6. $H_0: \mu = 40$ v. $H_a: \mu \neq 40$, where μ is the true average burn-out amperage for this type of fuse. The alternative refletts the fact that a departure from $\mu = 40$ in either direction is of concern. A type I error would say that one of the two concerns exists (either $\mu < 40$ or $\mu > 40$) when, in fact the fuses are perfectly compliant. A type II error would be to fail to detach either of these concerns when one exists.

7. A type I error here involves saying that the plant is not in compliance when in fact it is. A type II error occurs when we conclude that the plant is in compliance when in fact it isn't. Reasonable people may disagree as to which of the two errors is more serious. If in your judgement it is the type II error, then the reformulation $H_0: \mu = 150$ v. $H_a: \mu < 150$ makes the type I error more serious.

18. a. (72.3-75)/1.8 = -1.5, so 72.3 is 1.5 SD's (of $\bar{X}$) below 75.

b. H_0 is rejected if $z \le -2.33$; since $z = -1.5$ is not ≤ -2.33, don't reject H_0.

c. α = area under standard normal curve blow $-2.88 = \Phi(-2.88) = 0.002$.

d. $\Phi(-2.88+\{75-70\}/\{9/5\}) = \Phi(-0.1) = 0.4602$, so $\beta(70) = 0.5398$.

e. $n = [9(2.88+2.33)/(75-70)]^2 = 87.95 \nearrow 88$.

f. Zero. By definition, a type-I error can only occur when H_0 is true, but $\mu = 76$ means that H_0 is actually false.

19. a. Reject H_0 if either $z \ge 2.58$ or $z \le -2.58$; $\frac{\sigma}{\sqrt{n}} = 0.3$, so $z = \frac{94.32-95}{0.3} = -2.27$. Since -2.27 is not in the rejection region, don't reject H_0.

b. $\beta(94) = \Phi(2.58 + \frac{1}{0.3}) - \Phi(-2.58 + \frac{1}{0.3}) = \Phi(5.91) - \Phi(.75) = .2266$

c. $n = \left(\frac{1.20(2.58 + 2.90)}{95-94}\right)^2 = \left(\frac{1.20(2.58+1.28)}{95-94}\right)^2 = 21.46$

so we use $n = 22$.

10.

a. H_0: $\mu = 1300$ v. H_a: $\mu > 1300$.

b. $\bar{X}$ is normally distributed with mean $E(\bar{X}) = \mu$ and standard deviation $\frac{\sigma}{\sqrt{n}} = \frac{60}{\sqrt{20}} = 13.416$.

When H_0 is true, $E(\bar{X}) = 1300$.

Thus $\alpha = P(\bar{X} \geq 1331.26$ when H_0 is true$) = P\left(Z \geq \frac{1331.26-1300}{13.416}\right) = P(Z \geq 2.33) = .01$.

c. When $\mu = 1350$, $\bar{X}$ has a normal distribution with mean 1350 and standard deviation 13.416, so $\beta(1350) = P(\bar{X} < 1331.26$ when $\mu = 1350) = P\left(Z \leq \frac{1331.26-1350}{13.416}\right) = P(Z \leq -1.40) = .0808$.

d. Replace 1331.26 by c, where c satisfies $\frac{c-1300}{13.416} = 1.645$ (since $P(Z \geq 1.645) = .05$). Thus c = 1322.07. Increasing α gives a decrease in β; now $\beta(1350) = P(Z \leq -2.08) = .0188$.

e. $\bar{x} \geq 1331.26$ iff $z \geq \frac{1331.26-1300}{13.416}$ iff $z \geq 2.33$.