probability that you will draw a 9 or a heart?

- A.  $\frac{1}{52}$
- B.  $\frac{17}{52}$
- C.  $\frac{1}{26}$
- D.  $\frac{4}{13} = \frac{16}{52}$

$$\frac{4}{52} + \frac{13}{52} - \frac{1}{52}$$



6. Use the following table to find the probability that a student has a cell phone and is from school B.

- A. 0.85
- B. 0.62
- C. 0.41
- D. 0.21

	Students who have a cell phone	Students who do not have a cell phone	Total
School A	365	156	521
School B	408	71	479
Total	773	227	1000

7. Lexus automobiles come in the following colors and are manufactured in these percentages.

White	Black	Red	Silver	Gold
.46	.22	.09	.11	.12

If I choose a car at random, the probability that I do not choose a white or black car is:

- A. 0.32
- B. 0.46
- C. 0.20
- D. 0.68

8. A box contains 4 green tiles, 8 white tiles, and 10 red tiles. Manuel will reach into the bag and select a tile without looking. What is the probability that he will select either a green tile or a red tile?

- A.  $\frac{20}{231}$
- B.  $\frac{52}{271}$
- C.  $\frac{7}{11}$
- D.  $\frac{10}{121}$

$$\frac{4}{22} + \frac{10}{22} = \frac{14}{22} = \frac{7}{11}$$

**Goal 3: I can calculate conditional probabilities.**

9. In your class, 56% of the students get an allowance and 41% get an allowance and do household chores. What is the probability that a student in your class does household chores given that the student gets an allowance?

- A. 75%
- B. 73%
- C. 70%
- D. 67%

$$P(H|A) = \frac{P(H \cap A)}{P(A)}$$

$$= \frac{.41}{.56}$$

10. The table below shows numbers of purchases in three stores and the corresponding gender of customers for each number of purchases. What is the probability that a purchase is made by a male, given that the purchase is made in store B?

- A.  $\frac{6}{11}$
- B.  $\frac{4}{7}$
- C.  $\frac{1}{3}$
- D.  $\frac{7}{22}$

$$\frac{20}{35} P(M|B)$$

Gender	Store		
	Store A	Store B	Store C
Male	15	20	25
Female	20	15	15

$\begin{matrix} 60 \\ 50 \\ 110 \end{matrix}$

11. A sports club for girls has 80 members. Each member is currently involved in one activity, as shown in the table.

Grade	Activity		
	Volleyball	Basketball	Cheerleading
10	8	8	8
11	6	12	12
12	2	12	12

$\begin{matrix} 24 \\ 30 \\ 26 \\ 80 \end{matrix}$

The following probabilities apply to a randomly chosen member of the club. Which probability is the greatest?

- ~~A.~~ probability that the girl is in tenth grade  $\frac{24}{80} = .30$
- ~~B.~~ probability that the girl is in twelfth grade, given that she is in basketball  $\frac{12}{32} = .375$
- ~~C.~~ probability that the girl is in twelfth grade  $\frac{26}{80} = .325$
- D. probability that the girl is in tenth grade, given she is in volleyball  $\frac{8}{16} = .50$

12. Use the following table to calculate the probability that a randomly selected student has a cell phone given that the student attends School B.

- A. 0.85
- B. 0.62
- C. 0.41
- D. 0.21

$$\frac{408}{479} P(C|B)$$

	Students who have a cell phone	Students who do not have a cell phone	Total
School A	365	156	521
School B	408	71	479
Total	773	227	1000

**Goal 4: I can calculate independent and dependent probabilities.**

13. Which of the following events are independent given  $P(A)$ ,  $P(B)$ , and  $P(A \text{ and } B)$ ?

- A.  $P(A) = 0.08$ ;  $P(B) = 0.4$ ,  $P(A \text{ and } B) = 0.12$       $.08 \neq .4$
- B.  $P(A) = 0.25$ ;  $P(B) = 0.25$ ,  $P(A \text{ and } B) = 0.5$       $.25 \neq .25$
- C.  $P(A) = 0.3$ ;  $P(B) = 0.15$ ,  $P(A \text{ and } B) = 0.045$       $.3 \neq .15$
- D.  $P(A) = 0.16$ ;  $P(B) = 0.24$ ,  $P(A \text{ and } B) = 0.32$

