T1SGA

Part 2 H represents the number of head being observed

$P(H=5) = (\frac{1}{2})^5 = \frac{1}{32} = 0.03125$

T1SGB

Part 1 Assume the sample is approximately normal and randomly selected

$\hat{p} = \frac{1000-988}{1000} = 0.012 \qquad \hat{q} = 1-\hat{p} = 1-0.012 = 0.988$

$n\hat{p} = (1000)(0.012) = 12 < 15$

$n(1-\hat{p}) = (1000)(1-0.012) > 15$ Therefore, need to adjust the sample proportion.

$\tilde{p} = \frac{12+2}{1000+4} = \frac{14}{1004}$

$Z_{\frac{\alpha}{2}} = 1.96$ which is got from the table in the book with

$\alpha = 1-0.95 = 0.025$

95% Confidence interval :

$$\tilde{p} \pm Z_{\frac{\alpha}{2}}\sqrt{\frac{\tilde{p}(1-\tilde{p})}{n+4}} = \frac{14}{1004} \pm 1.96\sqrt{\frac{(\frac{14}{1004})(1-\frac{14}{1004})}{1000+4}}$$

$$\approx (0.00669, 0.0212)$$

Part 2 Assume the sample is approximately normal and randomly selected

$n = 25 < 30$ use t-statistic

$\alpha = 1-0.98 = 0.02$

$df = 25-1 = 24$ $\quad t_{\frac{\alpha}{2}} = t_{0.01} = 2.492$ with 24df is got from the table in the book

$\bar{x} = 43.9 \qquad s = \sqrt{39.7} \approx 6.30079$

98% confidence interval: $\bar{x} \pm t_{\frac{\alpha}{2}}\frac{s}{\sqrt{n}} = 43.9 \pm (2.492)\frac{6.30079}{\sqrt{25}}$

$$\approx (40.759, 47.040)$$

T1SGC

Part b

Using calculator, enter the numbers in the question into a List, and calculate the standard deviation, which is 1.889885

Click "stat" on the calculator and then choose Z-test,

enter $\mu_0 = 12$ $\sigma = 1.889885$ $\bar{x} = 13.25$ $n = 10$

$\mu > \mu_0$

Get p-value, which is 0.0182

T1SGD

No work for this skill group.

TI SGE

Part 1

$p = 0.65$ $SE = 0.05$

$q = 1 - 0.9 = 0.1$ $Z_{0.05} = 1.645$ is got from the table in the book

$$n = Z_{\frac{\alpha}{2}}^2 \frac{P(1-P)}{SE^2} = Z_{0.05}^2 \frac{0.65(1-0.65)}{0.05^2} \approx 246.248$$

The sample size is 247 because it has to be an integer

Part 2

$\sigma = 3$ $SE = 0.5$ represents the standard error

X. $Z_{0.05} = 1.645$ is got from the table in the book

$$n = Z_{\frac{\alpha}{2}}^2 \frac{\sigma^2}{SE^2} = (1.645)^2 \frac{3^2}{(0.5)^2} = 97.417$$

The sample size is 98 because it has to be an integer

Part 3

$$n = Z^2 \frac{P(1-P)}{SE^2}$$ conservative choice of p: $p = 0.5$

$$n_1 = Z^2 \frac{0.3(1-0.3)}{SE^2} \qquad n_2 = Z^2 \frac{0.5(1-0.5)}{SE^2}$$

$$\frac{n_2}{n_1} = \frac{0.25}{0.21}$$

$$= \frac{25}{21}$$

$$n_2 = \frac{25}{21} n_1 \approx 1.190 n_1$$

The sample size would be about 1.190 times the previous sample size.

TISGF

No work for this skill group

X.

TISGG

Part 1B

$n = 20 < 30$ Small Sample use t-statistic

Assume the sample is approximately normal and randomly selected

$\bar{x}_1 = 4.9$ $\bar{x}_2 = 6.1$ $s_1^2 = 2.0$ $s_2^2 = 3.3$

$H_0: \mu_1 - \mu_2 = 0$

$H_a: \mu_1 - \mu_2 < 0$

where μ_2 is the average reading score after the program μ_1 is the average reading score before the program

$$t_c = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{(s_1^2 + s_2^2)}{n}}} = \frac{4.9 - 6.2}{\sqrt{\frac{(2.0 + 3.3)}{20}}} \approx -2.331$$

Part 1C

$P(t < t_c) = P(t < -2.331) \approx 0.0127$ (using calculator with "2-SampTTest" and not pooled)

The p-value is greater that α which is 0.01

Therefore the null hypothesis that these is no difference between the average reading score before and after the program is failed to be rejected

