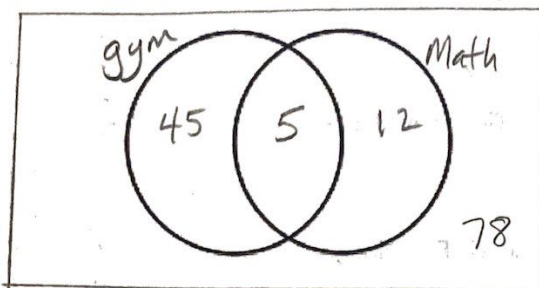


1. Out of 140 <sup>Total</sup> HS teachers, 50 go to the gym regularly, and 17 are Math teachers. 5 of the Math teachers go to the gym regularly. How many HS teachers teach Math or go to the gym regularly? (Hint: A Venn diagram might help by drawing it below)



- d. What is the probability of teachers that teach Math but do not go to the gym?

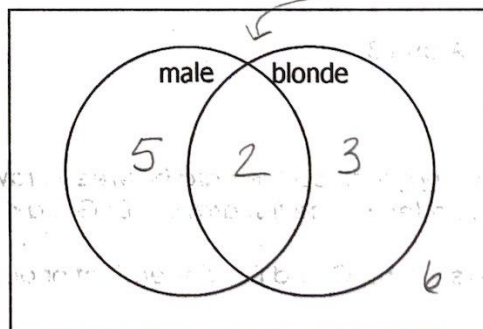
$$\frac{12}{140} = \boxed{\frac{3}{35}}$$

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

$$\frac{78}{140} = \boxed{\frac{39}{70}}$$

2. On this season of Make Me a Superstar, there are 16 contestants. 7 contestants are male, 5 contestants are blonde, and 2 of the male contestants are blonde. \*Careful! Start with the intersection of 2

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



- b. How many female contestants are there?

$$\boxed{9}$$

- c. P(blonde  $\cap$  females)? blonde but not male  
intersection  $\frac{3}{16}$

- d. How many contestants are neither female nor blonde? male but not blonde

$$\boxed{5}$$

- e. P(female  $\cup$  blonde)? Complement (not) not male and not blonde

$$\frac{9}{16} + \frac{11}{16} - \frac{6}{16} = \frac{14}{16} = \boxed{\frac{7}{8}}$$

↑  
overlap

FOR THIS ENTIRE SECTION, USE THE FOLLOWING INFORMATION:

You have a box with ten blue cards numbered 1 through 10, ten red cards numbered 1 through 10, ten yellow cards numbered 1 through 10, and ten green cards numbered 1 through 10.

*Total Cards: 40*

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

3. You randomly pick one card from the box

a. Event A: Get blue. Event B: Get a number greater than 6.

① Are events A and B mutually exclusive? Explain.

*No, there is overlap. Blue cards # 7, 8, 9, 10*

②  $P(A \text{ and } B) = \frac{4}{40} = \frac{1}{10}$

③  $P(A \text{ or } B) = \frac{10}{40} + \frac{16}{40} - \frac{4}{40} = \frac{22}{40} = \frac{11}{20}$

b. C: Get a yellow. D: Get red.

① Are events C and D mutually exclusive? Explain.

*Yes, there is no overlap.*

②  $P(C \text{ and } D) = 0$

③  $P(C \text{ or } D) = \frac{10}{40} + \frac{10}{40} = \frac{20}{40} = \frac{1}{2}$

*It is not possible to get a yellow and red from 1 pick.*

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.

*Independent because the cards are replaced. One event will not affect the other event.*

②  $P(A \text{ and } B) = \frac{4}{40} \cdot \frac{4}{40} = \frac{16}{1600} = \frac{1}{100}$

b. You do not 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.

*Dependent because the cards are not replaced. The 1st event affects the 2nd event.*

②  $P(C \text{ and } D) = \frac{14}{40} \cdot \frac{4}{39} = \frac{16}{1560} = \frac{2}{195}$

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

a. it is red?  $\frac{10}{40} = \frac{1}{4}$

b. it is less than 3?  $\frac{8}{40} = \frac{1}{5}$

c. it is either green or an 8?  $\frac{10}{40} + \frac{4}{40} - \frac{1}{40} = \frac{13}{40}$

*\* Remember overlap of 1 green 8 card!*

d. it is green and greater than 8?  $\frac{2}{40} = \frac{1}{20}$

e. it is blue or less than 8?

