5.5 a. $12.3 \pm (1.96)\frac{0.2}{\sqrt{25}} = (12.22, 12.38)$

b. We are 95% confident that the average weight of a box of corn flakes is between 12.22 and 12.38 oz.

5.9 a. $5.2 \pm (2.58)(\frac{7.5}{\sqrt{10}}) = 5.2 \pm 6.12 = (-.92, 11.32)$

b. Since the sample size is small, the condition that the distribution of profit margins needs to be normal is crucial. Similarly, with n=10, replacing σ with s is questionable. Section 5.7 will provide more details about this type of situation.

5.11 $3.2 \pm (1.96)(\frac{1.1}{\sqrt{150}}) = 3.2 \pm 0.18 = (3.02, 3.38)$

5.13 $850 \pm (1.96)(\frac{100}{\sqrt{60}}) = 850 \pm 25.3 = (824.7, 875.3)$

5.19 a. n decreases

b. n increases

c. n increases

5.21 $\hat{\sigma} = 13, E = 3, \alpha = .01 \Rightarrow n = \frac{(2.58)^2(13)^2}{(3)^2} = 125$

5.25 a. $n = \frac{(.225)^2(1.96+2.33)^2}{(.1)^2} = 94$

b. The sample size is somewhat larger.

5.31 $H_o : \mu \geq 16$ vs $H_a : \mu < 16$

$\alpha = 0.05, \beta = 0.10,$ whenever $\mu \leq 12, \sigma = 7.64$

$z_{0.05} = 1.645, z_{0.10} = 1.28, n = \frac{(7.64)^2(1.645+1.28)^2}{(12-16)^2} = 31.2 \Rightarrow n = 32$

5.34 $n = \frac{(80)^2(1.645+1.96)^2}{(525-550)^2} = 133.1 \Rightarrow n = 134$

5.35 $z = \frac{542-525}{76/\sqrt{100}} = 2.24 > 1.645 = z_{0.05} \Rightarrow$ Reject H_o.

There is sufficient evidence to conclude that the mean has been increased above 525.

5.36 a. Yes. The weight may be lost faster by those people who weigh considerably more at the beginning of the study. One may want to select men for the study who all have approximately the same percentage of body fat.

b. $H_o : \mu \leq 5$ vs $H_a : \mu > 5$

$\alpha = 0.05, \beta = 1 - 0.90 = 0.10,$ whenever $\mu \geq 8, \hat{\sigma} = 6.8$

$z_{0.05} = 1.645, z_{0.10} = 1.28, n = \frac{(6.8)^2(1.645+1.28)^2}{(5-8)^2} = 43.9 \Rightarrow n = 44$. Thus, the sample size was too small.

5.41 p-value $= 0.0359 > 0.025 = \alpha \Rightarrow$

No, there is not significant evidence that the mean is greater than 45. With $\alpha = 0.025$, the researcher is demanding greater evidence in the data to support the research hypothesis.

5.42 p-value $= 2P(z \geq \frac{|5.8-4|}{4.11/\sqrt{30}}) = 2P(z \geq 2.40) = 0.0164 > 0.01 = \alpha \Rightarrow$

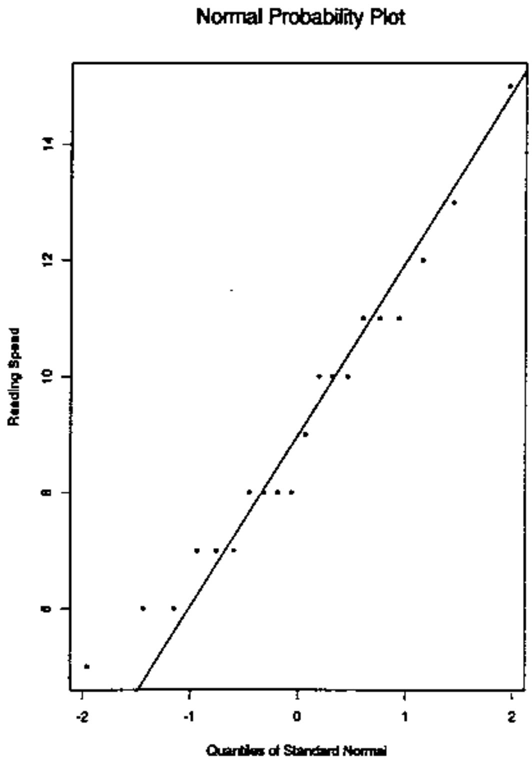
No, there is not significant evidence that the mean differs from 4.

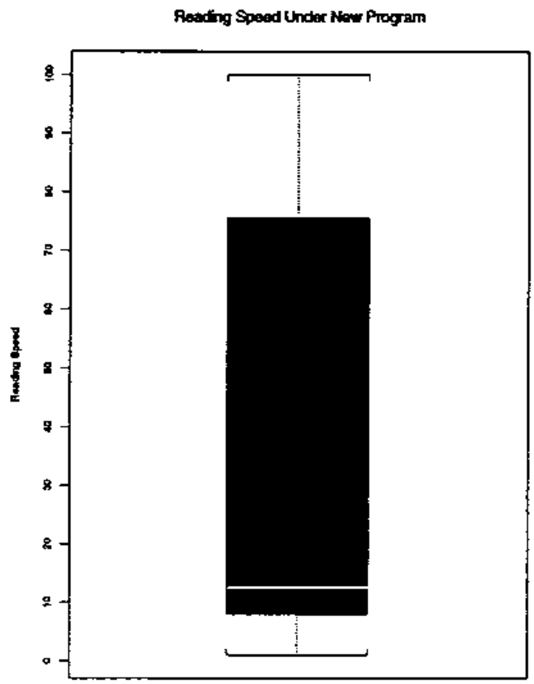
5.43 Yes, since p-value would now equal $0.0164/2 = 0.0082$, which is less than 0.01, the value of α.

