7.3.
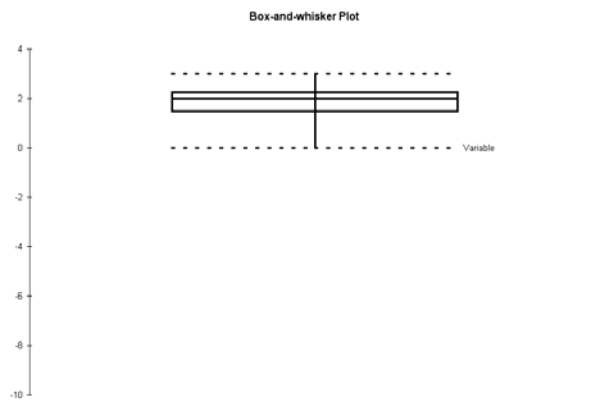
    a. $102.36 \pm 1.645(1.26/\sqrt{17})$; 101.8573 ----- 102.8627

    b. $56.33 \pm 1.7247(22.4/\sqrt{21})$; 47.8995 ----- 64.7605

7.12.

    a. point estimate $= \bar{x} = \$1.875$

    b. The population will have to be a normal distribution in this situation. The critical value can then come from the t-distribution.

Box-and-whisker Plot

    c. The population must be normally distributed.

        Based on the box and whiskers plot there is reason to believe that the data may come from a population that is approximately normally distributed.

    d. $1.875 \pm 1.7959(.735/\sqrt{12})$; $1.875 \pm .3810$; 1.494 ----------- 2.2688

7.19.

    a. $\bar{x} = \dfrac{\sum x}{n} = 67.0$; $s = \sqrt{\dfrac{\sum (x - \bar{x})^2}{n-1}} = 14.5285$

    $67 \pm 1.7709(14.5285/\sqrt{14})$; 67 ± 6.8762; 60.1238 -------- 73.8762

    Based on the sample results, with 90% confidence we believe that the mean heart rate is between 60.1238 and 73.8762.

    b. No, the conclusions could apply to only those people that have heart rates higher than 55 when they begin taking the medication. Even then, care would need to be taken to assure that the sample was random.

c. (1) It does look like heart rates did increase since the interval estimate for the mean heart rate, based on 90% confidence is estimate to be between 60.1 and 73.9 after taking the medication compared to the 55 or less baseline prior to taking the medication. (2) Using the point estimate of $\bar{x} = 67$ and assuming that the population mean prior to taking the medication was 55, we get:

$$P(z \geq (67\text{-}55)/(14.5285/\sqrt{14})) = P(z \geq 3.09) = .50 - .50 = 0$$

Thus, there is essentially a zero chance of getting a sample of 67 or more if the population mean stays at 55 for the heart rate. Again, we conclude that heart rates do increase.

7.23.

a. Students can use Excel's pivot table features to manipulate the data to obtain the information they need.

All Complaint Categories   Boise

Count of Dollar Claim Amount	78
Average of Dollar Claim Amount	268.4358974
StdDev of Dollar Claim Amount	50.89551041

$268.4359 \pm 1.9913(50.8955/\sqrt{78})$; 256.9605 ----- 279.9113

Boise

Corrosion		
	Count of Dollar Claim Amount	30
	Average of Dollar Claim Amount	274.1333333
	StdDev of Dollar Claim Amount	54.01962181

Corrosion:

$274.1333 \pm 2.0452(54.0196/\sqrt{30})$; 253.9623 ----- 294.3043

The corrosion estimate is less precise and centered at a higher value.

Count of Dollar Claim Amount	31
Average of Dollar Claim Amount	273.6774194
StdDev of Dollar Claim Amount	42.61876511

Malfunction:

Since $n \geq 30$, students could use either z = 1.96 or t = 2.0423

$273.68 \pm 2.0423(42.62/\sqrt{31})$; 258.05 ----- 289.31

Count of Dollar Claim Amount	13
Average of Dollar Claim Amount	265.2307692
StdDev of Dollar Claim Amount	53.76825868

Wiring:

$265.23 \pm 2.1788(53.77/\sqrt{13})$; 232.49 ----- 297.72

Sound:

Count of Dollar Claim Amount	4
Average of Dollar Claim Amount	195.5
StdDev of Dollar Claim Amount	28.34901527

$195.5 \pm 3.1824(28.35/\sqrt{4})$; 150.39 ----- 240.61

b. Student letters will vary but given the data it is difficult to conclude that one cause or the other is more serious in terms of dollar values. The interval estimates for the mean cost overlap. However, Sound seems to have lower average warranty costs.

7.25.

$$n = \frac{z^2\sigma^2}{e^2} = \frac{(1.96^2)(40^2)}{2.5^2} = 983.44 = 984$$

7.34.

a. $n = (1.96)^2(1400)^2/(100)^2 = 752.95$ or 753

b. 10 percent higher: $n = (1.96)^2(1540)^2/(100)^2 = 911.07$ or 912; percentage change $(912 – 753)/753 = 21\%$ increase in sample size. 10 percent reduction: $n = (1.96)^2(1260)^2/(100)^2 = 609.89$ or 610; percentage change $(610 – 753)/753 = 19\%$ decrease in sample size

7.40.

a.