$\frac{10}{40} + \frac{28}{40} - \frac{7}{40} = \frac{31}{40}$

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

*complement*  
 $\frac{30}{40} \cdot \frac{28}{40} \rightarrow \frac{21}{40}$



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. **I**
- a. Select one day of the year: Get a day in March and Halloween. **ME**
- b. Roll a 6-sided cube: Get a prime number and get a number greater than 3. **O**
- c. Pick a marble. Without replacing the first marble, pick a second marble. **D**
- d. Draw one card from a deck of 52 playing cards: Get a heart and get a black card. **ME**
- e. Pick a marble. Pick a second marble after replacing the first marble. **I**

7. A letter is chosen at random from the word **MISSISSIPPI**. Find the following: total: 11 letters

- a. P(vowel)  $\frac{4}{11}$    b. P(S)  $\frac{4}{11}$    c. P(consonant)  $\frac{7}{11}$    d. P(M)  $\frac{1}{11}$    e. P(I)  $\frac{4}{11}$    f. P(S')

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

8. P(heart)  $\frac{13}{52} = \frac{1}{4}$    9. P(queen U ace)  $\frac{4}{52} + \frac{4}{52} = \frac{8}{52} = \frac{2}{13}$    10. P(heart')  $\frac{39}{52} = \frac{3}{4}$
11. P(club  $\cap$  king)  $\frac{1}{52}$    12. P(face card | spade)  $\frac{3}{13}$    13. P(diamond | club)  $\frac{0}{52}$  Not Possible
- only 1 card is a club + king*

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)  $\frac{30}{48} = \frac{5}{8}$    15. P(Packers fan  $\cap$  Student)  $\frac{21}{48} = \frac{7}{16}$
16. P(Student)  $\frac{34}{48} = \frac{17}{24}$    17. P(Student U Bears fan)  $\frac{34}{48} + \frac{18}{48} - \frac{13}{48} = \frac{39}{48} = \frac{13}{16}$    18. P(Bears fan  $\cap$  Teacher)  $\frac{5}{48}$
19. P(Teacher U Packers fan)  $\frac{14}{48} + \frac{30}{48} - \frac{9}{48} = \frac{35}{48}$    20. P(Bears fan | Student)  $\frac{13}{34}$    21. P(Teacher | Packers fan)  $\frac{9}{30} = \frac{3}{10}$

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

9, Joint Frequency

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

34, Marginal Frequency

24. A bag of marbles contains 5 large blue, 8 large green, 7 small white, and 2 small green marbles. total: 22

- a. P(large U green)   b. P(white  $\cap$  blue)   c. P(blue U green)   d. P(white  $\cap$  small)

$$\frac{13}{22} + \frac{10}{22} - \frac{8}{22}$$

$$= \frac{15}{22}$$

$$\frac{0}{22}$$

not possible.  
No intersection  
of white + blue.

$$\frac{5}{22} + \frac{10}{22}$$

$$= \frac{15}{22}$$

$$\frac{7}{22}$$

25. A bag of marbles contains 8 blue, 12 green, and 3 white marbles. Total: 23 marbles

a. If the first marble is replaced, determine  $P(\text{green and then green})$ .

$$\frac{12}{23} \cdot \frac{12}{23} = \frac{144}{529}$$

b. If the first marble is not replaced, determine  $P(\text{green and then green})$ .

$$\frac{12}{23} \cdot \frac{11}{22} = \frac{132}{506} = \frac{6}{23}$$

c. If the first marble is replaced, determine  $P(\text{green and then blue})$ .

$$\frac{12}{23} \cdot \frac{8}{23} = \frac{96}{529}$$

d. If the first marble is not replaced, determine  $P(\text{green and then blue})$ .

$$\frac{12}{23} \cdot \frac{8}{22} = \frac{48}{253}$$

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

a.  $P(\text{Rolling a multiple of 3} \cap \text{Greater than 2})$

↳ 3, 6

↳ 3, 4, 5, 6

$$\frac{2}{6} = \frac{1}{3}$$

b.  $P(\text{Rolling a 3} \cap \text{odd number})$

↳ 3

↳ 1, 3, 5

$$\frac{1}{6}$$

c.  $P(\text{Rolling a 6} \cup \text{a prime number})$

↳ 6

↳ 2, 3, 5

$$\frac{1}{6} + \frac{3}{6} = \frac{4}{6} = \frac{2}{3}$$

d.  $P(\text{Rolling at least a 3} \cap \text{even number})$

↳ 3, 4, 5, 6

↳ 2, 4, 6

$$\frac{2}{6} = \frac{1}{3}$$

25. Events A and B are independent,  $P(A) = 0.8$  and  $P(B) = 0.7$ . What is  $P(A \text{ and } B)$ ?

Use Formula  $P(A) \cdot P(B) = P(A \cap B)$

$$.8 \cdot .7 = .56$$

26. Events A and B are independent. Find  $P(A)$  if  $P(B) = 75\%$  and  $P(A \text{ and } B) = 15\%$ .

$$P(A \cap B) = P(A) \cdot P(B) \quad \rightarrow \text{Divide } .75 \text{ into both sides}$$

$$.15 = P(A) \cdot .75$$

$$\frac{.15}{.75} = P(A)$$

$$P(A) = .2 = 20\%$$

27. Are the following events independent?  $P(A) = 0.5$ ,  $P(B) = 0.8$ ,  $P(A \text{ and } B) = 0.45$

$$P(A \cap B) = P(A) \cdot P(B)$$

$$.45 \stackrel{?}{=} .5 \cdot .8$$

$$.45 \neq .4$$

Events are not independent