Stat Support Activity: Two-Population Mean
T-Test Statistic Calculations

Problems

1. Comparing cotinine levels (second hand smoke measure).

Sample 1 Cotinine Levels (does not live with smoker): $n_1 = 90$, $\bar{x}_1 = 7.2$, $s_1 = 5.8$

Sample 2 Cotinine Levels (lives with smoker): $n_2 = 85$, $\bar{x}_2 = 28.5$, $s_2 = 11.4$

    a) Calculate the sample mean difference $\bar{x}_1 - \bar{x}_2$.

    b) Calculate the standard error using the following formula:

$$\text{Standard Error} = \sqrt{\left(\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}\right)} =$$

    c) Calculate the T-test statistic by dividing answer to part (a) by the answer to part (b).

$$\text{T} - \text{test statistic} = \frac{(\bar{x}_1 - \bar{x}_2)}{\sqrt{\left(\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}\right)}} = \frac{sample\ mean\ difference}{Standard\ error}$$

    d) T – test statistic sentence: "The sample mean cotinine for those that do not live with smokers was _____ standard errors *(above or below)* the sample mean cotinine for those that do live with smokers." *(Note: Use "above" if the test statistic is positive. Use "below" if the test statistic is negative.)*

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2. Comparing weights of male German Shephards and male Doberman Pinchers.

	N	Mean	Stdev
German Shep Sample 1	20	112.0	28.0
Doberman Sample 2	14	107.0	24.0

a) Calculate the sample mean difference $\bar{x}_1 - \bar{x}_2$.

b) Calculate the standard error using the following formula:

$$\text{Standard Error} = \sqrt{\left(\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}\right)} =$$

c) Calculate the T-test statistic by dividing answer to part (a) by the answer to part (b).

$$\text{T} - \text{test statistic} = \frac{(\bar{x}_1 - \bar{x}_2)}{\sqrt{\left(\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}\right)}} = \frac{sample\ mean\ difference}{Standard\ error}$$

d) T – test statistic sentence: "The sample mean weight for German Shephards was _____ standard errors *(above or below)* the sample mean for Doberman Pinchers." *(Note: Use "above" if the test statistic is positive. Use "below" if the test statistic is negative.)*

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3. Comparing mean average gas mileage (miles per gallon) for cars made in USA verses cars made in other countries.

	N	Mean	Stdev
Population 1 USA mpg	22	22.995	6.054
Population 2 Other Country mpg	16	27.188	6.601

a) Calculate the sample mean difference $\bar{x}_1 - \bar{x}_2$.

b) Calculate the standard error using the following formula:

$$Standard\ Error = \sqrt{\left(\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}\right)} =$$

c) Calculate the T-test statistic by dividing answer to part (a) by the answer to part (b).

$$T - test\ statistic = \frac{(\bar{x}_1 - \bar{x}_2)}{\sqrt{\left(\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}\right)}} = \frac{sample\ mean\ difference}{Standard\ error}$$

d) T – test statistic sentence: "The sample mean gas mileage for cars made in the USA was _____ standard errors *(above or below)* the sample mean gas mileage for cars made in other countries." *(Note: Use "above" if the test statistic is positive. Use "below" if the test statistic is negative.)*

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4. Comparing mean average horsepower for cars made in USA verses cars made in other countries.

	N	Mean	Stdev
Population 1 USA car horsepower	22	110.182	26.383
Population 2 Other Country car horsepower	16	90.125	22.408

a) Calculate the sample mean difference $\bar{x}_1 - \bar{x}_2$.

b) Calculate the standard error using the following formula:

$$Standard\ Error = \sqrt{\left(\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}\right)} =$$

c) Calculate the T-test statistic by dividing answer to part (a) by the answer to part (b).

$$T - test\ statistic = \frac{(\bar{x}_1 - \bar{x}_2)}{\sqrt{\left(\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}\right)}} = \frac{sample\ mean\ difference}{Standard\ error}$$

d) T – test statistic sentence: "The sample mean horsepower for cars made in the USA was _____ standard errors *(above or below)* the sample mean horsepower for cars made in other countries." *(Note: Use "above" if the test statistic is positive. Use "below" if the test statistic is negative.)*