

Name _____

SHOW AS MUCH WORK AS POSSIBLE BECAUSE YOU MAY RECEIVE PARTIAL CREDIT FOR THE WORK YOU DO IF YOUR ANSWER IS INCORRECT.

A university surveyed 200 recent graduates from its liberal arts school and 300 from its engineering school. The number of low and high income earners classified by gender and degree type is summarized in the following table:

		Liberal Arts Degree		Engineering Degree	
		Low Income	High Income	Low Income	High Income
Gender	Female	90	60	20	30
	Male	30	20	100	150

1. For just Liberal Arts graduates:

- a. What is the probability of having a high income given that a graduate is female?

$$P(H | F) = \frac{60}{150} = 0.4$$

- b. What is the probability of having a high income given that a graduate is male?

$$P(H | M) = \frac{20}{50} = 0.4$$

- c. Is income level independent of gender? Why or why not?

Yes, they are independent since $P(H | F) = P(H | M) = P(H) = 0.4$

2. For just Engineering graduates:

- a. What is the probability of having a high income given that a graduate is female?

$$P(H | F) = \frac{30}{50} = 0.6$$

- b. What is the probability of having a high income given that a graduate is male?

$$P(H | M) = \frac{150}{250} = 0.6$$

- c. Is income level independent of gender? Why or why not?

Yes, they are independent since $P(H | F) = P(H | M) = P(H) = 0.6$

3. For all of the graduates:

- a. What is the probability of having a high income given that a graduate is female?

$$P(H | F) = \frac{90}{200} = 0.45$$

- b. What is the probability of having a high income given that a graduate is male?

$$P(H | M) = \frac{170}{300} = 0.567$$

- c. Is income level independent of gender? Why or why not?

No, they are not independent since $P(H | F) < P(H | M) \neq P(H) = 0.52$

4. Compare your answer to 3c with your answers to 1c and 2c. Give an explanation for the results.

The results are different because in problem 3, the numbers are aggregated across degree type. In this survey, females are more likely to have a Liberal Arts degree than an Engineering degree, and engineering graduates are more likely to have a high income than liberal arts graduates. That is why, overall (in this survey), females are less likely than males to have a high income, whereas within each degree type they are the same.