5.52 $n = 20, \bar{y} = 9.1, s = 2.573, t_{.025,19} = 2.093$

a. $9.1 \pm (2.093)(2.573)/\sqrt{20} \Rightarrow 9.1 \pm 1.2 \Rightarrow (7.9, 10.3)$ is a 95% C.I. on μ

b. The normal probability plot is given here:





The data set appears to be a sample from a normal distribution.

c. We are 95% confident that the mean reading speed for the population is between 7.9 and 10.3.

d. $9.1 \pm (2.539)(2.573)/\sqrt{20} \Rightarrow 9.1 \pm 1.46 \Rightarrow (7.64, 10.56)$ is a 98% C.I. on $\mu \Rightarrow$

The inference is less precise.

5.53 $H_o : \mu \leq 80$ versus $H_a : \mu > 80, n = 20, \bar{y} = 82.05, s = 10.88$

$t = \frac{82.05-80}{10.88/\sqrt{20}} = 0.84 \Rightarrow$ Reject H_o if $t \geq 1.729$.

Fail to reject H_o and conclude data does not support the hypothesis that the mean reading comprehension is greater than 80.

The level of significance is given by p-value $= P(t \geq 0.84) \approx 0.20$.

5.55 $n = 15, \bar{y} = 31.47, s = 5.04$

a. $31.47 \pm (2.977)(5.04)/\sqrt{15} \Rightarrow 31.47 \pm 3.87 \Rightarrow (27600, 35340)$ is a 99% C.I. on the mean miles driven.

b. $H_o : \mu \geq 35$ versus $H_a : \mu < 35$ Reject H_o if $t \leq -2.624$.
$t = \frac{31.47-35}{5.04/\sqrt{15}} = -2.71 \Rightarrow$
Reject H_o and conclude data supports the hypothesis that the mean miles driven is less than 35,000 miles.
Level of significance is given by p-value $= P(t \leq -2.71) \Rightarrow 0.005 < p - value < 0.01$.

5.57 a. $4.95 \pm (2.365)(0.45)/\sqrt{8} \Rightarrow 4.95 \pm 0.38 \Rightarrow (4.57, 5.33)$ is a 95% C.I. on the mean dissolved oxygen level.

b. There is inconclusive evidence that the mean is less than 5 since the C.I. contains values both less and greater than 5.

c. $H_o : \mu \geq 5$ versus $H_a : \mu < 5$, $t = \frac{4.95-5}{.45/\sqrt{8}} = -0.31 \Rightarrow$ p-value $= P(t \leq -0.31) = P(t \geq 0.31) \Rightarrow 0.25 < p - value < 0.40$ (Using a computer program p-value = 0.3828). Fail to reject H_o and conclude the data does not support that the mean is less than 5.

5.58 a. $H_o : \mu \leq 1600$ versus $H_a : \mu > 1600$, p-value $= P(t \geq 3.64) \Rightarrow$ p-value ≈ 0.001
Reject H_o and conclude the data supports that the mean is greater than 1600.

b. $1718.3 \pm (2.110)(137.8)/\sqrt{18} \Rightarrow 1718.3 \pm 68.53 \Rightarrow (1649.8, 1786.8)$ is a 95% C.I. on the mean volume.

c. p-value ≈ 0.001; Yes, the p-value is very small.

5.59 a. Untreated: $43.6 \pm (1.833)(5.7)/\sqrt{10} \Rightarrow (40.3, 46.9)$
Treated: $36.1 \pm (1.833)(4.9)/\sqrt{10} \Rightarrow (33.3, 38.9)$
We are 90% confident that the average height of untreated shrups is between 40.3 cm and 46.9 cm. We are 90% confident that the average height of treated shrups is between 33.3 cm and 38.9 cm.

b. The two intervals do not overlap. This would indicate that the average heights of the treated and untreated shrups is significantly different.

5.60 Before: $23.22 \pm (1.833)(4.25)/\sqrt{10} \Rightarrow (20.76, 25.68)$

After: $25.33 \pm (1.833)(4.25)/\sqrt{10} \Rightarrow (22.87, 27.79)$

Since the two intervals overlap, there is not strong evidence of an increase in the average mpg after installing the device.

5.61 a. $H_o : \mu_{After} - \mu_{Before} \leq 0$ versus $H_a : \mu_{After} - \mu_{Before} > 0$ which implies
$H_o : \mu_{After} \leq \mu_{Before}$ versus $H_a : \mu_{After} > \mu_{Before}$
$t = \frac{2.11-0}{7.54/\sqrt{10}} = 0.88 \Rightarrow$ p-value $= P(t \geq 0.88) = 0.2009 > 0.05$
There is not significant evidence that the mean change in mpg is greater than 0, i.e., the mean mpg has been increased after installing the device.

b. $2.11 \pm (1.833)(7.54)/\sqrt{10} \Rightarrow (-2.26, 6.48) \Rightarrow$
Using the decision rule: Reject $H_o : \mu \leq \mu_o$ in favor of $H_a : \mu > \mu_o$ if μ_o is less than the lower limit of the C.I., we have that since 0 is greater than the lower limit of the C.I., -2.26, we fail to reject H_o and conclude that there is not significant evidence that the difference in the average mpg, $\mu_{After} - \mu_{Before}$ is greater than 0.