MAT 135, Discussion Questions 4.22

1. Whether to use a z-test or a t-test is determined the same way we did for confidence intervals. What are the conditions that need to be satisfied to use a z-test?

n ≥ 40
and known standard deviation for population

2. A paint manufacturer fills cans of paint using a machine that has been calibrated to fill the cans to contain an average μ of 1 gallon (128 ounces) each. To test whether their machine has come out of calibration, the manufacturer takes a random sample of 25 cans and finds that they average 128.2 ounces with a standard deviation of 2 ounces. Is this strong evidence that the filling machine is set too high and thus is no longer calibrated properly? Use the p-value method to test this result.

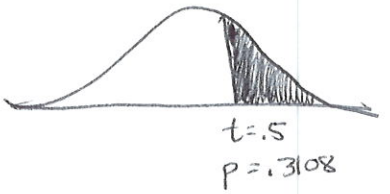
T-Test Stats

$H_0: \mu = 128$
$H_a: \mu > 128$

$t = .5$
$p = .3108$

fail to reject H_0
not enough evidence to recalibrate machine

$\mu_0 = 128$
$\bar{x} = 128.2$
$S_x = 2$
$n = 25$ $\mu > \mu_0$



3. How can we use a confidence interval to test a hypothesis?

if μ_0 is inside confidence interval
then fail to reject null.
if μ_0 is outside the confidence interval
reject null

4. According to the Crown ATM network, the mean ATM withdrawal is \$67. PayEase is a service that allows one to pay bills as well as withdraw money. A review of 40 withdrawals found a mean withdrawal at PayEase machines of \$73. If the standard deviation of the withdrawals was \$5, do users of PayEase withdraw more money than at a traditional ATM? Use the critical value method (for a significance level of $\alpha = 0.05$). Graph the critical value, the rejection region and the test statistic on the graph below. Interpret the results of your test.

T-Test Stats (or Z)

$\mu_0 = 67$

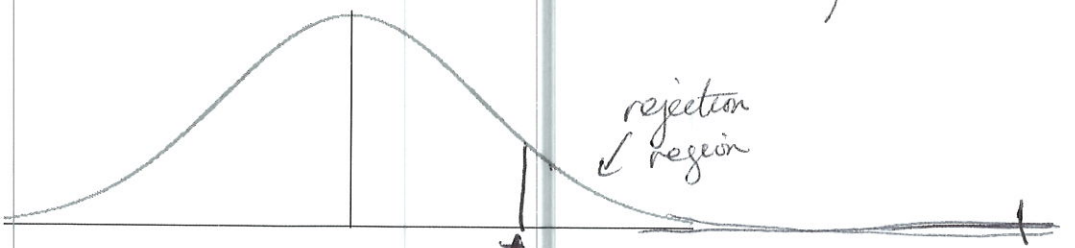
$\bar{x} = 73$

$S_x = 5$

$\mu > \mu_0$

$H_0: \mu = 67$

$H_a: \mu > 67$



$t = 7.589$

$p = 1.685 \times 10^{-9}$

reject null

5. Compare problems #2 and #4. Which method, the critical value method and the p-value method, do you think is easier? Does your answer depend on the technology available to you?

answers will vary
→ Choose one & stick w/ it

P-value is easier w/ technology

6. The manufacturer of a toner cartridge claims the mean number of printouts is 10,000 for each cartridge. A consumer advocate is concerned that the mean number of printouts is lower. He selects a random sample of 14 such cartridges and obtains the following number of printouts.

9600	10300	9000	10750	9490	9080	9655
9520	10070	9999	10470	8920	9964	10330

Use the data setting on your hypothesis test tool in your calculator to conduct the test. What can you conclude?

T-Test Data

$H_0: \mu = 10{,}000$

$H_a: \mu < 10{,}000$

List: L_1

Freq: 1

$\mu < \mu_0$

$t = -1.342$

$p = .10118 > .05$

fail to reject null

not enough evidence to think output is less than advertised

Are there any confounding variables that might affect how many printouts a cartridge produces?

The amount of print on page / images, etc.