$z = (\bar{x} - \mu)/\sigma_{\bar{x}} = (241 - 254)/3.2 = -2.50$

Step 5: For $\alpha = .01$, do not reject H_0 since $-2.50 > -2.58$.

For $\alpha = .02$, reject H_0 since $-2.50 < -2.33$.

For both parts a and b, conclude the mean time spent walking per month by such people does not differ from 254 minutes at $\alpha = .01$, but does differ from 254 minutes at $\alpha = .02$.

9.39 a. Step 1: H_0: $\mu = 10$ minutes, H_1: $\mu \neq 10$ minutes

Step 2: Since $n > 30$, use the normal distribution.

Step 3: $\sigma_{\bar{x}} = \sigma/\sqrt{n} = 3.80/\sqrt{100} = .38$ minute

$z = (\bar{x} - \mu)/\sigma_{\bar{x}} = (9.20 - 10)/.38 = -2.11$

From the normal distribution table, area to the left of $z = -2.11$ is .0174.

p-value = 2(.0174) = .0348

Step 4: For $\alpha = .02$, do not reject H_0 since .0348 > .02.

For $\alpha = .05$, reject H_0 since .0348 < .05.

b. Step 1: H_0: $\mu = 10$ minutes, H_1: $\mu \neq 10$ minutes

Step 2: Since $n > 30$, use the normal distribution.

Step 3: For $\alpha = .02$, the critical values of z are -2.33 and 2.33.

For $\alpha = .05$, the critical values of z are -1.96 and 1.96.

Step 4: $\sigma_{\bar{x}} = \sigma/\sqrt{n} = 3.80/\sqrt{100} = .38$ minute

$z = (\bar{x} - \mu)/\sigma_{\bar{x}} = (9.20 - 10)/.38 = -2.11$

Step 5: For $\alpha = .02$, do not reject H_0 since $-2.11 > -2.33$.

For $\alpha = .05$, reject H_0 since $-2.11 < -1.96$.

For both parts a and b, conclude the mean duration of long-distance calls made by residential customers does not differ from 10 minutes at $\alpha = .02$, but does differ from 10 minutes at $\alpha = .05$.

9.40 a. Step 1: H_0: $\mu = 36$ inches, H_1: $\mu \neq 36$ inches

Step 2: Since the population is normally distributed, use the normal distribution.

Step 3: $\sigma_{\bar{x}} = \sigma/\sqrt{n} = .035/\sqrt{20} = .00782624$ inch

$z = (\bar{x} - \mu)/\sigma_{\bar{x}} = (36.015 - 36)/.00782624 = 1.92$

From the normal distribution table, area to the right of $z = 1.92$ is $1 - .9726 = .0274$.

p-value = 2(.0274) = .0548

Step 4: For $\alpha = .02$, do not reject H_0 since .0548 > .02.

For $\alpha = .10$, reject H_0 since .0548 < .10.

b. Step 1: H_0: $\mu = 36$ inches, H_1: $\mu \neq 36$ inches

Step 2: Since the population is normally distributed, use the normal distribution.

Step 3: For $\alpha = .02$, the critical values of z are -2.33 and 2.33.

For $\alpha = .10$, the critical values of z are -1.65 and 1.65.

Step 4: $\sigma_{\bar{x}} = \sigma/\sqrt{n} = .035/\sqrt{20} = .00782624$ inch

$z = (\bar{x} - \mu)/\sigma_{\bar{x}} = (36.015 - 36)/.00782624 = 1.92$

Step 5: For $\alpha = .02$, do not reject H_0 since $1.92 < 2.33$.

For $\alpha = .10$, reject H_0 since $1.92 > 1.65$.

For both parts a and b, the inspector will not stop this machine at $\alpha = .02$, but will stop this machine and adjust it at $\alpha = .10$.

9.41 a. Step 1: H_0: $\mu = 32$ ounces, H_1: $\mu \neq 32$ ounces

Step 2: Since the population is normally distributed, use the normal distribution.

Step 3: $\sigma_{\bar{x}} = \sigma/\sqrt{n} = .15/\sqrt{25} = .03$ ounce

$z = (\bar{x} - \mu)/\sigma_{\bar{x}} = (31.93 - 32)/.03 = -2.33$

From the normal distribution table, area to the left of $z = -2.33$ is .01.

p-value $= 2(.01) = .02$

Step 4: For $\alpha = .01$, do not reject H_0 since $.02 > .01$.

