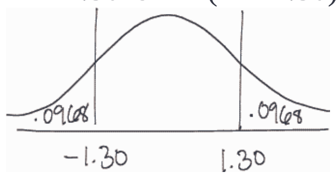
Homework 7 Solutions

15.26 Since the true mean is 4.88, we have Ho: $\mu = 4.88$.

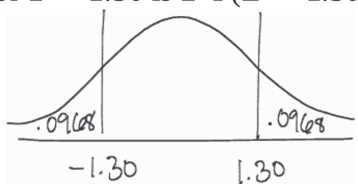
15.27 Since the manager expects higher scores in men in general, the alternative hypothesis is Ha: $\mu > 4.88$.

15.28 Z = (5.91-4.88)/(.79/sqrt(48)) = 9.03

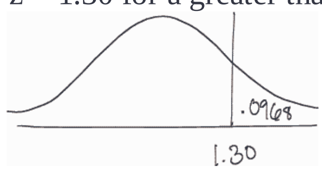
15.29 The two sided pvalue for z = 1.30 is 2*P(Z > 1.30) = 2*.0968 = .1936.



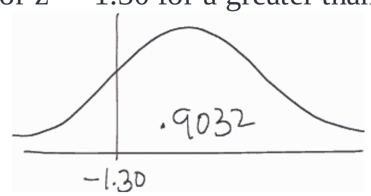
15.30 The two sided pvalue for z = -1.30 is 2*P(Z < -1.30) = 2*.0968 = .1936.



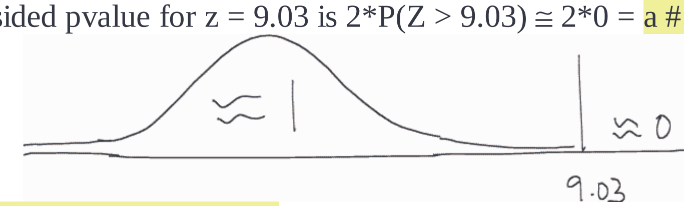
15.31 The one sided pvalue for z = 1.30 for a greater than test is P(Z > 1.30) = .0968.



15.32 The one sided pvalue for z = -1.30 for a greater than test is P(Z > -1.30) = .9032.

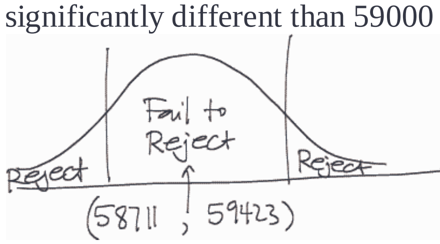


15.33 The two sided pvalue for z = 9.03 is 2*P(Z > 9.03) ≅ 2*0 = a # very close to 0.



15.34 Since .01 < pvalue = .031 < .05, we have significant results at the .05 level but not at the .01 level.

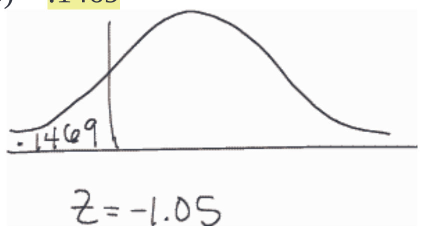
15.35 We note that the confidence interval is (58711, 59423). Since 59000 is in the interval, we fail to reject the null hypothesis at the 10% level. Thus the mean is not significantly different than 59000 at the 10% level. Now if we are at the 5% level our confidence will have increased and the resulting confidence interval will be wider. This means that 59000 will still be in the 95% interval and this means that the mean is not significantly different than 59000 at the 5% level.



2. a) The population parameter of interest is μ = mean apartment size for the population of apartments at this complex.

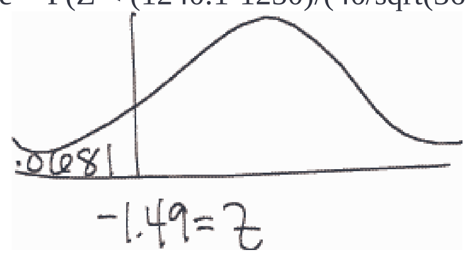
b) Ho: $\mu = 1250$ and Ha: $\mu < 1250$.

c) pvalue = P(Xbar < 1240.1) = P(Z < (1240.1-1250)/(40/sqrt(18)))
= P(Z < -1.05) = .1469



d) Since our pvalue is large we fail to reject the null hypothesis and conclude that the average apartment size is not significantly different than the advertised 1250 square feet.

e) With n = 36: pvalue = P(Z < (1240.1-1250)/(40/sqrt(36))) = P(Z < -1.49) = .0681



