

For each of the scenarios below complete the following:

- a. State the null hypothesis using proper notation
- b. State the alternative hypothesis using proper notation
- c. Determine the significance level = alpha (α)
- d. Find the standard error.
- e. Find the z-score and draw a well-labeled bell-curve with the appropriate region shaded based on H_a .
- f. Find the P-value
- g. Determine if the P-value is greater than or less than alpha (α)
- h. Determine if you reject or do not reject the null hypothesis
- i. Write a concluding sentence

Example 1. (Two-Tailed Test) The proportion of smokers among persons who graduated from a four-year college has been widely reported as 22%. A sociologist wonders if this is still true, so she sets up a survey that will yield a random sample of 785 college graduates. When the study is implemented, she finds that 153 out of the 785 are smokers. Use this data to test the sociologists question at the 5% significance level.

Example 2. (One-Tailed Test) At a certain casino, we observe 1000 rolls of a pair of dice and we see that they result in a sum of seven 153 times. Is this enough evidence to support a claim that the dice come up seven fewer than $1/6$ of the time? Use the given data to test at the 1% significance level.

1. Some years ago a study by the U.S. Bureau of Justice Statistics concluded that 61% of jail inmates had not completed high school. A sociologist wonders whether or not this holds today for her state. She surveys a random sample of 400 inmates and finds that 220 have not completed high school. At the 5% significance level what can this sociologist conclude?
2. It is widely believed that in July on a certain stretch of the northeast coast of the United States 60% of the seagulls are Franklin's gulls. A birdwatcher goes out one morning and spots 80 seagulls. He finds that 75 of them are Franklin's gulls. Assuming the 80 observed seagulls comprise a random sample of all seagulls, test the widely held belief at the 1% significance level.
3. At a large university, the dean of students has always assumed that 10% of the students are left-handed. James Hamblin, a left-handed student, has been having trouble finding left-handed desks. He suspects that more than 10% of the students are left-handed. He takes a survey of 100 students picked randomly and finds 16 left-handers. Is this good evidence at the 5% significance level to indicate that the dean is wrong?
4. For the disease Dandruffia Terminata, usually 68% of the victims recover without any treatment. The rest die within a short time. A researcher has a new drug that she hopes is a cure for the disease. She administers his drug to 64 patients picked at random from among victims of the disease, and 50 recover. Is this enough evidence to establish that the drug is effective? (Or is this result likely to have occurred just by chance?) Test at the 5% significance level.
5. The usual dropout rate in the freshman class at Central College is 50%. A new dean of admissions claims that recent policies have lowered the dropout rate, because in this year's class of 600 freshmen only 260 dropped out. Test the claim at the 5% significance level.
6. A manufacturer claims that only 2% of the women who use his birth control pill suffer from side effects. We have a feeling that this estimate is too low. We decide to test his claim at the 1% significance level using a sample of 900 randomly selected women. We find 23 women experienced side effects using this birth control pill.

ANSWERS TO PAGE 2 PROBLEMS

1. Some years ago a study by the U.S. Bureau of Justice Statistics concluded that 61% of jail inmates had not completed high school. A sociologist wonders whether or not this holds today for her state. She surveys a random sample of 400 inmates and finds that 220 have not completed high school. At the 5% significance level what can this sociologist conclude?
2. It is widely believed that in July on a certain stretch of the northeast coast of the United States 60% of the seagulls are Franklin's gulls. A birdwatcher goes out one morning and spots 80 seagulls. He finds that 75 of them are Franklin's gulls. Test at the 1% significance level. $H_0: p = 0.60$; $H_a: p \neq 0.6$; $z=6.16$; $P\text{-value} = .0000000072$; reject at the 1% level. There is strong statistical evidence to suggest that the percentage of Franklin gull's differs from 60%.
3. At a large university, the dean of students has always assumed that 10% of the students are left-handed. James Hamblin, a left-handed student, has been having trouble finding left-handed desks. He suspects that more than 10% of the students are left-handed. He takes a survey of 100 students picked randomly and finds 16 left-handers. Is this good evidence at the 5% significance level to indicate that the dean is wrong?
4. For the disease Dandruffia Terminata, usually 68% of the victims recover without any treatment. The rest die within a short time. A researcher has a new drug which he hopes is a cure for the disease. He administers his drug to 64 patients picked at random from among victims of the disease, and 50 recover. Is this enough evidence to establish that the drug is effective? (Or is this result likely to have occurred just by chance?) Test at the 5% significance level. $H_0: p = 0.68$; $H_a: p > 0.68$; $z=1.736$; $P\text{-value} = .0412$; do not reject at the 5% level. There is not enough evidence to suggest that the new drug is effective.
5. The usual dropout rate in the freshman class at Central College is 50%. A new dean of admissions claims that recent policies have lowered the dropout rate, because in this year's class of 600 freshmen only 260 dropped out. Test at the 5% significance level. $H_0: p = 0.50$; $H_a: p < 0.50$; $z=-3.27$; $P\text{-value} = .000545$; Reject at the 5% level. There is strong statistical evidence that the dropout rate at Central College has improved.
6. A manufacturer claims that only 2% of the women who use his birth control pill suffer from side effects. We have a feeling that this estimate is too low. We decide to test his claim at the 1% significance level using a sample of 900 randomly selected women. We find 23 women experienced side effects using this birth control pill. $H_0: p = 0.02$; $H_a: p > 0.02$; $z=1.19$; $P\text{-value}=.1169$; do not reject at the 1% level. There is not evidence to suggest that more than 2% of women suffer from side effects.