One-sided and two-sided hypothesis tests   NAME:

1. I made a six-sided die from a piece of cardboard. I want to check if it is fair. So I rolled it 100 times and got a “1” twenty-six of those times. We’ll perform a one-sided test to see if this sample data is evidence that the die is not fair.

a.) What is my experimental probability of rolling a “1”? This will serve as our statistic, as though we were sampling.

b.) If the die was fair, what should the probability of rolling a “1” be? Write your answer in decimal form, rounded to two decimal places. This will serve as the population percentage. Round appropriately.

c.) What are the null and alternative hypotheses for a one-sided test? Write your values in decimal form, with two decimal places.

d.) Every time I roll this die 100 times, it could result in a different experimental probability. These results are normally distributed. The mean (p) of this distribution is .17 (the true probability of rolling a “1”) and the standard deviation is found by calculating $\sqrt{\frac{p(1-p)}{n}}$ where p is the true probability of rolling a “1” and n is the number of trials of our experiment. What is the standard deviation of this distribution? Round your answer to three decimal places, leaving it in decimal form. (You should get .038 as the standard deviation.)

e.) Determine the P-value for our statistic. This gives us the probability that a fair die would turn up "1" as many or more times (out of 100) as it did in our experiment. Also, draw the normal curve with the mean of .17 and .26 marked; shade the area that corresponds to the P-value. What does it tell you about the die?

f.) Notice this P-value (.0082) is significant at the 1% level. This means we **reject** the null hypothesis at the 1% level. Our sample result is said to be **statistically significant**. It is unlikely to have occurred by chance, assuming the null hypothesis were true. We are saying that we have evidence that the die is **not** fair.

g.) Let's perform the two-sided test. What are the null and alternative hypotheses?

h.) Draw a normal curve with the mean of .17 and the values .26 and .08 marked. (Both .26 and .08 are as far away from the mean as the experimental probability of .26.) Shade the area we will find as the P-value. Then find this area.

i.) What is your conclusion about the die at the 1% level? What about the 5% level?

2. A large organization is trying to fight a sex-discrimination lawsuit. They are claiming that the percent of females in positions of power is 40%, and this shows they are not discriminating on sex. A full census of their organization is not possible so we must sample to see if they are telling the truth. We conduct a sample of 250 of their female employees. We find 87 of the females we sampled are in positions of power. Determine if this is evidence for or against the organization's claim. Follow the steps outlined below.

a.) What is the sample proportion of females in positions of power? Round to three decimal places, leaving it in decimal form.

b.) We will use a one-sided test. What will you use for the null and alternative hypotheses?

c.) Assuming the organization's claim, what is the standard deviation of the sampling distribution? Use the formula $\sqrt{\dfrac{p(1-p)}{n}}$. Round to three decimal places, leaving it in decimal form.

d.) Now, draw a normal curve, label the important values, and shade the area in which we are interested.

e.) Find the P-value or the area shaded in part d. What is your conclusion about the organization's claim at a 5% significance level?

f.) The government wants overwhelming evidence that the organization is discriminating. Is this overwhelming evidence? (A significant result at the 1% level would be overwhelming evidence.)