**Calculating Probabilities with The Binomial Distribution**

Instructions: Solve the following questions regarding binomial distributions. For the *Handwritten Calculations*, set up and write down the probability statement before calculating the probability, i.e. write,

before applying the formula for the binomial distribution,

Binomial Distribution on the TI84/TI-83

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1. You are taking a quiz with 5 multiple choice questions. Each question has four choices and only one of the choices is correct. Suppose you randomly guess on each question. Answer the following questions:

a. Identify the binomial parameters *n*, *p* and *q* in this experiment.

b. What is the probability of getting exactly one question right?

c. What is the probability of getting exactly four questions right?

d. What is the probability of getting less than two questions right?

I. Based on the probability calculated in *part c*, is the event of getting 1 test question right if you randomly guessed significant?

e. What is the probability of getting four or more questions right?

I. Based on the probability calculated in *part d*, is the event of getting 4 test questions right if you randomly guessed significant?

II. Suppose you randomly guess on each question and get exactly four questions right. Based on the probability calculated in part d, what can you conclude about your guessing procedure?

f. What is the expected number of correct answers if you randomly guess on each questions?

g. What is the variance of the number of correct answers if you randomly guess on each question?

2. According to a Ipsos poll, 57% percent of Americans believe in aliens. Assume this percentage is accurate. Suppose you stop 10 people on the street and ask them if they believe in aliens. Answer the following questions regarding this scenario.

a. Identify the binomial parameters *n*, *p,* and *q* in this experiment.

b. What is the probability exactly two people of the 10 believe in aliens?

c. What is the probability less than three people believe in aliens?

I. Is the event of 2 people believing in aliens significant?

d. What is the probability of exactly 8 people believing in aliens?

e. What is the probability of 8 or more people believing in aliens?

II. Is the event of 8 people believing in aliens significant?

f. What is the expected number of people who believe in aliens out of the 10 you ask?

3. According to the top result on Google (*which I definitely did not verify or authenticate*) 11% of all people are left handed. Also according to Google, there were 765 full-time students at FRCC Boulder County in 2017.

a. What is the expected number of left-handed full-time students at FRCC in 2017?

b. What is the variance associated with this expectation?

c. What is the probability no more than 50 full-time students at FRCC in 2017 were left- handed?

d. What is the probability at least 150 full-time students at FRCC in 2017 were left-handed?

e. What is the probability between 120 and 330 full-time students at FRCC in 2017 were left handed?

4. According to the YouGov, only 66% of Millenials (*aged 18 -24*) believe the Earth is round (*I looked this one up; source*: <https://today.yougov.com/topics/philosophy/articles-reports/2018/04/02/most-flat-earthers-consider-themselves-religious>). Suppose you sample 50 people from this age range and ask them whether or not the Earth is round. Answer the following questions.

a. What is the expected number of people out of this sample of 50 who believe the earth is round?

b. What is the variance associated with this expectation?

c. What is the probability that no more than 10 people out of this 50 believe the Earth is round?

d. What is the probability at least 45 out of 50 people aged 18 – 24 believe the Earth is round?

e. What is the probability exactly 49 out of 50 people aged 18 – 24 believe the Earth is round?

f. What is the probability that between 20 and 25 people aged 18 – 24 believe the Earth is round?