Comparing Two Means

Student Activity

Name _____

Class _____

The test statistic used for testing a claim about two means (independent and large) when σ_1 and σ_2 are known is:

$$z = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{\sqrt{\frac{(\sigma_1)^2}{n_1} + \frac{(\sigma_2)^2}{n_2}}}$$

Use s_1 and s_2 when σ_1 and σ_2 are unknown.

Problem 1 – Summer Course: Does it help?

In a school district, 44 eighth graders took a summer math course and 117 did not. In the first school quarter, the mean score of those in the program was 85.2 with a standard deviation of 5.8. The mean score of those not in the program was 81.4 with a standard deviation of 6.2.

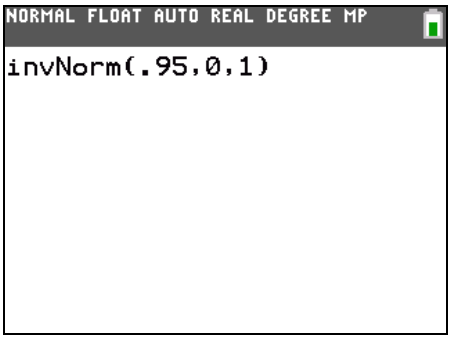
Test the claim that students who take the summer course score better in the first school quarter than those who do not take the course. Use $\alpha = 0.05$.

1. Write the null and alternative hypotheses.

2. Calculate the test statistic, *z*.

3. Find the critical value by using the **invNorm** command in the DISTR menu (2nd [DISTR]).

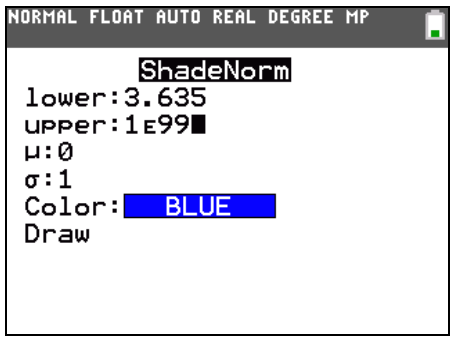
4. Do you reject or fail to reject the null hypothesis? Why?



Press WINDOW and set the values equal to the following.

Xmin = –5, **Xmax** = 5, **Xscl** = 1, **Ymin** = –0.1, **Ymax** = 0.5, **Yscl** = 0.1

The *P*-value can be found by using the **ShadeNorm** command. It is located in the **DRAW** menu which is accessed by pressing [DISTR]. The format is *lower bound, upper bound, mean, standard deviation*. Use –1E99 for negative infinity and 1E99 for positive infinity. (E is typed by pressing – [EE])



5. What is the area to the right of the test statistic?

6. What is the *P*-value?

7. Fill in the blank: There _____ enough evidence to support the claim that students that take the summer course score better in the first quarter than those that did not take the course.

Problem 2 – Boys and Girls: Did they work the same number of hours?

Sixty-two boys and fifty-five girls from the senior class are randomly surveyed and asked how many hours they worked per week over the summer. The means and standard deviations, in hours, are shown below.

	Mean	Standard Deviation
Boys	30.6	4.7
Girls	28.2	5.9

Test the claim that boys and girls from this senior class did not work the same number of hours per week during the summer. Use $\alpha = 0.05$.

8. Write the null and alternative hypotheses.

9. Calculate the test statistic.

10. Find the critical values.

11. Do you reject or fail to reject the null hypothesis? Why?

12. Fill in the blank: There _____ sufficient evidence to suggest that the boys and girls in this school did not work the same number of hours over the summer.

13. Find the *P*-value.

Problem 3 – Morning Rush: Does the east side have longer commutes?

Decisions about the allocation of transportation money in a certain city depend on if people on the east side of the city have a longer commute than people on the west side to City Hall, as some claim. The distance traveled is the same for both east and west commuters. Surveys of commuters from each side of the city are taken. Sample sizes and results, in minutes, are shown below.

	n	$\bar{x}$	*s*
East	159	29.1	17.1
West	132	25.5	12.5

Test the claim that commutes on the east side are longer than those on the west side.
Use $\alpha = 0.01$.

14. Write the null and alternative hypotheses.

15. Calculate the test statistic.

16. Calculate the critical value.

17. Do you reject or fail to reject the null hypothesis? Why?

18. Fill in the blank: There _____ enough evidence to support the claim that commutes on the east side are longer than on the west.

19. What must be true about the *P*-value? Why?

Press STAT, choose **TESTS** and select **2-SampZTest**. Choose **Stats** for **Inpt**, the input method.

20. Enter the information for the problem. What is the *P*-value?