4.17: **(a):** The null hypothesis claims New Yorkers sleep 8 hours on average.

$$H_0: \quad \mu = 8$$

The alternative hypothesis claims New Yorkers sleep less than 8 hours on average.

$$H_A: \quad \mu < 8$$

(b): The null hypothesis claims employees waste 15 minutes on average.

$$H_0: \quad \mu = 15$$

The alternative hypothesis claims employees waste more than 15 minutes on average.

$$H_A: \quad \mu > 15$$

4.18: **(a):** The null hypothesis claims the average calories is 1100.

$$H_0: \quad \mu = 1100$$

The alternative hypothesis claims the average calories is not 1100.

$$H_A: \quad \mu \neq 1100$$

(b): The null hypothesis claims the population's average score is 462.

$$H_0: \quad \mu = 462$$

The alternative hypothesis claims the population's average score is not 462.

$$H_A: \quad \mu \neq 462$$

4.19: The claims should be about the population mean, not the sample mean. The null should be an equality. Both hypotheses should involve the same number (10).

$$H_0: \quad \mu = 10$$

$$H_A: \quad \mu > 10$$

4.20: The claims should be about the population parameter. The alternative should be an inequality because she is interested in a value being higher or lower.

$$H_0: \quad \mu = 23.44$$

$$H_A: \quad \mu \neq 23.44$$

4.21: **(a):** That claim is not supported. Our confidence interval has a maximum of 2.45 hours.

(b): Sure. Our confidence interval is (2.133, 2.45) hours.

(c): Yep. A 99% confidence interval will be even larger, so it will still straddle 2.2.

4.22: **(a):** I think her claim is outside of the confidence interval, so I am skeptical. Maybe she is just estimating to the nearest power of 10?

(b): Nope. A 90% confidence interval is even smaller!

4.23: We will use a 5% significance level. We state the hypotheses.

$$H_0: \quad \mu = 130$$

$$H_A: \quad \mu \neq 130$$

We assume $\sigma \approx 17$ and calculate the standard error.

$$SE = \frac{17}{\sqrt{35}} = 2.87$$

We find a z-score.

$$z = \frac{\bar{x} - \mu}{SE} = \frac{134 - 130}{2.87} = 1.39$$

Because the alternative hypthesis is $\neq$, we find a two-tail area.

$$p\text{-value} \;=\; P(|Z| > 1.39) \;=\; 2P(Z < -1.39) \;=\; 0.16$$

The p-value is bigger than 5%, we retain the null. We do not have sufficient evidence to claim the bags are lying.