MATH221 Statistics for Decision Making

Week 4 Lab

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Statistical Concepts:

* Probability
* Binomial Probability Distribution

# Calculating Binomial Probabilities

**NOTE: For question 1, you will be using the same data file your instructor gave you for the Week 2 lab.**

1. Using the data file from your instructor (same one you used for the Week 2 lab), calculate descriptive statistics for the variable (Coin) where each of the thirty-five students in the sample flipped a coin 10 times. Round your answers to three decimal places and type the mean and the standard deviation in the grey area below.

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| Mean:  Standard deviation: |

**NOTE: for questions 2-7, you will NOT be using the data file your instructor gave you. Please follow the instructions given in each question.**

Plotting the Binomial Probabilities

* For the next part of the lab, open the Week 3 Excel worksheet. This will be used for the next few questions, rather than the data file used for the first question.

1. Click on the “binomial tables” workbook
2. Type in n=10 and p=0.5; this simulates ten flips of a coin where x is counting the number of heads that occur throughout the ten flips
3. Create a scatter plot, either directly in this spreadsheet (if you are comfortable with those steps), or by using the week 1 spreadsheet and copying the data from here onto that sheet (x would be the x variable, and P(X=x) would be the y variable.
4. Repeat steps 2 and 3 with n=10 and p=0.10
5. Repeat steps 2 and 3 with n=10 and p=0.90
6. In the end, you will have three scatter plots for the first question below.
7. Create scatter plots for the binomial distribution when p=0.50, p=0.10, and p=0.90 (see directions above). Paste the three scatter plots in the grey area below.

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Calculating Descriptive Statistics

Short Answer Writing Assignment – Both the calculated binomial probabilities and the descriptive statistics from the class database will be used to answer the following questions. Round all numeric answers to three decimal places.

1. List the probability value for each possibility in the binomial experiment calculated at the beginning of this lab, which was calculated with the probability of a success being ½. (Complete sentence not necessary; round your answers to three decimal places)

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| --- | --- | --- | --- | --- |
| P(x=0) |  |  | P(x=6) |  |
| P(x=1) |  |  | P(x=7) |  |
| P(x=2) |  |  | P(x=8) |  |
| P(x=3) |  |  | P(x=9) |  |
| P(x=4) |  |  | P(x=10) |  |
| P(x=5) |  |  |  |  |

1. Give the probability for the following based on the calculations in question 3 above, with the probability of a success being ½. (Complete sentence not necessary; round your answers to three decimal places)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| P(x≥2) |  |  | P(x<0) |  |
| P(x>2) |  |  | P(x≤5) |  |
| P(5<x ≤7) |  |  | P(x<5 or x≥7) |  |

1. Calculate (by hand) the mean and standard deviation for the binomial distribution with the probability of a success being 0.50 and n = 10. Either show work or explain how your answer was calculated. Use these formulas to do the hand calculations: Mean = *np*, Standard Deviation = 

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| Mean = *np*:  Standard Deviation = : |

1. Calculate (by hand) the mean and standard deviation for the binomial distribution with the probability of a success being 0.10 and n = 10. Write a comparison of these statistics to those from question 5 in a short paragraph of several complete sentences. Use these formulas to do the hand calculations: Mean = *np*, Standard Deviation = 

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| Mean = *np*:  Standard Deviation = :  Comparison: |

1. Calculate (by hand) the mean and standard deviation for the binomial distribution with the probability of a success being 0.90 and n = 10. Write a comparison of these statistics to those from question 6 in a short paragraph of several complete sentences. Use these formulas to do the hand calculations: Mean = *np*, Standard Deviation = 

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| Mean = *np*:  Standard Deviation = :  Comparison: |

**NOTE: For questions 8-9, you will use the results of the previous questions.**

1. Using all four of the properties of a Binomial experiment (see page 201 in the textbook) explain in a short paragraph of several complete sentences why the Coin variable from the class survey represents a binomial distribution from a binomial experiment.

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1. Compare the mean and standard deviation for the Coin variable (question 1) with those of the mean and standard deviation for the binomial distribution that was calculated by hand in question 5. Explain how they are related in a short paragraph of several complete sentences.

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| Mean from question #1:  Standard deviation from question #1:  Mean from question #5:  Standard deviation from question #5:  Comparison and explanation: |