14. A bag contains 5 red marbles, 3 yellow marbles, and 2 blue marbles. Once a marble is drawn, it is not replaced. What is the probability of drawing a blue marble on the first draw and a yellow marble on the second draw?

- A.  $\frac{2}{25}$
  - B.  $\frac{28}{90}$
  - C.  $\frac{1}{15}$
  - D.  $\frac{3}{50}$
- $\frac{2}{10} \cdot \frac{3}{9} = \frac{6}{90} = \frac{1}{15}$

15. An aquarium contains 3 female fish and 6 male fish. What is the probability of catching a male fish, then a female fish, and then another male fish, if you put each fish back in the aquarium before catching another one?

- A.  $\frac{4}{27}$
  - B.  $\frac{3}{5}$
  - C.  $\frac{2}{27}$
  - D.  $\frac{4}{3}$
- $\frac{6}{9} \cdot \frac{3}{9} \cdot \frac{6}{9} = \frac{108}{729}$

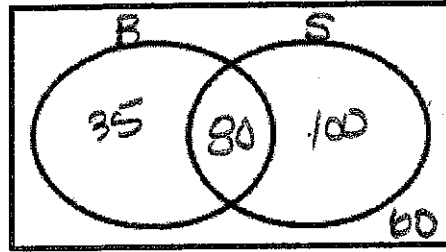
16. A drawer contains 3 red socks, 5 white socks, and 7 blue socks. Without looking, you draw out a sock and then draw out a second sock without returning the first one to the drawer. What is the probability that both socks are blue?

- A.  $\frac{49}{225}$
  - B.  $\frac{1}{5}$
  - C.  $\frac{2}{21}$
  - D.  $\frac{1}{9}$
- $\frac{7}{15} \cdot \frac{6}{14} = \frac{42}{210}$

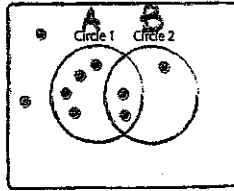
1. Create a Venn Diagram to represent the following situation:

In a school of 275 students, 115 students are in band, 180 students are on a sports team, and 80 participate in both activities.

Make sure all <sup>275</sup> 275 students are accounted for in your Venn Diagram.



2. In a game, discs are thrown into two circles from one side of the room. The results are shown below. Let Event A = landing in Circle 1 and Event B = landing in Circle 2. Express your answer as a fully reduced fraction.



Find the following probabilities:

$\frac{1}{3}$  a.  $P(B)$   $\frac{3}{9}$   
 $\frac{2}{9}$  c.  $P(A \cup B)$

$\frac{1}{3}$  b.  $P(A)$   $\frac{2}{9}$   
 $\frac{4}{9}$  d.  $P(A \cap B)$

3. Using the table below, answer the following questions. Express your answer as a fully reduced fraction

	Math	Science	English	History	
Male	46	42	13	25	126
Female	12	21	45	36	114
	58	63	58	61	240

$\frac{58}{240}$  a. What is the probability of liking English?  $\frac{58}{240}$

$\frac{31}{60}$  b. What is the probability of liking science or history?  $\frac{63 + 61}{240}$

$\frac{2}{3}$  c. What is the probability that a student likes math or is a female?  $\frac{58 + 114 - 12}{240}$

$\frac{7}{36}$  d. What is the probability that a student likes science given they are a female?  $\frac{21}{114}$

4. A jar contains 4 white chips, 5 purple chips, and 1 black chip. Chips are selected randomly one at a time. Find the probability of the following.

