HW 4 - CONDITIONAL PROBABILITY HW NAME Key

1. *Donald, the quarterback, has 2 wide receivers. He throws to Goofy thirty plays and Goofy drops the ball 90% of the time. Donald throws to Pluto twenty plays and Pluto is able to catch the ball 70% of the time.*

	GOOFY	PLUTO	TOTAL
CAUGHT	3	14	17
DROPPED	27	6	33
TOTAL	30	20	50

a. What is the probability that ball was caught by either Goofy or Pluto? $\frac{17}{50}$

b. What is the probability that the ball was dropped by either Goofy or Pluto? $\frac{33}{50}$

c. Given that the ball is dropped, what is the probability that it was passed to Pluto? $\frac{6}{33} = \frac{2}{11}$

d. Given that the pass is caught, what is the probability that it was Goofy who caught it? $\frac{3}{17}$

e. P(caught | Goofy) $\frac{3}{30} = \frac{1}{10}$

f. P(dropped | Pluto) $\frac{6}{20} = \frac{3}{10}$

2. *A box contains three blue marbles, five red marbles, and four white marbles. If one marble is chosen at random, find:*

a. P(blue | not white) $\frac{3}{8}$

b. P(not red | not white) $\frac{3}{8}$

c. P(white | not red) $\frac{4}{7}$

d. P(red | not blue) $\frac{5}{9}$

e. P(not blue | not white) $\frac{5}{8}$

f. P(white | not blue) $\frac{4}{9}$

3. *Given the following two way table, answer the following questions:*

Eye Color \ Hair Color	Black	Brown	Red	Blond	Total
Brown	7	12	3	1	23
Blue	2	8	2	9	21
Hazel	2	5	1	1	9
Green	1	3	1	2	7
Total	12	28	7	13	60

a. What is the probability that a person has brown hair, given that they have green eyes? $\frac{3}{7}$

b. What is the probability that a person has green eyes, given that they have brown hair? $\frac{3}{28}$

c. Given that a person has blue eyes, what is the probability that a person has blonde hair? $\frac{9}{21} = \frac{3}{7}$

d. What is the probability that a person has hazel eyes, given that they do NOT have brown hair? $\frac{4}{32} = \frac{1}{8}$

e. P(brown eyes | brown hair) $\frac{12}{28} = \frac{3}{7}$

f. P(black hair | blue eyes) $\frac{2}{21}$

g. P(blonde | not blue eyes) $\frac{4}{39}$

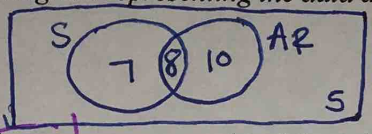
4. *In New York State, 48% of all teenagers own a skateboard and 39% of all teenagers own a skateboard and roller blades. What is the probability that a teenager owns roller blades given that the teenager owns a skateboard?*

$$\frac{P(\text{roller blades \& skate board})}{P(\text{skateboard})} = \frac{.39}{.48} = .8125 \quad 81.25\%$$

5. *At a middle school, 18% of all students play football and basketball and 32% of all students play football. What is the probability that a student plays basketball given that the student plays football?*

$$\frac{P(F \text{ and } B)}{P(F)} = \frac{.18}{.32} = .5625 \quad 56.25\%$$

6. *Of a class of 30 seniors, 15 enjoy watching survivor and 18 enjoy watching The Amazing Race, while 5 students watch neither show. Create a Venn diagram representing the data and find the following:* $15+18+5=38 \rightarrow 38-30=8$ overlap



a) P (watches only Survivor) $\frac{7}{30}$

b) P (watches Amazing Race | Survivor) $\frac{8}{15}$

c) P (watches Survivor | Amazing Race) $\frac{8}{18} = \frac{4}{9}$

d) P (watches Amazing Race | does not watch Survivor) $\frac{10}{15} = \frac{2}{3}$

e) P (watches neither show) $\frac{5}{30} = \frac{1}{6}$

7. *The international club at a school has 105 members, many of whom speak multiple languages. The most commonly spoken languages in the club are English, Spanish and Chinese. Use the Venn Diagram below to determine:*

a) P (does not speak English) $\frac{16}{105}$

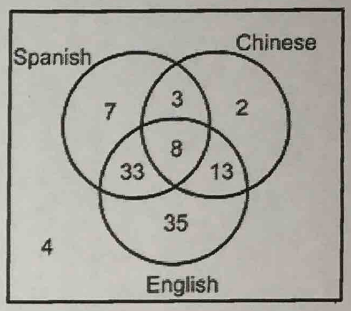
b) P (Spanish | English) $\frac{41}{89}$

c) P (Spanish | Chinese) $\frac{11}{26}$

d) P (English | Chinese) $\frac{21}{26}$

e. P(English | Spanish) $\frac{41}{51}$

f. P(Chinese | not Spanish) $\frac{15}{54} = \frac{5}{18}$

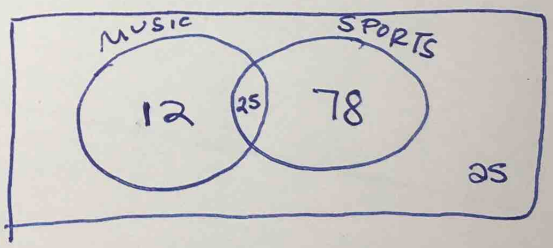


8. *The data from a survey of 140 students showed that 37 study music, 103 play a sport and 25 do neither. Create a Venn diagram to illustrate the data and find the following:* $37+103+25=165 \rightarrow 165-140=25$ overlap

a) Find the probability that a student does not study music $\frac{103}{140}$

b) Find the probability that a student studies music, given that they do not play sports. $\frac{12}{37}$

c) Given that a student does not study music, find the probability that they do not play sports. $\frac{25}{103}$



9. *Compute the conditional probabilities $P(A|B)$ and $P(B|A)$:*

a) P(A) = 0.7, P(B) = 0.4, P(A and B) = 0.25

$P(A|B) = \frac{0.25}{0.4} = .625$ $P(B|A) = \frac{0.25}{0.7} = .357$

b) P(A) = 0.45, P(B) = 0.8, P(A and B) = 0.3

$P(A|B) = \frac{0.3}{0.8} = .375$ $P(B|A) = \frac{0.3}{0.45} = .67$

10. *Compute P (A and B):*

c) P(A) = 0.6, P(B) = 0.18, P (A | B) = 0.3

$0.3 = \frac{P(A \text{ and } B)}{0.18}$

$.054 = P(A \text{ and } B)$

d) P(A) = 0.2, P(B) = 0.5, P (B | A) = 0.1

$0.1 = \frac{P(A \text{ and } B)}{0.2}$

$.02 = P(A \text{ and } B)$