Unit 9 Lesson 6 Notes

Conditional Probability: The probability that Event B will occur given that Event A has occurred.
(2nd Event) ... *(1st Event)*

- Fraction of Event A's outcomes that also belong to event B.
- Assume event A has occurred, now what is the probability of event B?

Notation: $P(B|A)$ "The probability of Event B given event A"

Sample Wording: probability of getting the flu given that you got a flu shot.

Conditional Probability (the probability of Event A GIVEN Event B)

$$P(B|A) = \frac{P(A \cap B)}{P(A)} \Rightarrow \frac{P(A \text{ and } B)}{P(A)}$$

Examples:

1. The table shows the number of restaurants in a town that provide wifi for their patrons.

	Fast Food	Mid-Price	High Price	Total
No wifi	7	5	3	15
Has wifi	2	3	1	6
Total	9	8	4	(21)

Find the probability of choosing a restaurant that has wifi, given it is a fast food restaurant.

$$P(\text{Wifi}|FF) = \frac{P(\text{Wifi and } FF)}{P(FF)} = \frac{2}{9}$$

b. Find the probability of choosing a High Price restaurant, given it has wifi.

$$P(\text{High Price}|\text{wifi}) = \frac{P(HP \text{ and wifi})}{P(\text{wifi})} = \frac{1}{6}$$

c. Find $P(NW|MP)$
$$\frac{5}{8}$$

d. $P(W)$
$$\frac{6}{21} = \frac{2}{7}$$

2. The table shows the number of people who visited a movie theater one evening for the 7pm showing of various movies with the ratings shown.

	G	PG	R	Total
Minor	30	50	2	82
Adult	15	60	35	110
Total	45	110	37	(192)

a. Find the probability someone attended a PG movie, given they were an adult.

$$P(PG|adult) = \frac{P(PG \text{ and adult})}{P(adult)} = \frac{60}{110} = \frac{6}{11}$$

b. Find the probability someone attended a PG movie, given they were a minor.
$$P(PG|MINOR) = 50/82 = \frac{25}{41}$$

c. Find $P(A|R)$
$$35/37$$

d. Find $P(M|R)$
$$2/37$$

e. Find $P(G|M)$ $30/82 = 15/41$

f. $P(R|M)$ $2/82 = 1/41$

3. A number is randomly selected from a game spinner with the numbers 1-6. Find the probability of selecting an even number, given that the outcome is 4 or less. $P(\text{Even}|<4) = 1/3$

$\{1,2,3,4,5,6\}$

50 students are surveyed about their enrollment in a foreign language class and participation in a sport. Of the 50 students, 14 responded that they plan to play a sport and take a foreign language class. 10 students reported that they plan to only play a sport. Only 3 students plan not to participate in either a sport or a foreign language.
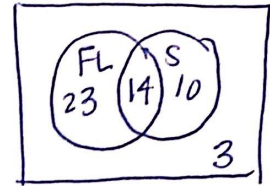
a. Organize the data into a Venn diagram.

FL | S
23 (14) 10
3

b. What is the probability that a randomly selected student will take a foreign language class and not play a sport?

23/50   *NO GIVEN

c. What is the probability that a randomly selected student will play a sport given they do not plan to enroll in a foreign language class? 10/13

d. What is the probability that a randomly selected student will take a foreign language class given they also plan to play a sport?
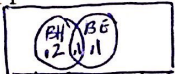
14/24 = 7/12

5. In New York State, 48% of all teenagers own a skateboard and 39% of all teenagers own a skateboard and roller blades. What is the probability that a teenager owns roller blades given that the teenager owns a skateboard?

SB | RB
.09 (.39) .52
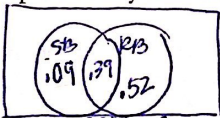
.39/.48 = .8125 or 13/16

Suppose 30% of a population has brown hair, 20% has blue eyes, and 10% has both brown hair and blue eyes.

BH | BE
.2 (.1) .1

a. What is the probability that a person randomly chosen from this population will have blue eyes given the person has brown hair?

.1/.3 = 1/3

b. What is the probability that a person randomly chosen from this population will have brown hair given the person has blue eyes?

.1/.2 = 1/2

7. Suppose we survey all the students at school and ask them how they get to school and also what grade they are in. The chart below gives the results. Complete the two way frequency table.

a. P(walk to school) 88/500 = 22/125

b. P(9th or 10th grader) 210/500 = 21/50

c. P(11th or 12th grade | rode a car to school) 92/127
184/254

d. P(rode a car to school | 11th or 12th grade) 92/145
184/290

e. P(walk | 9th or 10th grade) 1/7
30/210

f. P(9th or 10th grade | walk) · 15/44
30/88

	Bus	Walk	Car	Other	Total
9th or 10th	106	30	70	4	210
11th or 12th	41	58	184	7	290
Total	147	88	254	11	500