Month Code	2

Data	Total
Count of WIM Gross - POE Gross	24
Average of WIM Gross - POE Gross2	1182.5
StdDev of WIM Gross - POE Gross2	4817.433242

$1182.5 \pm 2.0687(4817.4332/\sqrt{24})$; -851.7653 ----- 3216.7653

b. $n = (1.96)^2(4817.4332)^2/(50)^2 = 35661.82$ or $35662 – 24 = 35638$ additional

This is an unreasonable sample size. The margin of error is too small based on the variability in the data.

c. The standard deviation of the sample = 5.9224
$n = (2.575)^2(5.9224)^2/(1.5)^2 = 103.36$ or 104; the current pilot sample size of 200 is sufficient. No additional trucks would be needed.

7.41.

$0.30 \pm 1.96(\sqrt{[(0.3)(1-0.3)]/400})$; 0.2551 ----- 0.3449

7.46.

a. $\bar{p} = 750/900 = .8333$; $0.8333 \pm$
$1.645(\sqrt{[(0.8333)(1-0.8333)]/900})$;

.8333 $\pm$ .0204   .8129 --------- .8537

b. $e = .0204/2 = .0102$; $n = \dfrac{z^2 p(1-p)}{e^2} = \dfrac{1.645^2(.8333)(1-.8333)}{.0102^2} =$
$3{,}613.004 = 3{,}614.$ Additional units = $3{,}614 - 900 = 2{,}714$

7.55.

a. Use 0.50 for the population proportion to provide a conservatively large sample sample size.
$$n = \frac{z^2 p(1-p)}{e^2} = \frac{1.96^2(.50)(1-.50)}{.03^2} = 1{,}067.1 = 1{,}068$$

b $\bar{p} = .18$; $0.18 \pm 1.96(\sqrt{[(0.18)(1-0.18)]/1{,}068})$; $.18 \pm .0230$;
.1570 ----- .2030

c. The reason is that the sample size was computed based on the assumption that the population proportion is 0.50. However, the interval was computed using the sample proportion equal to 0.18. This implies that the population is less variable than assumed when the sample size was computed. They would have been wise to have selected a pilot sample to get a feel for what the population proportion might be before taking a sample as large as 1,068.

7.58.

$\bar{p} = 345/1000 = 0.345$

a. $0.345 \pm 1.96(\sqrt{[(0.345)(1-0.345)]/1000})$; 0.3155 ----- 0.3745

Based on the sample data and with 95% confidence we believe that the proportion of customers that carry more than one bag on the airline is between 0.3155 and 0.3745. The proportion of customers who would have been affected by the policy is thought to be in this range.

b. (0.3155)(568) ----- (0.3745)(568); 179.20 ----- 212.716

c. $\bar{p} = (280/690) = 0.4058$

$$0.4058 \pm 1.96(\sqrt{[(0.4058)(1-0.4058]/690}); 0.3692 ---- 0.4424$$

Based on 95% confidence, the proportion of males that would be affected is between .3692 and .4424. So less that half would be affected. However, this might imply that men may be more affected than the population overall.

d. $n = \dfrac{z^2 p(1-p)}{e^2} = \dfrac{1.96^2(.15)(1-.15)}{.02^2} = 1,224.51 = 1,225$

7.62

a. This is not correct. The average number of miles people commute is a single value. Therefore it has no probability. What the confidence interval is telling you is that if you want to produce all the possible confidence intervals using each possible sample mean from the population, 95% of these intervals would contain the population mean.

b. This is incorrect. The interval estimate refers to the population mean, not to the sample mean. By definition the sample mean will be at the center of the confidence interval.

7.68.

a. $n = 1.96^2(0.5)(1-0.5)/(0.04)^2 = 600.25$ or 601

b. $0.379 \pm 1.96\sqrt{\dfrac{.379(1-.379)}{601}}$; $0.379 \pm .0388$; 0.3402 -----------
0.4178

Based on the sample data and with 95% percent confidence, we believe that the proportion favoring the proposal will be between 0.3402 and 0.4178.

7.72.

a. $\bar{p} = 404/548 = 0.7372$

Count of Current Cable Subscriber	
Current Cable Subscriber	Total
No	144
Yes	404
Grand Total	548

$0.7372 \pm 1.96(\sqrt{[(0.7372)(1-0.7372]/548}); 0.7372 \pm 0.0369$;
0.7003 ----- 0.7741

b.

	Household Annual Income
Mean	**32801.09489**
Standard Error	266.1365661
Median	31000
Mode	30000
Standard Deviation	**6230.097282**
Sample Variance	38814112.14
Kurtosis	3.044243192
Skewness	1.481126946
Range	41000
Minimum	20000
Maximum	61000
Sum	17975000
Count	**548**

$32801.095 \pm 1.96(6230.097/\sqrt{548}); 32{,}279.4674$ ----- 33,322.7227

Based on the sample data, with 95% confidence the company can conclude that the mean income is between $32,279 and $33,323.

7.82.

Using Excel's AVERAGE and STDEV functions the sample average is 4387.80 and the sample standard deviation = 6356.044

a. $4{,}387.80 \pm 1.96(6{,}356.044/\sqrt{49})$; $4{,}387.80 \pm 1{,}779.69$; 2,608.11 ----- 6,167.49

b. $(0.60)(1779.69) = 1{,}067.81$; $n = \dfrac{z^2\sigma^2}{e^2} = \dfrac{1.96^2(6356.04^2)}{1067.81^2} =$ 136.11 = 137