$\frac{9}{10}$  a.  $P(\text{purple or white})$   $\frac{5}{10} + \frac{4}{10} = \frac{9}{10}$

$\frac{5}{90}$  c.  $P(\text{black and purple})$ ; chip is **not** replaced  
 $\frac{1}{10} \cdot \frac{5}{9}$

$\frac{1}{100}$  b.  $P(2 \text{ black chips})$ ; chip is replaced  
 $\frac{1}{10} \cdot \frac{1}{10}$

$0$  d.  $P(\text{white and blue})$ ; chip is replaced  
 $\frac{4}{10} \cdot \frac{0}{10}$

Name: \_\_\_\_\_ Date: \_\_\_\_\_

## Using Formulas and Working Backwards

**Mutually Exclusive:**  $P(A \cup B) = P(A) + P(B)$ **Independent:**  $P(A \cap B) = P(A) \cdot P(B)$ **Overlapping:**  $P(A \cup B) = P(A) + P(B) - P(A \cap B)$ **Dependent:**  $P(A \cap B) = P(A) \cdot P(B|A)$ 

1. For two events A and B, it is known that  $P(A) = 0.2$ ,  $P(B) = 0.4$  and  $P(A \cup B) = 0.5$ . Find

$$P(A \cap B)? \quad .5 = .2 + .4 - P(A \cap B)$$

$$.5 = .6 - P(A \cap B)$$

$$\boxed{.1 = P(A \cap B)}$$

- For two events X and Y, it is known that  $P(X) = 1/5$  and  $P(X \cap Y) = 2/15$ . Find  $P(Y|X)$

$$\frac{5}{1} \cdot \frac{2}{15} = \frac{5}{15} \cdot P(Y|X)$$

$$\frac{10}{15} = P(Y|X)$$

$$\boxed{\frac{2}{3} = P(Y|X)}$$

- For two events B and C, it is known that  $P(C|B) = 0.61$  and  $P(C \cap B) = 0.48$ . Find  $P(B)$ .

$$.48 = P(B) \cdot .61$$

$$\boxed{.79 = P(B)}$$

4. Swim and whistle. 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?

$$P(S \cup W)?$$

$$P(S) = .80$$

$$P(W) = .70$$

$$P(S \cap W) = .55$$

$$P(S \cup W) = .80 + .70 - .55$$

$$\boxed{P(S \cup W) = .95}$$

5. Backpack and wallets. At Hillgrove, 60% of the students carry a backpack or a wallet. 40% carry only a backpack, and 30% carry only a wallet. If a student is selected at random, find the probability that the student carries both a backpack and a wallet.

$$P(B \cup W) = .60 \quad P(B \cap W) = ?$$

$$P(B) = .40$$

$$P(W) = .30$$

$$.60 = .40 + .30 - P(B \cap W)$$

$$.60 = .70 - P(B \cap W)$$

$$\boxed{.10 = P(B \cap W)}$$

6. Suppose that the probability of Eirik coming to a party is 80% and the probability of Emma coming to a party is 95%. Assuming that these events are independent, what is the probability that they both will come to a party?

$$P(Er) = .80$$

$$P(Em) = .95$$

$$P(Er \cap Em) = ?$$

$$P(Er \cap Em) = .80 \cdot .95$$

$$\boxed{P(Er \cap Em) = .76}$$

Name: \_\_\_\_\_

Date: \_\_\_\_\_

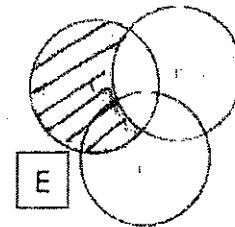
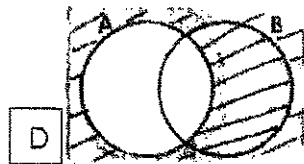
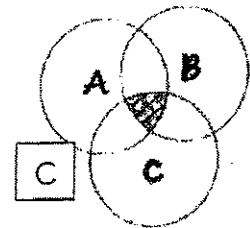
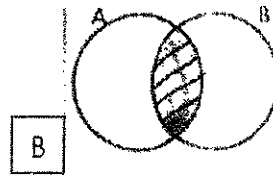
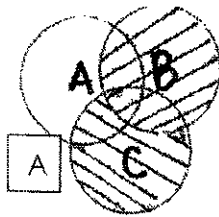
**Matching**

