L18. Hypothesis Test on the Population Proportion

Example 1

A food company is planning to market a new type of frozen yoghurt. However, before marketing this yoghurt, the company wants to find the percentage of people who like it. The company's management has decided only to market this yoghurt if at least 35% of people like it. The company's research team selected a random sample of 400 people and asked then to taste this yoghurt. Of these, 112 said that they liked it. At the 2.5% level of significance, can you conclude that the company should market this yoghurt? What is the $P-value$?

Solution

Example 2

A study in 2015 claimed that 11% of all children in the US currently live with at least on grandparent. In 2020, a random sample of 1600 children found that 180 did currently live with at least grandparent. At the 10% level of significance does the data indicate that the proportion of all children in the US who live with at least one grandparent is different from 11%? What is the $P-value$ for this test?

Solution

Example 3

A company that sell computer parts claims that more 90% of their orders are mailed within 72 hours of them being received. The quality control department took a random sample of 150 orders and found that 140 were mailed within 72 hours of the order being placed. At the 0.005 level of significance does the data indicate that the company's claim is true?

Solution

Example 4

A researcher claims that at least 10% of all football helmets have manufacturing flaws that could potentially cause injury to the wearer. A sample of 200 helmets revealed that 24 helmets contained such defects.

a. Does this finding support the researcher's claim? Use $\alpha = 0.01$. Find the P-value.

b. Explain and show how the question in part (a) could be answered with a confidence bound.

Solution

Example 5

An article in Fortune (September 21, 1992) claimed that nearly one-half of all engineers continue academic studies beyond the B.S. degree, ultimately receiving either an M.S. or a Ph.D. degree. Data from an article in Engineering Horizons (Spring 1990) indicated that 230 of 484 new engineering graduates were planning graduate study.

a. Is the data from Engineering Horizons consistent with the claim reported by Fortune? Use a double tail test with $\alpha = 0.05$ in reaching your conclusions. Find the P-value for this test.

b. Discuss how you could have answered the question in part a by constructing a two-sided confidence interval on p.

Solution

Example 6

A random sample of 500 registered voters in Phoenix is asked if they favour the use of oxygenated fuels year-round to reduce air pollution. If more than 315 voters respond positively, we will conclude that at least 60% of the voters favour the use of these fuels.

a. What is the smallest level of significance for which the the null hypothesis will be rejected if exactly 60% of the voters favour the use of these fuels?

b. Construct and interpret an appropriate interval estimate to corroborate the conclusion obtained in (a).

Solution