Statistics Hypothesis test for mean time, standard deviation, type II error

Executives of a supermarket chain are interested in the amount of time that customers spend in the stores during shopping trips. The mean shopping time, μ spent by customers at the supermarkets has been reported to be  35 minutes, but executives hire a statistical consultant and ask her to determine whether it can be concluded that μ is greater than  35 minutes .

To perform her statistical test, the consultant collects a random sample of shopping times at the supermarkets. She computes the mean of these times to be 30 minutes and the standard deviation of the times to be 10 minutes.

What are the null hypothesis ( Ho )  and the alternate hypothesis( H1) that should be used in the test?

In the context of this test, what is the type II error?
A type II error is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_the hypothesis that is μ is \_\_\_\_\_\_\_\_when, in fact, μ is\_\_\_\_\_\_\_\_\_\_\_

Suppose the consultant decides not to reject the null hypothesis what sort of error might they be making Type I or Type II

A furniture store claims that a specially ordered product will take, on average, μ =  42 days (6 weeks) to arrive. The standard deviation of these waiting times is 7 days. We suspect that the special orders are taking longer than this. To test this suspicion, we track a random sample of 60 special orders and find that the orders took a mean of 43 days to arrive. Can we conclude at the 0.05 level of significance that the mean waiting time on special orders at this furniture store exceeds 42 days

Perform a one-tailed test

Null Hypothesis:                          Ho

Alternative Hypothesis:               H1

Type of Test Statistic:

The Value of the Test Statistic:
The p-value:

Can we compute that the mean waiting time on special orders at this furniture store exceeds 42 days?

The Critical value at the 0.05 level of significance round to at least three decimal palces
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The Ellington Dukes are a minor-league baseball team in Ellington, Georgia. As with most other minor-league teams, the Dukes rely heavily on promotions to bring fans to the ballpark. These promotions are typically aimed at fans of specific ages. The management for the Dukes has planned its current promotional schedule according to the following estimates: 15% of fans attending Dukes games are ages 0 to 12 10%, are ages 13 to18 , 30% are ages 19 to35 , 25% are ages 36 to 55, and 20% are over 55 .

A statistical consulting firm for the Dukes surveyed a random sample of 180 fans attending Dukes games in order to see if these estimates are accurate. The observed frequencies in the sample of 180 for each of the age categories are given in the top row of numbers in Table 1 below. The second row of numbers contains the frequencies expected for a random sample of 180 fans if the Dukes' management's estimates are accurate. The bottom row of numbers in Table 1 contains the values

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| http://www.phoenix.aleks.com/alekscgi/x/math2htgif.exe/M?%2Be%3Fpva%3DL%3F%2Cpva%3D%23%2E%23e%3Fpva%3DF%3F%2Cpva%3D%2A%3Fpvs%3D1%3F%2Cpvs%3D |   | = |   | (Observed frequency - Expected frequency)2 |  |
| http://www.phoenix.aleks.com/aleks/gif/Gwhite.gif | http://www.phoenix.aleks.com/aleks/gif/Gwhite.gif |
| http://www.phoenix.aleks.com/alekscgi/x/math2htgif.exe/M?e%3Fpva%3DF%3F%2Cpva%3D | Expected frequency |

for each of the age categories.

Fill in the missing values of Table 1. Then, using the 0.05level of significance, perform a test of the hypothesis that the management's estimates are accurate.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | 0-12 | 13-18 | 19-35 | 36-55 | Over 55 | Total |
| Observation freq (fo) | 29 | 21 | 67 | 34 | 29 | 180 |
| Expected freq (fg) |  | 18.00 |  | 45.00 | 36.00 |
| http://www.phoenix.aleks.com/alekscgi/x/math2htgif.exe/M?%2Be%3Fpva%3DL%3F%2Cpva%3D%23%2E%23e%3Fpva%3DF%3F%2Cpva%3D%2A%3Fpvs%3D1%3F%2Cpvs%3Dfg |  | 0.500 |  | 2.689 | 1.361 |

The Type of test statistic :

Z,

t (Degrees of freedom) ,

Chi Square Degrees of freedom

F Degrees o freedom dfn \_\_\_\_ dfd\_\_\_\_

The value of the test statistic:

The critical value for a test at the 0.005 level of significance:

Can we conclude that the managers original estimates for the age distribution of fans attending Dukes games are inaccurate? Yes or No

The General Social Survey is an annual survey given to a random selection of about adults in the United States. Among the many questions asked are "What is the highest level of education you've completed?" and "If you're employed full-time, how many hours do you spend working at your job during a typical week?"

In a recent year, respondents answered both questions. The summary statistics are given in the chart below. (The sample data consist of the times, in hours per week, that were given by the respondents.)

|  |  |  |  |
| --- | --- | --- | --- |
| Groups | Sample Size | Sample Mean | Sample Variance |
| Less than HS | 287 | 43.9 | 95.0 |
| High School | 256 | 43.2 | 102.7 |
| Bachelors | 281 | 41.1 | 86.4 |
| Graduate | 27.8 | 42.8 | 100.5 |

To decide if there are any differences in the mean hours per week worked by these different groups, we can perform a one-way, independent-samples ANOVA test. Such a test uses the statistic

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| http://www.phoenix.aleks.com/alekscgi/x/math2htgif.exe/M?E |  | http://www.phoenix.aleks.com/alekscgi/x/math2htgif.exe/M?%3E |  | Variation between the samples | . |
| http://www.phoenix.aleks.com/aleks/gif/Gwhite.gif |
| Variation within the samples |

For the data from the survey, .

Give the p-value corresponding to this value of the F statistic, Round the answer to at least three decimals places

From this survey data can we conclude that at least one of the groups differs significantly from the others in mean hours worked in a typical wee? Use the 0.05 level of significance Yes Or No

A manufacturer of summer clothing has generated the following regression model for forecasting the number of pairs of walking shorts (in hundreds of thousands) that will be sold during the next few quarters:

Y t=2.9+0.09t-0.29Q10.58Q2+0.87Q3

where , , and are indicator variables of the form

Q1$\left\{\begin{array}{c}1 if the data are associated with Quarter 1\\0 Otherwise \end{array}\right.$

This model is developed using a data set that starts in Quarter 2 of 2004 (i.e., the first time period is associated with Quarter of ). Use this model to forecast the number of pairs of walking shorts (in hundreds of thousands) that will be sold in Quarter of