

For 1-3, identify the null and alternative hypotheses:

1. An entomologist writes an article in a scientific journal which claims that fewer than 7 in ten thousand male fireflies are unable to produce light due to a genetic mutation.
2. Carter Motor Company claims that its new sedan the Libra, will average better than 26 miles per gallon in the city. However, a recent study of 500 Libras found an average of 24 miles per gallon.
3. A skeptical paranormal researcher claims that the proportion of Americans that have seen a UFO is 0.03%. While a study of 32 people showed that 0.01% of the respondents had seen a UFO.
4. What should you do if you read a problem and the requirements for the section it is in are not met?

For 5 -13, test the given claim: Show the complete work for (a) Requirement Checking (b) Null/Alternative Hypothesis (c) Test Statistic formula and calculation (d) P-value (diagram if needed) (e) Short and formal Conclusion

5. A supplier of digital memory cards claims that less than 1% of the cards are defective. In a simple random sample of 400 memory cards, it is found that 3% are defective, but the supplier claims that this is only a sample fluctuation. At the 0.01 significance level, test the supplier's claim.
6. Research conducted a few years ago showed that 35% of UCLA students had travelled outside the US. UCLA has recently implemented a new study abroad program and results of a new survey show that out of the 100 simple random sampled students 42 have travelled abroad. Is there significant evidence to suggest that the proportion of students at UCLA who have travelled abroad has increased after the implementation of the study abroad program if $\alpha = 0.05$?
7. A survey conducted five years ago by the health center at a university showed that 18% of the students smoked at the time. This year a new survey was conducted on a simple random sample of 200 students from this university, and it was found that 40 of them smoke. Do these data provide convincing evidence to suggest that the percentage of students who smoke has changed over the last five years? Test the claim at the 0.01 significance level.
8. Arthritis is a painful, chronic inflammation of the joints. An experiment on the side effects of pain relievers examined arthritis patients to find the proportion of patients who suffer side effects when using ibuprofen to relieve the pain. In a simple random sample of 440 subjects with chronic arthritis were given ibuprofen for pain relief, 23 subjects suffered from adverse side effects. Food and Drug Administration claim that if more than 3% of users suffer side effects, they will put a stronger warning label on packages of ibuprofen. Test the claim at $\alpha = 0.01$ level.
9. A simple random sample of 100 pumpkins is obtained and the mean circumferences is found to be 40.5 cm. Assuming that the population standard deviation is known to be 1.6cm, use a 0.05 significance level to test the claim that the mean circumference of all pumpkins is equal to 39.9 cm.
10. A light-bulb manufacturer advertises that the average life for its light bulbs is 900 hours. A normally distributed simple random sample of 15 of its light bulbs resulted in the following lives in hours:
995 590 510 539 739 917 571 555 916 728 664 693 708 887 849
Test the claim at the 0.01 significance level.

11. Last year the government made a claim that the average income of the American people was \$33,950. However, a simple random sample of 50 people taken recently showed an average income of \$34,076 with a population standard deviation of \$324. Is the government's estimate too low? Conduct a significance test to see if the true mean is more than the reported average. Use an $\alpha = 0.01$.
12. An environmentalist collects a liter of water from 45 different locations randomly along the banks of a stream. The water sample is identified as simple random sample. He measures the amount of dissolved oxygen in each specimen. The mean oxygen level is 4.62 mg, with the overall standard deviation of 0.92. A water purifying company claims that the mean level of oxygen in the water is 5 mg. Conduct a hypothesis test with $\alpha = 0.01$ to determine whether the mean oxygen level is less than 5 mg.
13. An agro-economist examines the cellulose content of a variety of alfalfa hay. Suppose that the cellulose content in the population is normally distributed and has a standard deviation of 8 mg. A simple random sample of 15 cuttings has a mean cellulose content of 145 mg. A previous study claimed that the mean cellulose content was 140 mg. Perform a hypothesis test to determine if the mean cellulose content is different from 140 mg if $\alpha = 0.05$.