

1. According to the website EV Hub, about 11% of new vehicle sales nationwide are electric. Santiago, an AP Stats student in California, believes that the percentage of new vehicle sales that are electric is higher in his state. From the Department of Motor Vehicles registry, he selects a random sample of 200 new vehicles sold in California in the past year and finds that 52 are electric. He wants to perform a hypothesis test for the following hypotheses: $H_0 : p = 0.11$, $H_a : p > 0.11$ where p = the true proportion of all new vehicle sales in California in the past year that are electric.
 - a. Is the Random condition satisfied? Why is this important?
 - b. Is the 10% condition satisfied? Why is this important?
 - c. Is the Large Counts condition satisfied? Why is this important?

2. Brazil produces about 25% of the world's coffee beans, more than any other country in the world. Madcap, a coffee roaster in Michigan, believes that purchases of Brazilian beans represent a smaller percentage of their coffee sales. A random sample of 100 Madcap coffee sales finds that 22 of them were for Brazilian beans. A hypothesis test of $H_0 : p = 0.25$ versus $H_a : p < 0.25$ is performed, where p = the true proportion of all Madcap coffee sales that are Brazilian beans. Assume that H_0 is true and that the conditions for inference are met.
 - a. Find the mean and standard deviation of the sampling distribution of $\hat{p}$ when taking samples of size 100?
 - b. Find the z -score for the sample proportion of 0.22? Show your work.
 - c. Find the probability of getting a sample proportion of 0.22 or less, purely by chance.

3. According to the Center for Disease Control and Prevention, 37% of Americans consume fast food daily. Kayla believes that this percentage is greater for students at her large high school. She selects a random sample of 80 students at her school and finds that 60% of them consume fast food daily.
- a. Write appropriate hypotheses for a hypothesis test. Be sure to define the parameter.
- b. Kayla checked the Large Counts condition by writing $80(0.60) = 48 \geq 10$, $80(1 - 0.60) = 32 \geq 10$. Is this correct? Why or why not?
- c. Kayla calculated the test statistic as follows: $z = \frac{0.60 - 0.37}{\sqrt{\frac{(0.60)(0.40)}{80}}} = 4.2$. Is this correct? Why or why not?

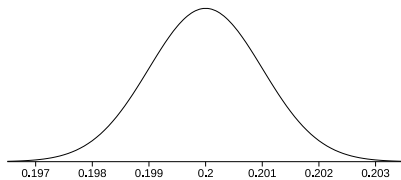
4. Research shows that 9% of personal computers sold worldwide are Apple computers. A marketing director believes this percentage is greater for sales on their website. She selects a random sample of 300 computer sales from the past year and finds that 39 are Apple computers.
- Write appropriate hypotheses for a hypothesis test. Be sure to define the parameter.
 - Explain why the sample proportion gives some evidence for the alternative hypothesis.
 - Check the conditions for inference.
 - Calculate the test statistic and p -value. Interpret the p -value.
 - Is this result convincing statistical evidence that the true proportion of all computers sold on this website that are Apple is greater than 9%?

5. An online article claimed that 75% of people who post photos on social media edit them before posting. Researchers in Nepal believe that the true percentage is greater for social media users in Nepal. They select a random sample of social media users from Nepal and find that 81% of them edit photos before posting. A hypothesis test results in a p -value of 0.0004. At the $\alpha = 0.05$ significance level, is there convincing statistical evidence that the true proportion of social media users in Nepal who edit photos before posting is greater than 0.75?

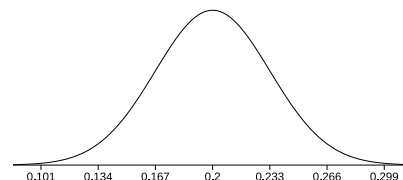
- A) No, because $0.0004 < 0.05$.
- B) No, because $0.81 - 0.75 > 0.05$.
- C) Yes, because $0.81 > 0.75$.
- D) Yes, because $0.0004 < 0.05$.

6. A company claims that 20% of its employees are younger than 30 years old. A human resources manager suspects that the true percentage is greater and decides to test this claim. He randomly selects 150 employees and finds that 50% of them are younger than 30 years old. Assuming all conditions for inference are met, which of the following best represents the sampling distribution of the sample proportion used in the hypothesis test?

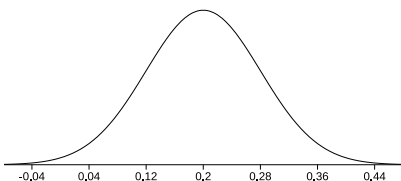
A)



B)



C)



D)