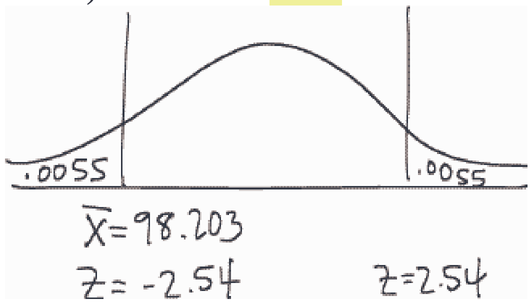
f) With n = 72: pvalue = P(Z < (1240.1-1250)/(40/sqrt(72))) = P(Z < -2.10) = .0179

g) If we get the same sample mean; when we increase the sample size the pvalue will decrease. If we get a big enough sample we can always reject a hypothesis test. It is important to check for practical significance (is the difference between 1240 sq ft and 1250 sq ft likely to be important to tenants?), and not just worry about statistical significance.

h) We no longer have a random sample of the building. It is possible that all the first and second floor units were built one way and the units on the upper floors are smaller or bigger on average than 1250 square feet. Thus we can't rely on our results for inference about μ.

3. a) Let μ represent the mean body temperature for the population of healthy adults.
Ho: $\mu = 98.6$ The average body temperature is 98.6^o.
Ha: $\mu \neq 98.6$ The average body temperature is different than 98.6^o.
We note that the sample mean is 98.203.
Z = (98.203 – 98.6) / (.7 / sqrt(20)) = -2.54

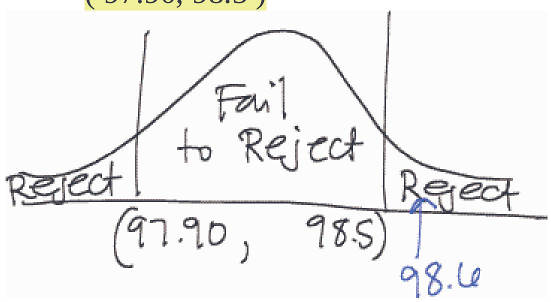
pvalue = 2*P(Z < -2.54) = 2*.0055 = .0110



b) Since our pvalue is small, we reject the null hypothesis and conclude that the average body temperature is different than 98.6^{o}. The results of our sample are statistically significant.

c) Below is a 95% confidence interval for the true mean body temperature, μ:

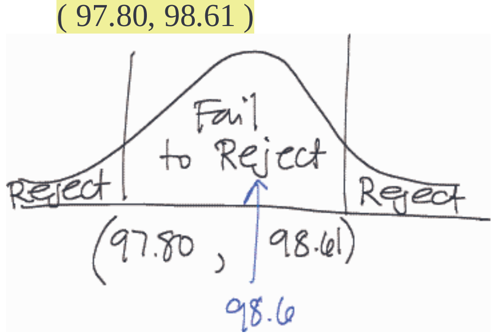
$\bar{X} \pm z\,\sigma/\sqrt{n}$ = (98.203 – 1.96*.7/sqrt(20), 98.203 + 1.96*.7/sqrt(20)) = (97.90, 98.5)



Since 98.6 is not in the interval, we would reject the null hypothesis at the 5% level.

d) Below is a 99% confidence interval for the true mean body temperature, μ:

$\bar{X} \pm z\,\sigma/\sqrt{n}$ = (98.203 – 2.576*.7/sqrt(20), 98.203 + 2.576*.7/sqrt(20)) = (97.80, 98.61)



Since 98.6 is in the interval, we would not reject the null hypothesis at the 1% level.

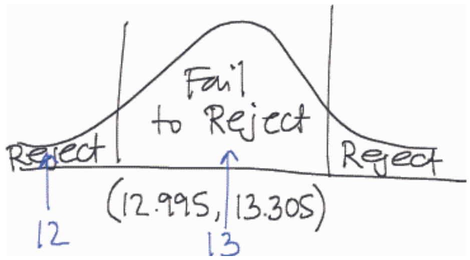
e) If the hypothesized value is in the confidence interval, we would not reject the null hypothesis for the two sided significance test. If the hypothesized value is not in the confidence interval, we would reject the null hypothesis for the two sided significance test.

