**Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Math 127 Exam 2 Summer 2014**

**Oath: “*I will not discuss the exam contents with anyone until it is returned to me by my instructor*”**

**Sign Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

Every question is worth 3 points, except those marked \* are worth 2 points.

**1.** The diameters of Papa John’s Large pizzas follow N(14.15”, 0.25”). Large pizzas are advertised to have a diameter of 14”.

**1a\*.** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ What percentage of pies are actually under the advertised size?

**1b\*.** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ What is the probability that your next pizza is over 14.5” in diameter?

**1c.** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Determine the 70th percentile for diameter.

**1d.** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ If you buy four pizzas, determine the probability that all four are between 13.75” and 14.25”. Show calculation.

**1e.** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ If you buy four pizzas, determine the probability that at least one of them is below the advertised size. Show calculation.

**1f.** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Determine the IQR for this distribution. Show calculation.

**1g.** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ If a pizza is known to have a *z*-score = 2.57, what was the diameter? Show calculation.

**2.** Papa John’s Extra Large pizzas have diameters that follow a Normal model, but the mean diameter is unknown. We know that 8% of pizzas are 16.5” or bigger. The standard deviation is 0.30”. Find the mean, show work.

**3.** Suppose the time between arrivals to the Cecil College registration desk follows an Exponential probability distribution with a mean time of 9 minutes and a standard deviation of 9 minutes.

**3a.** Determine the first and third quartiles of this distribution. Then determine the IQR. Show work.

**3b\*.** P(Next arrival within 2 minutes) = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**3c\*.** P(Next arrival longer than 30 minutes) = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**4.** Suppose that 14% of Cecil College students are married, 39% of Cecil College students are Christian, and 3% of Cecil College students are both married and Christian. Create the 2 by 2 contingency table using the above information. Label clearly.

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| --- | --- | --- | --- |
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**5.** Use the “**Neighborhood**” dataset to answer the following questions. We will use “***Square Footage”*** of homes to predict the “***Assessed***” values of homes. “***Assessed***” value is the dollar value that property taxes are based on.

**5a.** Describe the relationship between the two variables, hitting all the important points and including a measure of strength in your write up.

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**5b.** Determine the best-fitting linear equation for this dataset. Explain why the *y*-intercept is meaningless in the context of this problem.

Equation: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

*y*-intercept: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**5c.** Interpret the value of the slope with a sentence in context. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**5d.** Interpret the value of *R*2 with a sentence in context. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**5e.** Interpret the value of *se*with a sentence in context. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**5f.** Identify any homes by row that have large Studentized residuals (what is large?):

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**5g.** Identify any homes by row that have large Cook’s distances (what is large?):

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**5h.** One house was forgotten to be included in the list. 200 Friendship is 2205 square feet. Predict its “***Assessed***” value using the model. If its actual “***Assessed***” value is $233,900, determine the value of the residual.

**Predicted value:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Residual:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**5i.** Interpret the value of the residual for 306 Hermitage.

**Residual:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Interpretation:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**5j.** The correlation is clearly statistically significant. ***If*** you were to run the randomization test to confirm this:

**Null Hypothesis:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Alternative Hypothesis:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**6.** At Cecil College, presume that 89.3% of our students have smart phones. We will randomly sample *n* = 15 students.

**6a.** P(Everyone has a smart phone) = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**6b.** P(At least 90% of the sample has a smart phone) = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**6c.** Why is it not appropriate to use the Normal approximation for this Binomial problem? \_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**6d.** Determine the mean and standard deviation for this probability distribution:

**Mean:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Standard Deviation:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**7.** Suppose the length of piano sonatas from the Romantic era follow a Uniform distribution on the interval [5, 25] in minutes.

**7a.** Draw the probability distribution graph and give the probability function:

**7b.** What percentage of sonatas last at least 21 minutes? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**7c.** Determine the 45th percentile for this probability distribution. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**8.** Use the following table to answer the following questions. Give fractions and then decimal answers rounded to three decimals if appropriate.

**Contingency table results:**   
Rows: Born in USA  
Columns: How Religious

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Extremely religious | Not religious | Somewhat religious | Very religious | Total |
| No | 0 | 1 | 3 | 1 | 5 |
| Yes | 5 | 42 | 55 | 25 | 127 |
| Total | 5 | 43 | 58 | 26 | 132 |

**8a\*.** P(Born in USA | Extremely Religious) = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**8b\*.** P(Somewhat religious | Not Born in USA) = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**8c\*.** P(Born in USA and Very Religious) = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**8d\*.** P(Religious in any way, shape, or form) = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**9.** The following table represents the number of customers that arrive, per 30 minutes, at that coffee place across the street from the college.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Number of Customers | 0 | 1 | 2 | 3 | 4 | 5 |
| Probability | 0.05 | 0.10 | 0.20 | 0.30 | 0.30 | 0.05 |

**9a.** P(At most 2 customer) = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**9b.** P(At least 2 customers) = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**9c.** Determine the expected number of customers. Show work.