1.  $A'$  D

2.  $A \cap B$  B

3.  $B \cup C$  A

4.  $A \cap B \cap C$  C



**Multiple Choice**

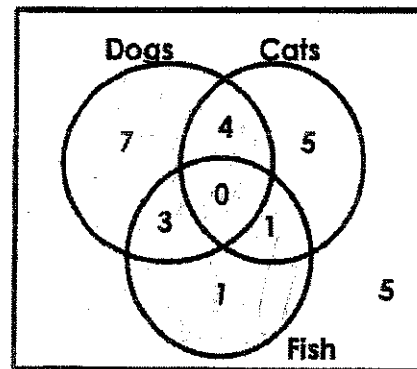
5. Which pair of events is **mutually exclusive**?

- A. Rolling 2 dice and getting an odd sum or a sum of 5.
- B. Picking a Jack or a Spade from a deck of cards.
- C. Picking a Red card or an Ace from a deck of cards.
- D. Rolling 2 dice and getting an odd sum or getting a sum of 12.

D

6. In the Venn Diagram at right, how many members are in the set  $\{Dogs \cup Fish\}$ ?

- A. 3
- C. 16
- B. 12
- D. 20



C

7. In the Venn Diagram at right, how many members are in the set  $\{\overline{Dogs}\}$ ?

- A. 6
- B. 12
- C. 20
- D. 26

B

8. Mary owns a cat name Snoopy. She reaches into her bag of 4 fish, 6 liver, 3 chicken-flavored, and 10 milk treats and gives one to Snoopy without looking. What is the probability that Snoopy gets a liver treat?

- A.  $\frac{1}{6}$
- B.  $\frac{6}{17}$
- C.  $\frac{6}{23}$
- D.  $\frac{1}{23}$

C

A person rolls two dice, one after the other. Find the probability of the following events.

$\frac{23}{36}$  9. P(even sum or sum of 5)

$$\frac{18}{36} + \frac{5}{36}$$

+	1	2	3	4	5	6
1	2	3	4	5	6	7
2	3	4	5	6	7	8
3	4	5	6	7	8	9
4	5	6	7	8	9	10
5	6	7	8	9	10	11
6	7	8	9	10	11	12

$\frac{5}{9}$  10. P(even sum or sum greater than 9)

$$\frac{18}{36} + \frac{6}{36} - \frac{4}{36} = \frac{20}{36}$$

$\frac{1}{2}$  11. What is the probability that the sum is less than 6, given the 1<sup>st</sup> roll is a 2?

$$\frac{3}{6}$$

The Georgia Coaches Association appointed a sports director with the numbers shown in the chart.

	Male	Female	
Basketball	16	12	28
Soccer	14	18	32
Lacrosse	12	10	22
	42	40	82

$\frac{23}{41}$  12. If the director is randomly selected, find the probability that the person is a female.

$$\frac{40}{82}$$

$\frac{30}{41}$  13. If the director is randomly selected, find the probability of getting a man or soccer coach.

$$\frac{42}{82} + \frac{32}{82} - \frac{14}{82} = \frac{60}{82}$$

In an experiment to study which hand people write with, the following data was collected.

If a person is selected at random:

14 Find P(Female)  $\frac{738}{1469}$

15 Find P(Male  $\cap$  Left Hand)  $\frac{268}{1469}$

16 Find P(Female | Right Hand)  $\frac{244}{958}$

	Males	Females	Total
Left Hand	268	243	511
Right Hand	470	488	958
Total	738	731	1469