1. (9.2, p. 177)
   (a) $H_0 : \mu = 10$
   $H_A : \mu \neq 10$
   (b) $H_0 : \mu = 8$
   $H_A : \mu \neq 8$
   (c) $H_0 : \mu = 1$
   $H_A : \mu \neq 1$

2. (9.6, p. 187)
   $p_{\text{1-sided}} = \Pr(Z > 1.72) = 0.0427$
   $p_{\text{2-sided}} = 2 \times p_{\text{1-sided}} = 0.0854$

3. (9.10, p. 187)
   - We will test the hypothesis $H_0 : \mu = 1.3$ against the two-sided alternative hypothesis $H_A : \mu \neq 1.3$.
   - We set our significance level at $\alpha = 0.05$ and calculate the following:
   - $z_{\text{stat}} = \dfrac{\bar{x} - \mu}{\sigma/\sqrt{n}} = \dfrac{1.4 - 1.3}{0.3/\sqrt{25}} = 1.67$
   - $p_{\text{2-sided}} = 2 \times p_{\text{1-sided}} = 2 \times \Pr(Z > z_{\text{stat}}) = 2 \times \Pr(Z > 1.67) = 2(0.0478) = 0.0956$
   - Our p-value is greater than α, so we fail to reject the null hypothesis.
   - There is no evidence to support the claim that mean dose of lithium carbonate is significantly different from 1.3.
   - Therefore, the sample mean is not significantly higher than that of a well-maintained patient population.

4. (9.12, p. 193) Let X represent gestational length such that $X \sim N(39, 2)$. Suppose $\alpha = 0.05$. Based on information from Problem 9.11, we have $\sigma = 2$, $n = 22$, and $\mu_0 = 39$, where the hypotheses would be set up as

$$H_0 : \mu = 39$$

$$H_a : \mu \neq 39$$

Now, if the true mean gestational length for African American women is actually 38.5, then we have $\mu_a = 38.5$. We may now find the power of this test by plugging these pieces into our formula.

$$
\begin{aligned}
1-\beta &= \Phi\left(-z_{1-\frac{\alpha}{2}} + \frac{|\mu_0-\mu_a|\sqrt{n}}{\sigma}\right)\\
&= \Phi\left(-z_{1-\frac{0.05}{2}} + \frac{|39-38.5|\sqrt{22}}{2}\right)\\
&= \Phi\left(-z_{0.975} + \frac{|0.5|\sqrt{22}}{2}\right)\\
&= \Phi\left(-1.96 + \frac{2.3452}{2}\right)\\
&= \Phi\left(-0.7874\right) \approx \Phi\left(-0.79\right)\\
&= \Pr(Z \leq -0.79)\\
&= 0.2148 \quad \text{(from Table B)}
\end{aligned}
$$

Therefore, the power of this test is 0.2148. If the mean gestational length for African American women is truly $\mu_a = 38.5$, then we only have 0.2148 power to reject H_0.

5. (9.16, p. 194)

   - We will test the hypothesis $H_0 : \mu = 175$ against the two-sided alternative hypothesis $H_A : \mu \neq 175$.
   - We set our significance level at $\alpha = 0.05$ and calculate the following:
   - $z_{\text{stat}} = \dfrac{\bar{x}-\mu}{\sigma/\sqrt{n}} = \dfrac{195-175}{50/\sqrt{39}} = 2.4980$
   - $p_{\text{2-sided}} = 2 \cdot p_{\text{1-sided}} = 2 \cdot \Pr(Z > z_{\text{stat}}) = 2 \cdot \Pr(Z > 2.4980) = 2(0.0062) = 0.0124$
   - Our p-value is less than α, therefore we reject the null hypothesis.
   - We have sufficient evidence to conclude that among boys whose fathers had a heart attack, the mean fasting cholesterol level is significantly different that 175.
   - Furthermore, since our z_{stat} is positive, we may say that this mean fasting cholesterol level is significantly higher than 175.

