

Lesson 13: Inference for Two Means (Independent Samples)

Preparation

Solutions

Problem	Part	Solution																				
1	-	There is no pairing between the two groups. Group 1 does not determine Group 2.																				
		<table><tr><th>Name of Hypothesis Test</th><th>Requirements for test</th><th>Name of Distribution from which the test statistic is computed</th><th>Null Hypothesis and Possible Alternative Hypotheses</th></tr><tr><td>Hypothesis test for one mean—sigma known</td><td>Data are a simple random sample from the population. The distribution of sample means is normal.</td><td>Normal distribution</td><td>$H_0: \mu = \mu_0$ $H_a: \mu < \mu_0$ $H_a: \mu > \mu_0$ $H_a: \mu \neq \mu_0$</td></tr><tr><td>Hypothesis test for one mean – sigma unknown</td><td>Data are a simple random sample from the population. The distribution of sample means is normal.</td><td>T-Distribution</td><td>$H_0: \mu = \mu_0$ $H_a: \mu < \mu_0$ $H_a: \mu > \mu_0$ $H_a: \mu \neq \mu_0$</td></tr><tr><td>Hypothesis test for two means – paired data</td><td>Data are a simple random sample from the population. The distribution of the differences means is normal.</td><td>T-Distribution</td><td>$H_0: \mu_d = 0$ $H_a: \mu_d \neq 0$ $H_a: \mu_d < 0$ $H_a: \mu_d > 0$</td></tr><tr><td>Hypothesis test for two means – independent samples</td><td>Data are a simple random sample from the population. The distribution of sample means from each group is normal.</td><td>T-Distribution</td><td>$H_0: \mu_1 = \mu_2$ $H_a: \mu_1 \neq \mu_2$ $H_a: \mu_1 < \mu_2$ $H_a: \mu_1 > \mu_2$</td></tr></table>	Name of Hypothesis Test	Requirements for test	Name of Distribution from which the test statistic is computed	Null Hypothesis and Possible Alternative Hypotheses	Hypothesis test for one mean—sigma known	Data are a simple random sample from the population. The distribution of sample means is normal.	Normal distribution	$H_0: \mu = \mu_0$ $H_a: \mu < \mu_0$ $H_a: \mu > \mu_0$ $H_a: \mu \neq \mu_0$	Hypothesis test for one mean – sigma unknown	Data are a simple random sample from the population. The distribution of sample means is normal.	T-Distribution	$H_0: \mu = \mu_0$ $H_a: \mu < \mu_0$ $H_a: \mu > \mu_0$ $H_a: \mu \neq \mu_0$	Hypothesis test for two means – paired data	Data are a simple random sample from the population. The distribution of the differences means is normal.	T-Distribution	$H_0: \mu_d = 0$ $H_a: \mu_d \neq 0$ $H_a: \mu_d < 0$ $H_a: \mu_d > 0$	Hypothesis test for two means – independent samples	Data are a simple random sample from the population. The distribution of sample means from each group is normal.	T-Distribution	$H_0: \mu_1 = \mu_2$ $H_a: \mu_1 \neq \mu_2$ $H_a: \mu_1 < \mu_2$ $H_a: \mu_1 > \mu_2$
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2	-																					
3	A	Is there a difference between the mean wages of BYU-Idaho male students and female students?																				
3	B	$H_0: \mu_1 = \mu_2$ $H_a: \mu_1 \neq \mu_2$																				
4	-	Students from one of the Math Department professor’s classes took a survey which asked how much they make as an hourly wage.																				

Problem	Part	Solution
5	-	-Males: $\bar{x} = 11.935$, $s = 10.491$, $n = 85$ - Females: $\bar{x} = 9.759$, $s = 3.169$, $n = 91$ - You should also include two histograms here, one for the men and one for the women. The figure consists of two vertically stacked histograms. The top histogram is labeled 'F' for females and the bottom is labeled 'M' for males. Both share the same axes: the x-axis is 'Wages of Students' with major ticks at \$0, \$25, \$50, \$75, and \$100; the y-axis is 'Frequency' with major ticks at 0, 20, 40, and 60. The female histogram shows a peak frequency of approximately 60 for wages between \$0 and \$10, with a long tail extending towards \$100. The male histogram shows a peak frequency of approximately 55 for wages between \$0 and \$10, also with a long tail extending towards \$100.
6	A	Independent Samples Hypothesis test
6	B	-The sample size is large for each sample so we can assume normality. - It was not a simple random sample.
6	C	$t = \pm 1.836$
6	D	$df = 98.263$
6	E	P-value = 0.069, $\alpha = 0.05$, p-value $> \alpha$
6	F	fail to reject the null hypothesis
6	G	We have insufficient evidence to say that there is a difference between wages of male and female BYU-Idaho students.
6	H	$(-0.176, 4.529)$ or $(-4.529, 0.176)$
6	I	-We are 95% confident that the true difference in mean wages between women and men at BYU-Idaho is somewhere between \$-0.18 and \$4.53, or \$-4.53 and \$0.18. - We can also see that there is insufficient evidence using the confidence interval method because zero is included in our confidence interval.
7		Answers may vary