



z-score	t-score
$z = \frac{\bar{X} - \mu}{\frac{\sigma}{\sqrt{n}}}$	$t = \frac{\bar{X} - \mu}{\frac{s}{\sqrt{n}}}$

Problem 1 – Large Sample, $\alpha = 0.05$

Ten years ago, the mean salary in a certain community was \$43,208. An investor thinks it is now higher than that.

In the community, 100 residents are randomly surveyed; the sample mean and standard deviation of this sample are computed.

1. Write null and alternative hypotheses.
2. Will you need to find a z-score or a t-score? Why?

The sample mean and standard deviation from the 100 residents are:

$$\bar{x} = \$45,742, s = \$14,192$$

3. Calculate the test statistic.
4. Find the critical value by using the **invNorm** command in the [DISTR] menu. Use a 5% significance level.
5. Do you reject or fail to reject the null hypothesis? Why?

```
invNorm(.95,0,1)
```

Press **WINDOW** and set the values equal to the following.

$$\begin{aligned} X_{\min} &= -5 & X_{\max} &= 5 & X_{\text{scl}} &= 1 \\ Y_{\min} &= -0.15 & Y_{\max} &= 0.45 & Y_{\text{scl}} &= 0.1 \end{aligned}$$

The P -value can be found by using the **ShadeNorm** command. It is located in the **DRAW** menu which is accessed by pressing $\boxed{2nd}$ \boxed{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 \boxed{EE} .)

6. What is the area to the right of the test statistic?
7. What is the P -value?
8. How does this confirm your decision to either reject or fail to reject the null hypothesis?

```
DISTR  $\boxed{DISTR}$ 
 $\boxed{1}$  ShadeNorm(
2: Shade_t(
3: ShadeX $\chi^2$ (
4: ShadeF(
```

```
ShadeNorm(1.786,
1E99, 0, 1)
```

Problem 2 – Large Sample, $\alpha = 0.01$

In Problem 1, the significance level was 5%. Perform the hypothesis test again, this time with a significance level of 1%.

9. What is the new critical value?
10. Do you reject or fail to reject the null hypothesis? Why?

Problem 3 – Small Sample, $\alpha = 0.05$

Suppose that the sample mean and standard deviation (\$45,742 and \$14,192) came from a sample of 25 residents instead of 100 residents.

11. Will you find a z -score or a t -score? Why?
12. Calculate the test statistic.

13. Calculate the critical value by using the **invT** command. It is located in the [DISTR] menu, below the **invNorm** command. The format is *area to the left, degrees of freedom*.

```
invT(.95,24)
```

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

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

16. Find the *P*-value.

Problem 4 – Extension

Press [STAT], choose **TESTS** and select **Z-Test** or **T-Test** to find the test statistic and *P*-value for sample sizes between 25 and 100. Discuss how these values change and why.

Note: For **Inpt** (the input method), choose **Stats**.

```
Z-Test
Inpt:Data  Stats
μ₀:43208
σ:14192
x̄:45742
n:30
μ:≠μ₀ <μ₀ >μ₀
Calculate Draw
```