6. (10.2, p. 203)

   a) The margin of error of this estimate for exact 95% confidence is
   $m = z_{1-\frac{\alpha}{2}}(SE_{\bar{x}}) = 1.96(0.22) = 0.4312$.
   (The approximate margin of error would be $m \approx 2(SE_{\bar{x}}) = 2(0.22) = 0.44$)

   b) 95% CI for μ: $\bar{x} \pm m = \bar{x} \pm z_{1-\frac{\alpha}{2}}(SE_{\bar{x}}) = 6.1 \pm 0.4312 = (5.67, 6.53)$ pounds.

   c) It means that 95% of 'like intervals' will capture μ and 5% will not. Or, 95 out of 100 confidence intervals created in this manner will capture μ.

d) We use the formula for $SE_{\bar{x}}$ to calculate the population standard deviation:

$$SE_{\bar{x}} = \frac{\sigma}{\sqrt{n}} \quad \Rightarrow \quad \sigma = SE_{\bar{x}}(\sqrt{n}) = 0.22(\sqrt{81}) = 1.98 \text{ pounds}$$

7. (10.4, p. 203) We are given $\sigma = 2$ lbs. For 99% confidence intervals, we have $\alpha = 0.01$ so $z_{1-\frac{\alpha}{2}} = z_{1-\frac{0.01}{2}} = z_{1-0.005} = z_{0.995} = 2.576$.

   a) 99% CI: $\bar{x} \pm z_{1-\frac{\alpha}{2}}\left(\frac{\sigma}{\sqrt{n}}\right) = 6.1 \pm 2.576\left(\frac{2}{\sqrt{81}}\right) = 6.1 \pm 0.5724 = (5.5276, 6.6724)$. With 99% confidence, we can say that the mean birth weight for babies in this population is between 5.53 and 6.67 pounds.

   b) 99% CI: $\bar{x} \pm z_{1-\frac{\alpha}{2}}\left(\frac{\sigma}{\sqrt{n}}\right) = 7.0 \pm 2.576\left(\frac{2}{\sqrt{36}}\right) = 7.0 \pm 0.8587 = (6.1413, 7.8587)$. With 99% confidence, we can say that the mean birth weight for babies in this population is between 6.14 and 7.86 pounds.

   c) 99% CI: $\bar{x} \pm z_{1-\frac{\alpha}{2}}\left(\frac{\sigma}{\sqrt{n}}\right) = 5.8 \pm 2.576\left(\frac{2}{\sqrt{9}}\right) = 5.8 \pm 1.7173 = (4.0827, 7.5173)$. With 99% confidence, we can say that the mean birth weight for babies in this population is between 4.08 and 7.52 pounds.

8. (10.8, p. 205) We will assume $\sigma = 100$ g in the community and $\alpha = 0.01$.

   a) $n = \left(z_{1-\frac{\alpha}{2}} \cdot \frac{\sigma}{m}\right)^2 = \left(z_{0.995} \cdot \frac{100}{10}\right)^2 = (2.576 \cdot 10)^2 = 663.58 \;\rightarrow\; n = 664$

   b) $n = \left(z_{1-\frac{\alpha}{2}} \cdot \frac{\sigma}{m}\right)^2 = \left(z_{0.995} \cdot \frac{100}{25}\right)^2 = (2.576 \cdot 4)^2 = 106.17 \;\rightarrow\; n = 107$

9. (10.12, p. 207) Yes, the sample mean is significantly different than 7.2 pounds at $\alpha = 0.05$ because the 95% confidence interval excludes that value.

   That is, the sample mean weight of infants born to mothers who smoke is significantly different than the average birthweight of 7.2 pounds at $\alpha = 0.05$. From this information we can tell that infants of mothers who smoke tend to have lower birthweight than average.

10. (10.14, p. 208)

    a) False – the confidence interval is centered on $\bar{x}$ so 100% of the confidence intervals will capture $\bar{x}$.

    b) False – 5% of the 95% confidence intervals will fail to capture μ.

    c) True