**BIS 305**

# Assignment 4

**Due 10/10/22**

Assignment to be turned in. This assignment should be well written with a word processor.

12. Row 26 of the Excel file Census Education Data gives the number of employed persons in the civilian labor force having a specific educational level.

1. Find the probability that an employed person has attained each of the educational levels listed in the data.

The probability is = 10890838/ 111,242,131 = 0.097902098 (9.79%)

1. Suppose that A is the event “An employed person has some type of college degree” and B is the event “An employed person has at least some college.” Find the probabilities of these events. Are they mutually exclusive? Why or why not?

P(Some Type of College) = 42,896,566/111,242,131 = 0.385614386 (38.56%)

P(At least Some College) = 63,344,670/111,242,131 = 0.569430569 (56.94%)

1. Find the probability P(A or B). Explain what this means.

Since both events aren't mutually exclusive, when you add both probabilities, the elements they have in common are counted 2x and this means we must subtract those elements. The ‘elements’ in the common are “associate, Bachelors, and Advanced Degree. The only different ‘element’ is “Some College Degree” soThat means the probability is .56.94.

16. Use the Civilian Labor Force data in the Excel file Census Education Data to find the following:

1. P(unemployed and advanced degree)

170,089( # of Unemployed people with advanced degrees) / 172,211,000 (Total number of people) = 0.000987678

1. P(unemployed ∙ advanced degree)

170,089 ( # of Unemployed people with advanced degrees) / 13572917 (# of People with Advanced Degrees) = 0.012531499

1. P(not a high school grad ∙ unemployed)

1,057,310 (# of unemployed people without a HS Degree) / 4,592,403 (All unemployed people) = 0.23023023

1. Are the events “unemployed” and “at least a high school graduate” independent?

These events are not independent because P(unemployed) = 4592403/172211000=**0.0266673** and P(at least a high school graduate) = (172211000-29620292)/172211000 = **0.828**

P(unemployed and at least a high school graduate) = (4592403-1057310)/4592403 = **0.7697698**

P(unemployed and at least a high school graduate) is not equal to P(unemployed)\*P(at least a high school graduate). This means unemployed and at least a high school graduate are not independent.

33. The number and frequency of Atlantic hurricanes annually from 1940 through 2015 is shown here. This means, for instance, that no hurricanes occurred during 5 of these years, only one hurricane occurred in 16 of these years, and so on.

1. Find the probabilities of 0–12 hurricanes each season using these data.

|  |  |  |
| --- | --- | --- |
| Number | Frequency | Probability |
| 0 | 5 | 0.065789 |
| 1 | 16 | 0.210526 |
| 2 | 20 | 0.263158 |
| 3 | 14 | 0.184211 |
| 4 | 4 | 0.052632 |
| 5 | 5 | 0.065789 |
| 6 | 5 | 0.065789 |
| 7 | 3 | 0.039474 |
| 8 | 2 | 0.026316 |
| 10 | 1 | 0.013158 |
| 12 | 1 | 0.013158 |
| Total | 76 |  |

Frequency / Frequency Total

1. Find the mean number of hurricanes.

|  |  |  |  |
| --- | --- | --- | --- |
| Number | Frequency | Probability | Number\*Probability |
| 0 | 5 | 0.065789 | 0 |
| 1 | 16 | 0.210526 | 0.210526316 |
| 2 | 20 | 0.263158 | 0.526315789 |
| 3 | 14 | 0.184211 | 0.552631579 |
| 4 | 4 | 0.052632 | 0.210526316 |
| 5 | 5 | 0.065789 | 0.328947368 |
| 6 | 5 | 0.065789 | 0.394736842 |
| 7 | 3 | 0.039474 | 0.276315789 |
| 8 | 2 | 0.026316 | 0.210526316 |
| 10 | 1 | 0.013158 | 0.131578947 |
| 12 | 1 | 0.013158 | 0.157894737 |
| Total | 76 |  | 3 |

Sum of Number \* Probability

1. Assuming a Poisson distribution and using the mean number of hurricanes per season from part b, compute the probabilities of experiencing 0–12 hurricanes in a season. Compare these to your answer to part a. How accurately does a Poisson distribution model this phenomenon? Construct a chart to visualize these results.

|  |  |  |
| --- | --- | --- |
| Probability | Number\*Probability | Poisson Probabilities |
| 0.065789 | 0 | 0.049787068 |
| 0.210526 | 0.210526316 | 0.149361205 |
| 0.263158 | 0.526315789 | 0.224041808 |
| 0.184211 | 0.552631579 | 0.224041808 |
| 0.052632 | 0.210526316 | 0.168031356 |
| 0.065789 | 0.328947368 | 0.100818813 |
| 0.065789 | 0.394736842 | 0.050409407 |
| 0.039474 | 0.276315789 | 0.021604031 |
| 0.026316 | 0.210526316 | 0.008101512 |
| 0.013158 | 0.131578947 | 0.000810151 |
| 0.013158 | 0.157894737 | 5.52376E-05 |
|  | 3 |  |

Using the =Posson.Dist Function to find the Poisson probabilities, I can tell that the probability from question A & question C are different. I don’t think Poisson Distribution models this distribution correctly.

40. A supplier contract calls for a key dimension of a part to be between 1.96 and 2.04 centimeters. The supplier has determined that the standard deviation of its process, which is normally distributed, is 0.03 centimeter.

1. If the actual mean of the process is 1.98, what fraction of parts will meet specifications?

z(1.95) = (1.95-1.98)/0.1 = -.3  
z(2.05) = (2.05-1.98)/0.1 = 0.7

P(1.95< x <1.98) = P(-0.3 < z < 0.7) = normalcdf(-0.3,0.7) = 0.3759

1. If the mean is adjusted to 2.00, what fraction of parts will meet specifications?

z(1.95) = (1.95-2)/0.1 = -.5   
z(2.05) = (2.05-2)/0.1 = 0.5  
  
P(1.95< x <1.98) = P(-0.5 < z < 0.5) = normalcdf(-0.5,0.5) = 0.3829

1. How small must the standard deviation be to ensure that no more than 2% of parts are nonconforming, assuming the mean is 2.00?

(1.95-2)/s = -2.3264  
s = 0.0215