**Hypothesis Testing on Population Mean**

1. An inventor has developed a new, energy-efficient lawn mower engine. He claims that the engine will run continuously for 300 minutes on a single gallon of regular gasoline. For a random sample of n = 25 engines taken in the stock, the sample mean  and the sample standard deviation is s = 20. Test the null hypothesis that the mean run time is equal to 300 minutes against the alternative hypothesis that the mean run time is not equal to 300 minutes. Use a 0.05 level of significance. (Assume that run times for the population of engines are normally distributed.)

(a) State the null and alternative hypothesis.

(b) Find the critical value of from the distribution table. .

(c) Calculate the value of test statistic.

(d) Test whether you reject  or not. Explain your answer.

2. Last year the average cost of a concert ticket was $54.80. This year, a random sample of 15 recent concerts had an average price of $62.30 with a variance of $90.25. At the 0.05 level of significance, can it be concluded that the average cost has increased?

3. Ten packs of flour were randomly selected from a large batch of cartons. The weights of flour (in kg) contained were as below:

2.05 2.08 2.03 2.00 2.06 2.07 2.01 2.03 2.07 2.00

At 1% significance level, does this support the hypothesis, that the mean weight for the whole batch is different from 2.00 kg?

4. Experience has shown that the scores obtained in a particular examination are normally distributed with mean score 65 and variance 81. When the examination is taken by a random sample of 29 students, the mean score is 60.5. Is there sufficient evidence, at the 5% level, that these students have not performed as well as expected?

**Hypothesis Testing on Population Proportion**

1. It has been reported that 40% of the adult population over 60 use e-mail. From a random sample of 180 adults, 65 used e-mail. At , is there sufficient evidence to conclude that the proportion differs from 40%?

2. The marketing officer of a company interviewed 6200 residents and found out that only 589 residents bought their Product X. Another survey completed 2 years ago showed that 8 percent of the residents bought Product X at that time. Test at the 5% level of significance whether this result is consistent with the claim made by the company that more than 8 percent of the residents bought the Product X.

3. A CEO of a large electric utility claims that at least 80 percent of his customers are satisfied with the service they received. To test this claim, the local newspaper surveyed 100 customers using simple random sampling. Among the sampled customers, 73 percent say they are satisfied. Based on these results, should we accept or reject the CEO’s hypothesis? Assume a significance level of 0.05.

4. A study found that Americans had a complex and ambivalent attitude toward technology. The study reported that 8% of the respondents were “Omnivores” who are gadget lovers, test messengers and online gamers. A sample of 200 students from a school in America were taken and found that 30 students can be classified as Omnivores. Test if there has been a significant that the percentage of Omnivores at that school is greater than 8%. Use the 0.05 significance level.

**Hypothesis Testing on Independency**

1. One hundred people were interviewed outside a chocolate shop to find out which flavor of chocolate cream they preferred. The results are given in the table, classified by gender.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Strawberry | Coffee | Orange | Vanilla | Total |
| Men | 23 | 18 | 8 | 8 | 57 |
| Women | 15 | 6 | 12 | 10 | 43 |
| Total | 38 | 24 | 20 | 18 | 100 |

Test whether, at 5% level of significance there is evidence of an association between gender and flavor.

(Correct the calculations to TWO decimal places)

2. Table below presents voters reactions to a new property tax plan according to party affiliation. Test the null hypothesis that there is no relationship between party affiliation and voter reaction, using the 1 percent level of significance.

|  |  |  |  |
| --- | --- | --- | --- |
| Party affiliation | Reaction | | |
| In favor | Neutral | Opposed |
| Democratic  Republican  Independent | 120  50  50 | 20  30  10 | 20  60  40 |

3.