4. b) Below is a 95% confidence interval for the true mean alcohol content of wine of this type, μ:

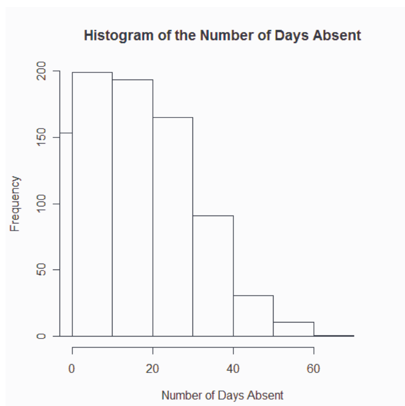
$\bar{X} \pm t_{n-1} \, s/\sqrt{n}$ = (13.15 – 2.021*.53/sqrt(48), 13.15 + 2.021*.53/sqrt(48))

= (12.995, 13.305)

c) Since 12 is not in the interval, the mean alcohol content is significantly different than 12% at the α = .05 level. Since 13 is in the interval, the mean alcohol content is not significantly different than 13% at the α = .05 level.



5. a) Clearly the number of days absent is positive. Below is a hypothetical sketch of the number of days absent. To have a large s.d. (with no negative values, we must have a long right tail.



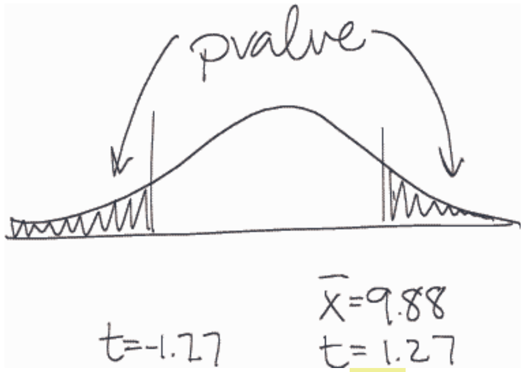
b) The t procedure is a robust procedure. For a large sample we know that the average will be approximately normal. Thus the t procedure seems appropriate.

c) μ is the mean number of days abset for the population of all workers at this factory in all years.

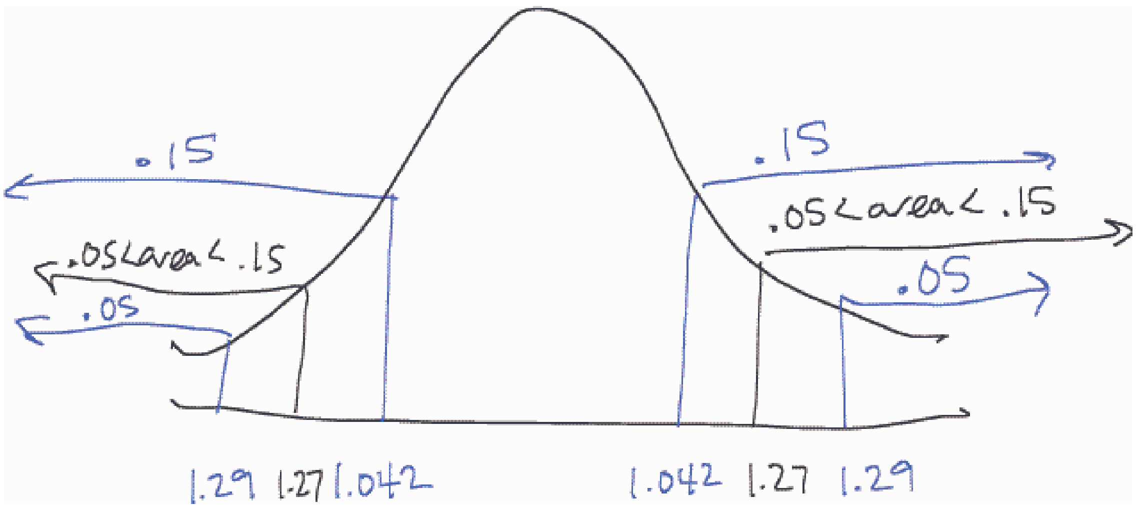
Ho: $\mu = 9$ The mean number of days absent at the factory is the same as the industry standard.

Ha: $\mu \neq 9$ The mean number of days absent at the factory is different than the industry standard.

We note that we have 667 degrees of freedom. Since 667 degrees of freedom is not on the table, we will drop to the next category on the table. So we will be getting the following from the row of df = 100.



1.042	<	t = (9.88 – 9) / (17.85 / sqrt(668)) = 1.27	<	1.290
.10	<	pvalue = 2*P(t > 1.27)	<	.30



Since our pvalue is large we fail to reject the null hypothesis and conclude that the mean number of days absent at the factory is not different than the industry standard. The results of our sample are not statistically significant.

Note that when d.f. is very large (as it is here) then we get almost identical results as we would if we used the z (normal) distribution. In practice this is probably OK but for showing that you understand it is important that you demonstrate knowledge of the t-distribution as was done in the answer to this problem.