8. The manager of a private clinic claims that the mean time of the patient-doctor visit in his clinic is 8 minutes. Test the hypothesis that $\mu = 8$ minutes against the alternative that $\mu \neq 8$ minutes if a random sample of 50 patient-doctor visits yielded a mean time of 7.8 minutes with a standard deviation of 0.5 minutes. It is assumed that the distribution of the time of this type of visits is normal. Use a 0.01 level of significance.

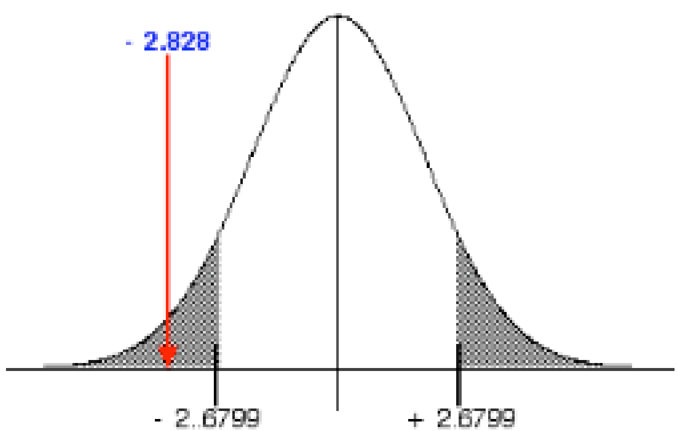
This is a two-tailed t - test.

$$H_0 : \mu = 8$$
$$H_a : \mu \neq 8$$

$$TS = \frac{\bar{x} - \mu}{\frac{s}{\sqrt{n}}} = \frac{7.8 - 8.0}{\frac{0.5}{\sqrt{50}}} = -2.828$$

$$CV = t_{0.005,\ 49} = \pm 2.6799$$

Since TS lies in the "rejection" range we must accept the fact that **there is reason to doubt the statement that there is no change in the average values, and tend to accept the claim that the average time to visit the doctor's office is different from 8 minutes.**



	n ->	50		TS:	-2.82842713
	x ->	7.8		CV:	2.679951964
	μ ->	8			
	s ->	0.5			
	alpha ->	0.01			
	alpha/2 ->	0.005			
degrees of	freedom ->	49			

9. Suppose in a sample of 25 people, the mean height was observed to be 70 inches. Suppose also $\sigma = 3$.

a) Would you reject the hypothesis $H_0 : \mu = 71 \; vs \; H_a : \mu \neq 71$ on the basis of the observations, when testing at level $\alpha = .05$?

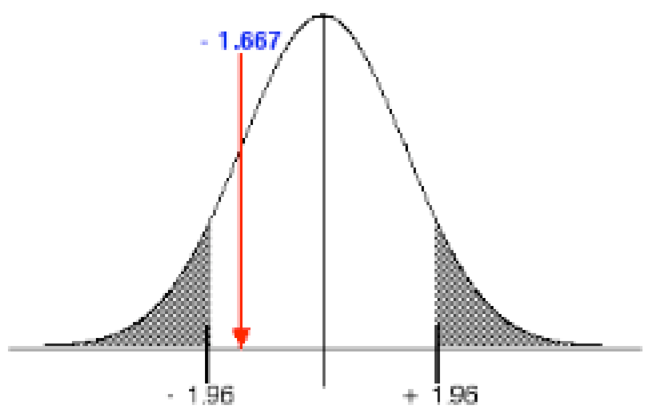
This is a two-tailed z - test.

$$H_0 : \mu = 71$$
$$H_a : \mu \neq 71$$

$$TS = \frac{\bar{x} - \mu}{\frac{z}{\sqrt{n}}} = \frac{70 - 71}{\frac{3}{\sqrt{25}}} = -1.667$$

$$CV = z_{0.025} = \pm 1.96$$

Since TS lies in the "acceptance" range we must accept the fact that **there is no reason to doubt the statement that there is no change in the average height.**



	n ->	25		TS:	- 1.6667
	x ->	71		CV:	-1.96
	μ ->	70			
	σ ->	3			
	alpha ->	0.05			
	alpha/2 ->	0.025			

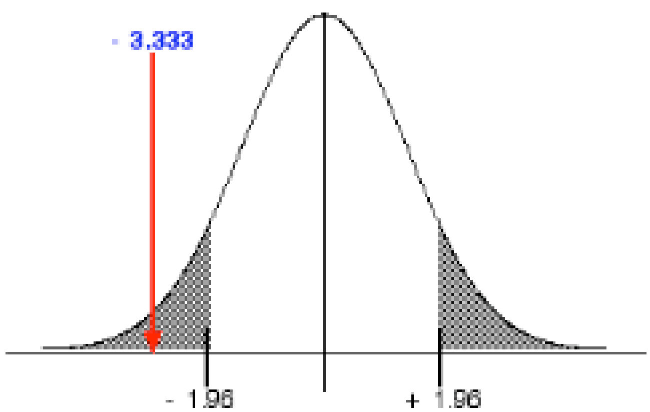
b) Would you reject the hypothesis $H_0 : \mu = 72 \;\; vs \;\; H_a : \mu \neq 72$ on the basis of the observations, when testing at level $\alpha = .05$?

