Chapter 9 AP PRACTICE TEST

SECTION II: FREE RESPONSE (Pg 598)

T9.11 A

p = the true proportion of customers who would pay \$100 for the upgrade

$H_0: p = .20$
$H_0: p > .20$ use $\alpha = .05$

CONDITIONS

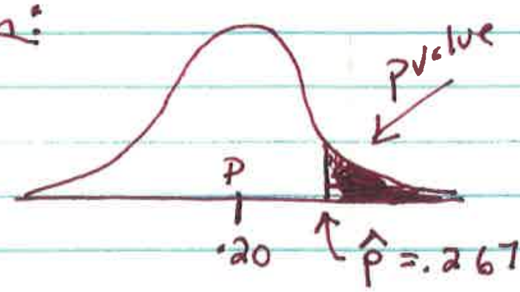
1. Random: took an SRS of 60 customers
2. Independent: It is reasonable there are more than $10(60) = 600$ customers for the software company
3. Normal:

$np = 60 \cdot .20 = 12 > 10$ ✓
$nq = 60 \cdot .80 = 48 > 10$ ✓

remember for TOH use p NOT $\hat{p}$

The Sampling Distribution:

$\hat{p} = 16/60 = .267$
$n = 60$



T9.11 A (cont)

TEST: 1 sample z test for proportions

Give the name or formula

$$z = \frac{.267 - .20}{\sqrt{\frac{(.2)(.8)}{60}}} = 1.29$$

Good practice to fill in statistic

USE CALC

STAT > TESTS > 1-PropZTest → 1.290

$$\text{pvalue} = P(Z \geq 1.29) = .098$$

CONCLUSION

Since the pvalue (.098) IS LARGER THAN $\alpha = .05$, we fail to reject Ho. WE DO NOT HAVE SUFFICIENT EVIDENCE TO CONCLUDE THAT MORE THAN 20% OF CUSTOMERS WILL PAY $100 FOR THE UPGRADE.

T9.11B

TYPE I ERROR: We would reject the null hypothesis and conclude that more than 20% OF CUSTOMERS WOULD PAY THE UPGRADE, WHEN IN REALITY THE CUSTOMERS WOULD NOT PAY THE UPGRADE.

TYPE II ERROR: We would fail to reject the null hypothesis and conclude that 20% Customers would NOT PAY FOR THE UPGRADE, WHEN IN FACT CUSTOMERS WOULD PAY THE $100 FOR THE UPGRADE

IN THIS CASE, FOR THE COMPANY, A TYPE I ERROR WOULD BE WORSE BECAUSE THE COMPANY WOULD IMPLEMENT THE UPGRADE FEE, BUT IT WOULD NOT BE PROFITABLE BECAUSE LESS THAN 20% OF CUSTOMERS WOULD PAY THE $100 FEE

T9.11C THERE ARE ONLY 2 WAYS TO INCREASE THE POWER OF A TEST:

(1) INCREASE THE SAMPLE SIZE (n) which was given

(2) INCREASE THE SIGNIFICANCE LEVEL (α)

T9.12

(A) STUDENTS MAY IMPROVE FROM MONDAY TO WEDNESDAY JUST BECAUSE THEY HAVE ALREADY DONE THE TASK ONCE.

ALSO, SOMETHING EXTERNAL MAY AFFECT SCORES ON ONE OF THE DAYS (PERHAPS STUDENTS DIDN'T GET AS MUCH SLEEP THE NIGHT BEFORE BECAUSE OF SOME SCHEDULED ACTIVITY)

A BETTER WAY TO RUN THE EXPERIMENT WOULD BE TO RANDOMLY ASSIGN HALF THE STUDENTS TO GET 1 CUP OF COFFEE ON MONDAY AND THE OTHER HALF TO GET THE CUP OF COFFEE ON WEDNESDAY.

(B) IF YOU DID (NO COFFEE − COFFEE) THEN SEE BOOK ANSWER ON PAGE S-46.

(B) THIS IS A "PAIRED T-TEST FOR THE DIFFERENCE OF MEANS (μ_D)"

2 method to do TOH

To DO THIS PROBLEM You need to enter: $L1$ = No Cup
$L2$ = 1 cup
You can do either way − I prefer working with positive differences. → $L3 = L2 - L1$

μ_D = the actual mean difference (Coffee − No Coffee) in the number of words recalled.

HINT: THINK ABOUT THIS

$H_0: \mu_D = 0$
$H_A: \mu_D > 0$

OR

$H_0: \mu_C - \mu_{NO} = 0$
$H_A: \mu_C - \mu_{NO} > 0$

$\mu_C > \mu_{NO}$

AND WORK BACKWARDS

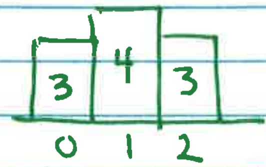
T 9.12 (CONT)

CONDITIONS:

Random: This was a randomized experiment

Independent: Score should be independent due to running a randomized experiment

NORMAL: Since the sample size was small, we must look at a histogram of the differences. Since the graph appears symmetric with no outliers, the t-distribution can be used.



Coffee − No Coffee
(word recall.

TEST: Paired T-test for the difference of means

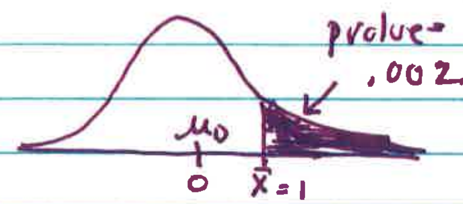
$\alpha = .05$

$t = 3.87$

pvalue $= .0018$

$\bar{X}_D = 1.0$

$S_D = .816$



CONCLUSION:

Since the pvalue (.002) is smaller than $\alpha = .05$, we reject the null hypothesis. We have convincing evidence to conclude that students perform better on this word recall test with coffee than without coffee, on average.

TQ.13 (A) This is a T-Test for means. There are 3 ways to meet the normal condition

1. BE TOLD THE DISTRIBUTION OF THE POPULATION WAS NORMAL (NOT DONE)
2. HAVE A LARGE ENOUGH SAMPLE SIZE. OUR RULE OF THUMB FOR CLT in $n \geq 30$. The sample size is 50 so the CLT applies and we STATE THE NORMAL CONDITION WAS MET.
3. SMALL SAMPLE SIZES, REQUIRES SHOWING A GRAPH AND LOOK FOR OUTLIERS AND SKEWNESS.

(B) PERFORM A "1 Sample T-INTERVAL FOR MEANS (μ)"

μ = actual mean amount spent on food by households in THIS city

H_0: $\mu = \$158$
H_A: $\mu \neq \$158$ (KEY WORD "DIFFERS")

CONDITIONS

Random - random sample of 50 household

Independent - it is reasonable there are more than $50(10) = 500$ households in this city

Normal - the sample size ($n=50$) is sufficiently large to support a normal distribution.

T9.13 (CONT.)

The Confidence interval was Given

95% Confidence Level
Interval was $159.32 to $170.68

Conclusion

Since the 95% confidence interval does NOT contain the population mean ($158), we reject the null hypothesis. We have sufficient evidence to conclude the mean amount spent on food per household in this city differs from the U.S. value amount of $158.