For $\alpha = .05$, reject H_0 since $.02 < .05$.

b. Step 1: H_0: $\mu = 32$ ounces, H_1: $\mu \neq 32$ ounces

Step 2: Since the population is normally distributed, use the normal distribution.

Step 3: For $\alpha = .01$, the critical values of z are -2.58 and 2.58.

For $\alpha = .05$, the critical values of z are -1.96 and 1.96.

Step 4: $\sigma_{\bar{x}} = \sigma/\sqrt{n} = .15/\sqrt{25} = .03$ ounce

$z = (\bar{x} - \mu)/\sigma_{\bar{x}} = (31.93 - 32)/.03 = -2.33$

Step 5: For $\alpha = .01$, do not reject H_0 since $-2.33 > -2.58$.

For $\alpha = .05$, reject H_0 since $-2.33 < -1.96$.

For both parts a and b, the inspector will not stop this machine at $\alpha = .01$, but will stop this machine and adjust it at $\alpha = .05$.

9.42 a. Step 1: H_0: $\mu = 11$ hours, H_1: $\mu < 11$ hours

Step 2: Since $n > 30$, use the normal distribution.

Step 3: For $\alpha = .01$, the critical value of z is -2.33.

Step 4: $\sigma_{\bar{x}} = \sigma/\sqrt{n} = 2.2/\sqrt{100} = .22$ hour

$z = (\bar{x} - \mu)/\sigma_{\bar{x}} = (9 - 11)/.22 = -9.09$

Step 5: Reject H_0 since $-9.09 < -2.33$.

Conclude that adult males spend less than 11 hours watching sports on television.

b. If $\alpha = 0$, there can be no rejection region, and we cannot reject H_0. Therefore, the decision would be "do not reject H_0."

9.43 a. Step 1: H_0: $\mu \geq \$35,000$, H_1: $\mu < \$35,000$

Step 2: Since $n > 30$, use the normal distribution.

Step 3: For $\alpha = .01$, the critical value of z is -2.33.

Step 4: $\sigma_{\bar{x}} = \sigma/\sqrt{n} = 5400/\sqrt{150} = \$440.90815370$

$z = (\bar{x} - \mu)/\sigma_{\bar{x}} = (33{,}400 - 35{,}000)/\$440.90815370 = -3.63$

Step 5: Reject H_0 since $-3.63 < -2.33$.

Conclude that the company should not open a restaurant in this area.

b. If $\alpha = 0$, there can be no rejection region, and we cannot reject H_0. Therefore, the decision would be "do not reject H_0."

9.44 a. The first two steps and the calculation of the observed value of the test statistic are the same for both the p-value approach and critical value approach.

Step 1: H_0: $\mu \geq 30$ hours, H_1: $\mu < 30$ hours

Step 2: Since the population is normally distributed, use the normal distribution.

$\sigma_{\bar{x}} = \sigma/\sqrt{n} = 7/\sqrt{25} = 1.4$ hours

$z = (\bar{x} - \mu)/\sigma_{\bar{x}} = (27 - 30)/1.4 = -2.14$

p-value approach

Step 3: From above, $z = -2.14$.

From the normal distribution table, area to the left of $z = -2.14$ is .0162.

p-value = .0162

Step 4: Reject H_0 since $.0162 < .025$.

critical value approach

Step 3: For $\alpha = .025$, the critical value of z is -1.96.

Step 4: From above, $z = -2.14$.

Step 5: Reject H_0 since $-2.14 < -1.96$.

Conclude that the time per month on such reading by all adults in this city is less than 30 minutes.

b. For $\alpha = .01$, do not reject H_0 using p-value approach since $.0162 > .01$. The critical value of $z = -1.96$; do not reject H_0 since $-2.14 > -2.33$.

The decisions in parts a and b are different. The results of this sample are not very conclusive, since lowering the significance level from .025 to .01 reverses the decision.

9.45 a. The first two steps and the calculation of the observed value of the test statistic are the same for both the p-value approach and critical value approach.

Step 1: H_0: $\mu \geq 8$ hours, H_1: $\mu < 8$ hours

Step 2: Since the population is normally distributed, use the normal distribution.

$\sigma_{\bar{x}} = \sigma/\sqrt{n} = 2.1/\sqrt{20} = .46957428$ hour