This is a two-tailed z - test.

$$H_0 : \mu = 72 \qquad\qquad TS = \frac{\bar{x} - \mu}{\frac{z}{\sqrt{n}}} = \frac{70 - 72}{\frac{3}{\sqrt{25}}} = -3.333$$
$$H_a : \mu \neq 72$$

$$CV = z_{\,0.025} = \pm 1.96$$

Since TS lies in the "rejection" range we must accept the fact that **there is reason to doubt the statement that there is no change in the average values, and tend to accept the claim that the average height is different from 72 inches.**



	n ->	25		TS:	-3.333
	x ->	71		CV:	-1.96
	μ –>	72			
	σ –>	3			
	alpha ->	0.05			
	alpha/2 ->	0.025			

c) Would you reject the hypothesis $H_0 : \mu = 69 \;\; vs \;\; H_a : \mu > 69$ on the basis of your observations, when testing at level $\alpha = .05$?

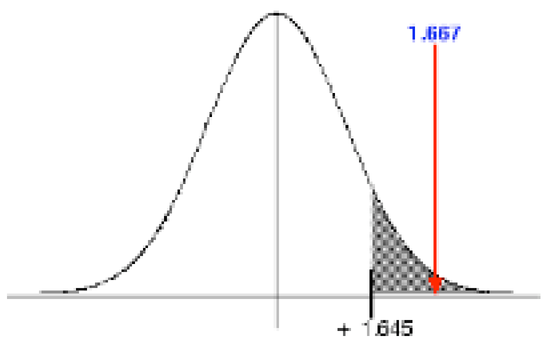
This is a one-tailed z - test.

$$H_0 : \mu = 69$$
$$H_a : \mu > 69$$

$$TS = \frac{\bar{x} - \mu}{\frac{z}{\sqrt{n}}} = \frac{70 - 69}{\frac{3}{\sqrt{25}}} = 1.667$$

$$CV = z_{0.05} = +1.645$$

Since TS lies in the "rejection" range we must accept the fact that **there is reason to doubt the statement that there is no change in the average values, and tend to accept the claim that the average height is greater than 69 inches.**



	n ->	25		TS:	1.667
	x ->	69		CV:	1.645
	μ ->	70			
	σ ->	3			
	alpha ->	0.05			

10. The calculated nitrogen content of pure benzanilide is 7.10%. Five repeat analyses of "representative" samples yielded values of 7.11%, 7.08%, 7.06%, 7.06%, and 7.04% ($\bar{x} = 7.07\%$, $s = 0.03\%$). Using an α level of size 5%, can we conclude that the experimental mean differs from the expected value? Assume that the measured values are approximately normally distributed.

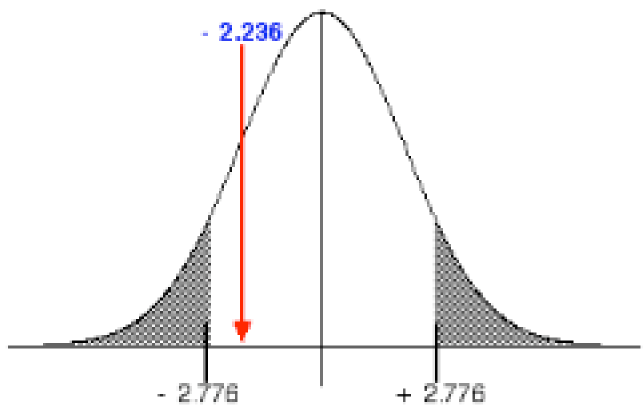
This is a two-tailed matched pair test.

$$H_0 : \mu = 0.071$$
$$H_a : \mu \neq 0.071$$

$$TS = \frac{\bar{x} - \mu}{\frac{s}{\sqrt{n}}} = \frac{0.0707 - 0.071}{\frac{0.003}{\sqrt{5}}} = -2.236$$

$$CV = t_{0.025,\ 4} = \pm 2.776$$

Since TS lies in the "acceptance" range we must accept the fact that **there is no reason to doubt the statement that there is no change in the average values.**



	n ->	5		TS:	-2.23606798
	x ->	0.0707		CV:	2.776445105
	µ ->	0.071			
	s ->	0.0003			
	alpha ->	0.05			
	alpha/2 ->	0.025			
degrees of freedom ->		4			