Question 8

Basketball

Population

We are studying the percentage successful free throw attempts made by Saquille O'Neal.

p= the true proportion of successful free throw attempts made by Shaquille O'Neal.

Goal: Test to see if there is support for saying that p has increased from 53.3% of his free throw attempts.

Method

$$\begin{gathered} H_0 : p = 0.533 \\ H_a : p > 0.533 \\ \alpha = 0.05 \end{gathered} \tag{1}$$

Sample

Interpretation for a 1-Sample Z-test

Decision Rule Based on p-value
Reject H_0 : p-value $\leq \alpha$
Fail to Reject H_0 : p-value $> \alpha$

p-value=0.0475
$\alpha = 0.050$

For the p-value approach:

Since 0.0475<=0.05, we reject the null hypothesis in favor of the alternative hypothesis. There is enough evidence to support the claim of the alternative hypothesis.

$$\begin{gathered} n(p_0)(1-p_0) \geq 10 \\ 36(0.533)(0.467) \geq 10 \\ 8.960796 \not\geq 10 \\ \therefore \\ \textit{The sample cannot be} \\ \textit{considered normal} \end{gathered} \tag{2}$$

Results

$$
\begin{aligned}
Z &= \frac{\hat{p} - p_0}{\sqrt{\frac{(p_0)(1-p_0)}{n}}} \\
Z &= \frac{0.6667 - 0.533}{\sqrt{\frac{(0.533)(1-0.533)}{100}}} \\
Z &= \frac{0.1337}{\sqrt{\frac{(0.533)(0.467)}{100}}} \\
Z &= \frac{0.1337}{\sqrt{\frac{0.2489}{100}}} \\
Z &= 1.67
\end{aligned}
\tag{3}
$$

My sample mean is 0.67 standard errors above 53.3%.

My p-value is 0.0475.

Assuming that the true proportion equals 53.3%, there is a 4.75% probability of getting a sample population ($\hat{p}$) at least as extreme as the one we got from sampling.

Conclusion

At the 5% level of significance, the sample data does provide sufficient evidence to say that the true proportion has increased from 53.3% success rate of Shaquille O'Neal's freethrow attempts.

Question 9

Couples

According to official census figures, 8% of couples living together are not married. A researcher took a
random sample of 400 couples and found that 38 of them are not married. Test at the 5% significance
level if the current percentage of unmarried couples is different from 8%. Show the complete testing process on a separate document.

In addition, which of the following is the correct set of hypotheses?

Population

We are studying the percentage of couples living together who are not married.

p= the true proportion of couples living together who are not married.

Goal: Test to see if there is support for saying that p has changed from 8%.

Method

$$\begin{aligned} H_0 &: p = 0.08 \\ H_a &: p \neq 0.08 \\ \alpha &= 0.05 \end{aligned} \tag{4}$$

Sample

Interpretation for a 1-Sample Z-test

Decision Rule Based on p-value
Reject H_0 : p-value $\leq \alpha$
Fail to Reject H_0 : p-value $> \alpha$

p-value=0.267
$\alpha = 0.050$

For the p-value approach:

Since 0.267> 0.05, we fail to reject the null hypothesis.
There is not enough evidence to support the claim of the alternative hypothesis.

$$\begin{gathered} n(p_0)(1-p_0) \geq 10 \\ 400(0.08)(0.92) \geq 10 \\ 29.44 \geq 10 \\ \therefore \\ \textit{The sample can be} \\ \textit{considered normal} \end{gathered} \tag{5}$$

Results

$$\begin{gathered} Z = \frac{\hat{p} - p_0}{\sqrt{\frac{(p_0)(1-p_0)}{n}}} \\ Z = \frac{0.095 - 0.08}{\sqrt{\frac{(0.08)(1-0.08)}{100}}} \\ Z = \frac{0.015}{\sqrt{\frac{(0.13)(0.87)}{100}}} \\ Z = \frac{0.015}{\sqrt{\frac{0.0736}{100}}} \\ Z = 1.11 \end{gathered} \tag{6}$$

My sample mean is 1.11 standard errors above 8%.

My p-value is 0.267.

Assuming that the true proportion equals 8%, there is a 26.7% probability of getting a sample population ($\hat{p}$) at least as extreme as the one we got from sampling.

Conclusion

At the 5% level of significance, the sample data does not provide sufficient evidence to say that the true proportion has changed from 8% of couples living together who are not married.