MA 1670 Hypothesis Testing

One Sample Mean

The manufacturer of an over-the-counter pain reliever claims that its product brings pain relief to headache suffers in less than 3.5 minutes, on average. To be able to make this claim in its television advertisements, the manufacturer was required by a particular television network to present evidence in support of the claim. The manufacturer reported that for a random sample of 40 headache sufferers, the mean time to relief was 3.3 minutes and the standard deviation was 65 seconds. Do these data support the manufacturers claim? Test using a level of significance of 0.05.

A company purchases large quantities of distilled water in 50 gallon drums. Because the purchases are ongoing, small shortages in the drums can represent a sizable loss to the company. The weights of the drums vary slightly from drum to drum, so the weight of the water is measured after removing it from the drums. Suppose the company samples the contents of 27 drums, measures the water in each, and calculates the mean to be 49.59 gallons and the standard deviation is .32 gallons. Do the sample statistics provide sufficient evidence to indicate that the mean fill per 50 gallon drum is less than 50 gallons? Use a level of significance of 0.10.

A company purchases large quantities of distilled water in 50 gallon drums. Because the purchases are ongoing, small shortages in the drums can represent a sizable loss to the company. The weights of the drums vary slightly from drum to drum, so the weight of the water is measured after removing it from the drums. Suppose the company samples the contents of 20 drums, measures the water in each, and calculates the mean to be 49.70 gallons and the standard deviation is .32 gallons. Do the sample statistics provide sufficient evidence to indicate that the mean fill per 50 gallon drum is less than 50 gallons? Use a level of significance of 0.10.

The manufacturer of the X-15 steel-belted radial truck tire claims that the mean mileage the tire can be driven before the tread wears out is 96 600 km. The population standard deviation of the mileage is 8050 km. The Crosset Truck Company bought 48 tires and found that the mean mileage for its trucks is 95 795 km. Is Crosset's experience different from that claimed by the manufacturer at the 0.05 level of significance?

The waiting time for customers at MacBurger Restaurants follows a normal distribution with a population standard deviation of 1 minute. At the Warren Road MacBurger, the quality assurance department sampled 50 customers and found that the mean waiting time was 2.75 minutes. At the 0.05 significance level, can we conclude that the mean waiting time is less than 3 minutes?

A recent national survey found that high school students watched an average (mean) of 6.8 Netflix movies per month, with a population standard deviation of 0.5 movies per month. The distribution of the number of Netflix movies watched follows the normal distribution. A random sample of 36 college students revealed that the mean number of movies watched last month was 6.2. At the 0.05 significance level, can we conclude that college students watch fewer Netflix movies a month than high school students?

At the time she was hired as a server at the Grumney Family Restaurant, Beth Brigden was told, “You can average more than $80 a day in tips.” Assume that the population of daily tips is normally distributed, with a standard deviation of $3.24. Over the first 35 days she was employed at the restaurant, the mean daily amount of her tips was $84.65. At the 0.01 significance level, can Ms. Brigden conclude that her daily tips average more than $80?

The Rocky Mountain district sales manager of Rath Publishing Inc., a college textbook publishing company, claims that the sales representatives make an average of 40 sales calls per week on professors. Several representatives say that this estimate is too low. To investigate, a random sample of 28 sales representatives reveals that the mean number of calls made last week was 42. The standard deviation of the sample is 2.1 calls. Can we conclude that the mean number of calls per salesperson per week is more than 40? Choose an appropriate significance level.

The management of White Industries is considering a new method of assembling its golf cart. The present method requires 42.3 minutes, on the average, to assemble a cart. The mean assembly time for a random sample of 24 carts, using the new method, was 40.6 minutes, and the standard deviation of the sample was 2.7 minutes. Using the 0.10 level of significance, can we conclude that the assembly time using the new method is faster?

A spark plug manufacturer claimed that its plugs have a mean life in excess of 35 600 km. Assume that the life of the spark plugs follows the normal distribution. A fleet owner purchased a large number of sets. A sample of 18 sets revealed that the mean life was 37 675 km and the standard deviation was 2415 km. Is there enough evidence to substantiate the manufacturer's claim at the 0.05 significance level?

Two Sample Proportion

Use hypothesis testing to test the claim that the percentage of women earning a bachelor's degree in business is less than 50%. A random sample of 200 business graduates earning a bachelor's degree in business found that 85 of them were women. Use a level of significance of 0.01

Two Sample Mean

An economist decided to test the hypothesis that higher retail prices were being charged for Japanese automobiles in Japan than in the United States. She obtained random samples of 29 retail sales in the U.S. and 26 retail sales in Japan over the same time period and for the same automobile, converted the Japanese sales prices from yen to dollars using current conversion rates and obtained the summary shown in the table. Do these data provide sufficient evidence for the economist to conclude that the mean sales price for this model is higher in Japan than in the United States?

U.S. Sales	*Japanese Sales*
$n_1 = 29$	$n_2 = 26$
$\text{mean}(x_1) = \$11,545$	$\text{mean}(x_2) = \$12,243$
$s_1 = \$2,189$	$s_2 = \$1,843$

Two Sample Proportion

Billy Boot garbage bag company randomly selects 300 bags during the first hour of production and finds 19 of them have holes. After modifying the raw plastic used in the process, another check of 400 bags shows that 8 have holes. At the 0.10 level of significance, test the claim that the modification has an effect on the proportion of bags with holes.

To aid in the development of new products and to guide their marketing programs, food producers attempt to identify the taste preferences of various segments of the population. A study by a specific department showed that a person's ability to identify food by smell and taste decreases with increasing age. As a result, the department recommends adding simulated odors to the food of older people to improve its flavor. Part of the department's experiment involved asking a random sample of older persons and a random sample of college students to smell, taste, and identify a variety of foods that had been blended to prevent identification by "feel". Subjects were blindfolded during the experiment. Suppose that blended apple was correctly identified by 81 of 100 students and by 51 of 100 older people. Would these data support the conclusion that the ability to identify food decreases with age? Test using a level of significance of .05.

Suppose the Acme Drug Company develops a new drug, designed to prevent colds. The company states that the drug is more effective for women than for men. To test this claim, they choose a simple random sample of 100 women and 200 men from a population of volunteers. At the end of the study, 38 of the women caught a cold; and 102 of the men caught a cold. Based on these findings, can we conclude that the drug is more effective for women than for men? Use a 0.01 level of significance.