Part 2A

$n_d = 20 < 30$ Small sample use t-statistic

Assume the sample is approximately normal and randomly selected

$\bar{x}_d = 4.9 - 6.1 = -1.2$ $\quad s_d^2 = 1.1$ $\quad n_d = 20$

$H_0: \mu_d = 0$ where μ_d is the average reading score before the program minus the average reading score after the program

$H_a: \mu_d < 0$

$$t_c = \frac{\bar{x}_d - 0}{\frac{s_d}{\sqrt{n_d}}} = \frac{-1.2 - 0}{\frac{\sqrt{1.1}}{\sqrt{20}}} \approx -5.117$$

Part 2B

$P(t < t_c) = P(t < -5.117) \approx 3.064 \times 10^{-5}$

(Using the Calculator with "T-test")

P-value is smaller than 2, which is 0.01

Therefore, reject the null hypothesis that the difference between the average reading score before and after the program is zero.

I have been following and will continue to follow the academic honesty policy for this quiz as stated in the Quiz 2 Instructions

Bingjian Chai

T2SGA

Part 1

$$\hat{\beta}_1 = \frac{SS_{xy}}{SS_{xx}} = \frac{\sum_i x_i y_i - \frac{(\sum x_i)(\sum y_i)}{n}}{\sum_i x_i^2 - \frac{(\sum x_i)^2}{n}} = \frac{72 - \frac{(10)(0)}{20}}{23 - \frac{(10)^2}{20}} = 4$$

$$\hat{\beta}_0 = \bar{y} - \hat{\beta}_1 \bar{x} = \frac{0}{20} - (4)\left(\frac{10}{20}\right) = -2$$

T2SGB

Part 1

To do a hypothesis test, suppose the four assumptions for ε are met

$H_0: \beta_1 = 0 \qquad H_a: \beta_1 > 0$

$$t = \frac{\hat{\beta}_1 - 0}{\frac{s}{\sqrt{SS_{xx}}}} = \frac{2 - 0}{\frac{\sqrt{\frac{2760}{22-2}}}{\sqrt{600 - \frac{(88)^2}{22}}}} \approx 2.681120$$

With $df = 22 - 2 = 20 \qquad t_{0.05} = 1.725$

$t > t_{0.05}$

Therefore, we would reject the null hypothesis. Conclusion is written on Top Hat

Part 2

Suppose the four assumptions about ε are met

$\alpha = 0.05 \qquad df = 22 - 2 = 20 \qquad t_{0.025} = 2.086$

$$\hat{\beta}_1 \pm \left(t_{\frac{\alpha}{2}}\right) S_{\hat{\beta}_1} = \hat{\beta}_1 \pm (t_{0.025})\left(\frac{s}{\sqrt{SS_{xx}}}\right) = 2 \pm (2.086)\left(\frac{\sqrt{\frac{2760}{22-2}}}{\sqrt{600 - \frac{(88)^2}{22}}}\right)$$

$\approx (0.444, 3.556)$

I have been following and will continue to follow the academic honesty policy for this quiz as stated in the Quiz 3 Instructions

Bingjian Chai

T3SGD

Part 1

$$R^2 = \frac{SSR}{SSTO} = \frac{0.8656172}{1.0523778} \approx 0.8225$$

T3SGE

Part 1

$$F = \frac{MSR}{MSE} = \frac{\frac{SSR}{1}}{\frac{SSE}{n-2}} = \frac{\frac{0.8656172}{1}}{\frac{0.1867605}{70}} \approx 324.443$$

T3SGF

No work for this skill group

I have been following and will continue to follow the academic honesty policy for this quiz as stated in the Quiz 4 Instructions

Bingjian Chai

T4SGA ×

Part 1

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	$p-1 = 4$	694.8	173.7	28.839
Error	$n-p = 26$	156.6	6.023	
C. Total	$n-1 = 30$	851.4		

$MSR = \frac{694.8}{4} = 173.7$ $\quad F = \frac{MSR}{MSE} = 28.839$

$MSE = \frac{156.6}{26} = 6.023$

Part 2

No work for this part.

Part 3

$t_{0.025} = 2.056$ with $df = 26$

$-0.397042 \pm (2.056)(0.128803) = (-0.662, -0.132)$

T4SGB

Part 4

$X_1 = \begin{cases} 1 & \text{Female} \\ 0 & \text{Male} \end{cases}$

Female: $E(y) = 80.960983 + 0.6638802 - 3.202187X_2 - 0.4966711X_2 + 5.2578$

$E(y) = 86.8827 - 3.6989X_2$

Part 5

Male: $E(y) = 80.960983 - 3.202187X_2$

Part 6

Female: $E(y) = 49.8941$ when $X_2 = 10.0$

Male: $E(y) = 48.9391$ when $X_2 = 10.0$

$49.8941 - 48.9391 = 0.9550$