Question 1:

Hypotheses

H0: μd = 0

Ha: μd > 0

This is a right-tailed test.

μd  is the average population difference of watching hours between males and females.

d = (xi\_husband – xi\_Wife).

And xi is the paired ith observations.

The sample size < 30 and the population standard deviation is not known, hence we will use the paired one-sample t-test. Simple random sample and approximately normally distributed.

n=20, DOF = 20-1 = 19

p-value, t(2.416,19) = 0.0130

0.01 < p-value < 0.05

Reject H0: in favor of the alternative hypothesis. There is fairly strong evidence against the null hypothesis.

There is fairly enough evidence to support the sociologist claim that for married couples with young children, the husbands watch more TV than husbands.

b.

Constructing the 95% confidence interval.

The conditions have been met since the sample observations are approximately normally distributed.

Sd = 8.146. , n=20

t(0.05,19) = 2.093

95% confidence interval = (4.4±3.812)

95% confidence interval = (0.588,8.212)

Observe that 0 is not included in the 95% confidence interval. Therefore, we can conclude that there is sufficient evidence at 5% level of significance to support the sociologist claim.

We are 95% confidence that the true mean difference of watching time between husbands and wives lies within the lower and the upper bound of the constructed interval.

Question 2:

Hypotheses

H0: μ1 = μ2

Ha: μ1 > μ2

Right-tailed test.

Where μ1 is the mean sugar content in children’s cereals and μ2 is the mean sugar content in adults’ cereals.

The samples are approximately normally distributed.

Test statistic = right-tailed t-test

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| X\_bar1 | 46.8 |  | X\_bar2 | 10.154 |
| s1 | 6.418 |  | s2 | 7.612 |
| n1 | 19 |  | n2 | 28 |

DOF = 42

P -value t(17.803,42) = p-value<0.001.

Reject H0 in favor of Ha. There is very strong evidence against Ho and in favor of Ha.

There is strong evidence to support the claim that the average sugar in children’s cereals is higher than that in adults’ cereals.

b.

Follow-up with 95% confidence interval

t\* = 2.018

95% confidence interval = (36.646 ± 4.154)

(32.492,40.8)

One should be 95% confident that the average sugar content in children’s cereals is higher than that in adults cereals by values within 32.492 and 40.8.

Question 3;

Hypotheses

H0: μd = 0

Ha: μd > 0

Right-tailed test

μd is the average of the difference (Project students – Control group).

Population standard deviation of the differences is not given and the sample size < 30.

The sample is a simple random sample which is approximately normally distributed, hence the t statistic will be calculated.

|  |  |
| --- | --- |
| X\_bard | 0.278 |
| sd | 0.537 |
| n | 20 |

DOF = 19

p-value , t(2.315,19) = 0.016

* 1. < p-value < 0.05

Reject H0 in favor of Ha. There is fairly strong evidence against H0 in favor of Ha.

There is enough evidence to support the programs claim. The program improved the students GPA scores because the average of scores of the program students is statistically higher than the control students.

b)

95% confidence interval

t\* = 2.093

95% confidence interval (0.2775 ± 0.251)

95% confidence interval (0.0262,0.5288)

We are 95% confident that the program is likely to improve students’ GPA scores by an average of between 0.0262 and 0.5288.

**Question 4:**

Hypotheses

H0: μ = 3218

Ha: μ ≠ 3218

Two-tailed test

The sample size is greater than 30 and the distribution is normally distributed, thus we can use the z-statistic, where the sample sd approximates sigma.

X\_bar = 3392

Sd = 287

n = 42

p-value = 0.0001

The p-value < 0.001. Reject the null hypothesis in favor of the alternative. There is very strong evidence against the null hypothesis.

The is very strong evidence to support the claim that the mean number of people entering the store after Michelle was hired has changed.

b.

95% confidence interval for one sample mean

Confidence interval

95% confidence interval = (3305.201,3478.99)

The number of people entering the store each day has increased since Michelle was hired. The lower and the upper bound of the 95% confidence interval for mean are both greater than the initial mean.

The true mean of the people entering the store has increased by a value between 3305.201 and 3478.99.

**Question 5:**

Hypotheses

H0: μ1 = μ2

Ha: μ1 < μ2

The test involves a left-tailed test.

Where; μ1 is the mean number of tapeworms in the treated sheep and μ2 is the average number of tapeworms in the untreated sheep.

T statistic is calculated to evaluate the claim

|  |  |  |  |
| --- | --- | --- | --- |
| x1 | 26.583 | x2 | 39.667 |
| s1 | 14.362 | s2 | 13.859 |
| n1 | 12 | n2 | 12 |

p-value = 0.017

* 1. < p-value < 0.05

Reject the null hypothesis. Fairly strong evidence against the null hypothesis in favor of the alternative hypothesis.

Tapeworm treatment was efficient in reducing the number of tapeworms.

b.

95% confidence interval

95% confidence interval (-25.039, -1.141)

We are 95% confident that the treatment process is likely to reduce the number of tapeworms by a value between -25.039 to -1.141.

**Question 6.**

**#1** Page 478,

For paired samples.

If the observations are approximately normally distributed, normal approximation applies regardless of the sample size.

#2 Page 491,

If we can assume that both populations distributions have a mound shape.

#3 paired experiment,

Normality assumption on page 478.

#4 Assumption on page 437.

#5. Page 491

Inferences about m1-m2

**Question 7:**

a.

Hypothesis

H0: μ1 = μ2

Ha: μ2 ≠ μ2

Two-tailed test

μ1 is the average percentage of 15-year old Female who have been drunk at least twice and μ2 is the average percentage of 15-year old Male who have been drunk at least twice.

Observations are normally distributed and the sample size is less than 30. Therefore, we can use the t statistic to evaluate the hypothesis.

|  |  |  |  |
| --- | --- | --- | --- |
| x\_bar1 | 34.407 | x\_bar2 | 42.370 |
| s1 | 16.234 | s2 | 12.879 |
| n1 | 27 | n2 | 27 |

DOF = 52

p-value, t(-1.997,52) = 0.051

0.05 < p-value < 0.10

There is little evidence against H0. If the investigator uses an alpha of 5%, the null hypothesis will be retained. At an alpha of 10%, we find evidence to reject the null hypothesis in favor of the alternative.

b)

95% confidence interval

Confidence interval =(x\_bar1-X\_bar2) ± ME

ME = 8.014

(X\_bar1-X\_bar2) = -7.963

95% confidence interval (-15.977,0.051)

0 is included in the 95% confidence interval. Therefore, we can conclude that there is not sufficient evidence against the null hypothesis at 5% level of significance.

There is no difference in the average percent of 15-year-old males who have been drunk at least twice and the average percent of 15-year-old females who have been drunk at least twice at 5% level of significance.