9.1 a. popsd({x}) $\approx$ samplesd({x})

$$= \sqrt{\frac{\sum_{i=0}^{n}(x_n - M)^2}{n-1}}, \quad M = 19.9$$

$$= 3.51 \qquad \frac{\text{popsd}(x)}{\sqrt{k}} = \boxed{1.11}$$

68% CI: $\text{mean} \pm \frac{\text{popsd}(x)}{\sqrt{k}} = \boxed{(18.8, 21.0)}$

b. 99% CI: $\text{mean} \pm \frac{3 \cdot \text{popsd}(x)}{\sqrt{k}} = \boxed{(16.6, 23.2)}$

9.2a. popsd({x}) $\approx$ samplesd({x}) = 75, k = 40

popmean({x}) $\approx$ mean({x}) = 340

a. 68% CI: $\text{mean} \pm \frac{\text{popsd}(x)}{\sqrt{k}} = (328.1, 351.8)$

b. 99% CI: $\text{mean} \pm \frac{3\,\text{popsd}(x)}{\sqrt{k}} = (304.42, 375.6)$

9.3 samplemean({x}) = 19.9

$$g = \frac{(M - M_0)}{s} = \frac{5.1}{1.1} = 4.64$$

$$p = 1 - \int_{-4.64}^{4.64} \frac{1}{\sqrt{2\pi}} \exp\frac{-x^2}{2}\,dx = .0000035$$

P is exceptionally small, so I would reject the null hypothesis that popmean({x}) = 25

9.4 $g = \frac{\mu - \mu_0}{s} = \frac{10-7}{\frac{1}{\sqrt{100}}} = 30$

$$1 - \int_{-30}^{30} \frac{1}{\sqrt{2\pi}} \exp\frac{-x^2}{2}\, dx \approx 0$$

Exceptionally small p-value, so I would reject the null hypothesis that popmean({X}) = 10

9.5 ~~[illegible]~~ Let D = popmean({fatty}) − popmean({lean})

h_0: ~~[illegible]~~ D=0

$$\text{popstd}(\{D\}) = \sqrt{\text{popstd}(\{\text{fatty}\})^2 + \text{popmean}\{(\text{lean}\})^2}$$

$$\text{standard error}(\{D\}) = \sqrt{\left(\frac{\text{popstd}(\{\text{fatty}\})}{\sqrt{20}}\right)^2 + \left(\frac{\text{popstd}(\{\text{lean}\})}{\sqrt{30}}\right)^2}$$

$$= 24.14$$

$$g = \frac{\mu_0 - \mu}{s} = \frac{500}{24.14} = 20.7$$

$$1 - \int_{-20.7}^{20.7} \frac{1}{\sqrt{2\pi}} \exp\frac{-x^2}{2}\, dx \approx 0$$

P is extremely small, would definitely reject the null hypothesis that the populations have the same weight.

4.6 Let D = difference between male & female weights

$h_0: E[D] = 0$

$$\text{stderror}(\{D\}) = \sqrt{\left(\frac{\text{popsd}(\{\text{male}\})}{\sqrt{30}}\right)^2 + \left(\frac{\text{popsd}(\{\text{female}\})}{\sqrt{35}}\right)^2}$$

$$= 23$$

$$g = \frac{M - M_0}{S} = \frac{100}{23} = 4.36$$

$$p = 1 - \int_{-4.36}^{4.36} \frac{1}{\sqrt{2\pi}} \exp\frac{-x^2}{2}\, dx = .000013$$

p is very low, so I would reject the null hypothesis that the population means are the same.

4.8. sample p(male) = $\frac{983}{2009}$ = .489, h_0: pop p(male) = .5

$$\text{sample sd} = \sqrt{\frac{\sum_{i=0}^{n}(x_n - p)^2}{n-1}} = \sqrt{\frac{983(.511)^2 + 1026(.489)^2}{2008}}$$

$$= .5$$

$$\text{stderror} = \frac{.5}{\sqrt{2009}} = .0112$$

$$g = \frac{M - M_0}{S} = \frac{.011}{.0112} = .986$$

$$p = 1 - \int_{-.986}^{.986} \frac{1}{\sqrt{2\pi}} \exp\frac{-x^2}{2}\, dx = .324$$

P is fairly large, so I would fail to reject the null hypothesis based on this sample