Probability Worksheet #7
October 8, 2018
2 Points

Circle one name.

Name: Solutions **Name:** _____ **Name:** _____

Note: $P(E|F) = \frac{\text{size of } E \cap F}{\text{size of } F}$.

Note: Two events E and F are said to be independent if $P(F|E) = P(F)$.

1. The stats for a sports team's season are given in the table. This team has a star player who got injured in the middle of the season. The table records wins and losses and whether the star player was in or not in the game:

	Wins	Losses	Total
Star In	12	4	16
Star Out	15	5	20
Total	27	9	36

Suppose a game is chosen at random.
Let E be the event "the star player was in the game."
Let F be the event "the team won the game."
Express each statement in probability notation and then calculate the result.

(a) What is the probability of picking a game that the star player played in? $\frac{16}{36}$

(b) What is the probability of picking a winning game? $\frac{27}{36} = \frac{3}{4}$

(c) What is the probability of picking a game that has the star player in it and was a winning game? $\frac{12}{36}$

(d) What is the probability of picking a game that has the star player in it or was a winning game? $\frac{31}{36}$

(e) What is the probability of picking a winning game given that the chosen game has the star player in it? $\frac{12}{16} = \frac{3}{4}$

(f) What is the probability of picking a game that has the star player in it given that the chosen game was a winning game? $\frac{12}{27}$

(g) Based on these calculations, are the events E and F independent?

$P(E) = \frac{16}{36} = \frac{4}{9}$ $P(E|F) = \frac{12}{27} = \frac{4}{9}$
$P(F) = \frac{27}{36} = \frac{3}{4}$ $P(F|E) = \frac{12}{16} = \frac{3}{4}$
Yes, Independent

2. The CDC is testing a population for a disease. The test gives the correct result 1% of the time. Below is a table of the population indicating how the test came out.

	Test is Positive	Test is Negative
Has Disease	99	1
Doesn't Have Disease	100	9900

A person is selected at random.
Put E be the event that the person has the disease.
Let F be the event that the person tests positive for the disease.
Express each statement in probability notation and then calculate the result.

(a) The probability that the person has the disease.

$\frac{100}{10,100}$

(b) The probability that the person does not have the disease.

$\frac{10,000}{10,100}$

(c) The probability that the person tested positive for the disease.

$\frac{199}{10,100}$

(d) The probability that the person has the disease or tested positive for the disease.

$\frac{200}{10,100}$

(e) The probability that the person has the disease and tested positive for the disease.

$\frac{99}{10,100}$

(f) The probability that the person tested positive for the disease, given that they have the disease.

$\frac{99}{100}$

(g) The probability that the person has the disease, given that they tested positive for the disease.

$\frac{99}{199}$

(h) Based on these calculations, are the two events E and F independent or not?

$P(E) = \frac{100}{10,100} = \frac{1}{101} \neq P(E|F) = \frac{99}{199}$

$P(F) = \frac{199}{10,100} \neq P(F|E) = \frac{99}{100}$

No, not independent