**Question 1**

According to a 2018 survey by a research group, 30% of adults typically run the water for a period of 6 to 10 minutes while taking the shower). Suppose that in a recent survey of 400 adults, 104 stated that they typically run the water for a period of 6 to 10 minutes when they take a shower. At the 5% significance level, can you conclude that the proportion of all adults run the water for a period of 6 to 10 minutes when they take a shower is less than 0.30? Answer the following questions.

1. Identify the claim and state the H0 and H1.
2. Find the critical value.
3. Calculate the test statistic.
4. Make a decision to reject or fail to reject the H0.
5. Interpret the decision in the context of the original claim.

**Hypothesis testing – comparing two means and proportion**

**Question 1**

A local college cafeteria has a self-service soft ice cream machine. The cafeteria provides bowls that can hold up to 16 ounces of ice cream. The food service manager is interested in comparing the mean amount of ice cream dispensed by male students to the mean amount dispensed by female students. A measurement device was placed on the ice cream machine to determine the amounts dispensed. Random samples of 85 male and 78 female students who got ice cream were selected. The sample means were 7.23 and 6.49 ounces for the male and female students, respectively. Assume that the population standard deviations are 1.22 and 1.17 ounces, respectively. Use 1% significance level to determine that the average amount of ice cream dispensed by male college students is larger than the average amount dispensed by female college students. Answer the following questions.

|  |  |  |
| --- | --- | --- |
|  | *Male student* | *Female student* |
| *Mean sample* | 7.23 oz | 6.49 oz |
| *Population standard deviation* | 1.22 oz | 1.17 oz |
| *Sample size* | 85 | 78 |

1. Identify the claim and state the H0 and H1.
2. Find the critical value.
3. Calculate the test statistic.
4. Make a decision to reject or fail to reject the H0.
5. Interpret the decision in the context of the original claim.

**Question 2**

An insurance company wants to know if the average speed at which men drive cars is greater than that of women drivers. The company took a random sample of 27 cars driven by men on a highway and found the mean speed to be 72 miles per hour with a standard deviation of 2.2 miles per hour. Another sample of 18 cars driven by women on the same highway gave a mean speed of 68 miles per hour with a standard deviation of 2.5 miles per hour. Assume that the speeds at which all men and all women drive cars on this highway are both normally distributed with equal standard deviation. Use 1% significance level to test the hypothesis that the mean speed of cars driven by all men drivers on this highway is greater than that of cars driven by all women driver. Answer the following questions.

|  |  |  |
| --- | --- | --- |
|  | *Man driver* | *Women driver* |
| *Mean sample* | 72 mph | 68 mph |
| *Sample standard deviation* | 2.2 mph | 2.5 mph |
| *Sample size* | 27 | 18 |

1. Identify the claim and state the H0 and H1.
2. Find the critical value.
3. Calculate the test statistic.
4. Make a decision to reject or fail to reject the H0.
5. Interpret the decision in the context of the original claim

**Question 3**

The manufacturer of a gasoline additive claims that the use of this additive increases gasoline mileage. A random sample of six cars was selected, and these cars were driven for 1 week without the gasoline additive and then for 1 week with the gasoline additive. The following table gives the miles per gallon for these cars without and with the gasoline additive. Use 2.5% significance level to determine that the use of gasoline additive increases the gasoline mileage. Answer the following questions.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | *Cars* | *1* | *2* | *3* | *4* | *5* | *6* |
| *Miles per gallon* | *Without additive* | 24.6 | 28.3 | 18.9 | 23.7 | 15.4 | 29.5 |
| *With additive* | 26.3 | 31.7 | 18.2 | 25.3 | 18.3 | 30.9 |

1. Identify the claim and state the H0 and H1.
2. Find the critical value.
3. Calculate the test statistic.
4. Make a decision to reject or fail to reject the H0.
5. Interpret the decision in the context of the original claim.

**Question 1**

1. A research reported that undergraduate students have a mean credit card balance of $3,173. This figure was an all-time high and had increased 44% over the previous five years. Assume that a current study is being conducted to determine if it can be concluded that the mean credit card balance for undergraduate students has continued to increase compared to the report. A sample of 180 undergraduate students showed a mean credit card balance of $3,325 and the population standard deviation is $1,000. Use 5% significance level to test the claim that undergraduate students have a mean credit card balance more than $3,173.
2. Identify the claim and state the H0 and H1.
3. Find the critical value.
4. Calculate the test statistic.
5. Make a decision to reject or fail to reject the H0.
6. Interpret the decision in the context of the original claim.
7. A shareholders’ group, in lodging a protest, claimed that the mean tenure for a chief executive officer (CEO) was at least nine years. A survey of companies reported in *The Wall Street Journal* found a sample of 25 companies revealed a mean tenure of 7.27 years for CEOs with a sample standard deviation of *s* = 6.38 years. Use 1% significance level to test the claim that the mean tenure for a chief executive officer (CEO) was at least nine years.
8. Identify the claim and state the H0 and H1.
9. Find the critical value.
10. Calculate the test statistic.
11. Make a decision to reject or fail to reject the H0.
12. Interpret the decision in the context of the original claim.
13. A study by *Consumer Reports* showed that 64% of supermarket shoppers believe supermarket brands to be as good as national name brands. To investigate whether this result applies to its own product, the manufacturer of a national name-brand ketchup asked a sample of shoppers whether they believed that supermarket ketchup was as good as the national brand ketchup. A sample of 100 shoppers showed 52 stating that the supermarket brand was as good as the national brand. Use 5% significance level to test the claim that the supermarket brand was as good as the national brand.
14. Identify the claim and state the H0 and H1.
15. Find the critical value.
16. Calculate the test statistic.
17. Calculate the p-value for the test.
18. Make a decision to reject or fail to reject the H0.
19. Interpret the decision in the context of the original claim.

**Question 2**

A researcher wanted to know the relationship between the price (in RM) of travelling suitcase with rollers and its’ scores (higher scores indicate better overall test result). The following table shows the output of statistical analysis for the price and scores of travelling suitcase with rollers.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Model Summary** | | | | |
| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
| 1 | 0.898a | 0.807 | 0.783 | 79.059 |
| a. Predictors: (Constant), Scores | | | | |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Coefficientsa** | | | | | | | |
| Model | | | Unstandardized Coefficients | | Standardized Coefficients | t | P-value |
| B | Std. Error | Beta |
| 1 | (Constant) | -696.668 | | 168.088 |  | -4.145 | 0.003 |
| Scores | 14.293 | | 2.473 | 0.898 | 5.778 | 0.001 |
| a. Dependent Variable: Price | | | | | | | |

1. Comment on coefficient of correlation between ***Price*** *and* ***Scores*.**
2. Determine the coefficient of determination and explain this value in relation to the problem.

At the 0.05 significance level is it reasonable to conclude that there is a significant relationship in the population between ***Price*** and **Scores*.***

iii.What is the value of Y-intercept? Interpret the meaning of the *Y-* intercept, ***a*** for this problem.

1. What is the value of the slope? Interpret the meaning of the slope, ***b*** for this problem
2. Write the regression equation for this problem from the output.
3. Predict the ***Price*** if the***Scores*** is 85.