9.1

$\mu_X = 4.1$ $\mu_Y = 4.5$ $\sigma_X = 1.8$

$n_X = 100$ $n_Y = 100$ $\sigma_Y = 2.0$

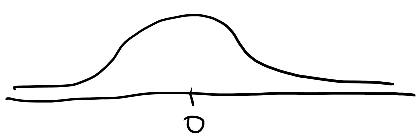
a) $E(\bar{X} - \bar{Y}) = 4.1 - 4.5 = \underline{-0.4}$ hr

It doesn't depend on the sample size

b) $V(\bar{X} - \bar{Y}) = \frac{1.8^2}{100} + \frac{2.0^2}{100} = \underline{0.0724}$ hr^2

$\sigma_{\bar{X}-\bar{Y}} = \sqrt{0.0724} = \underline{0.2691}$ hr

c)



approximate normal distribution due to CLT.

If sample size = 10, CLT doesn't apply, the shape would not be the same

9.3 $H_0: \mu_1 - \mu_2 = 5000$, $H_a: \mu_1 - \mu_2 > 5000$, $\alpha = 0.01$

$m = 45$, $\bar{x} = 42500$, $s_1 = 2200$

$n = 45$, $\bar{y} = 36800$, $s_2 = 1500$

$$z = \frac{42500 - 36800 - 5000}{\sqrt{\frac{2200^2}{45} + \frac{1500^2}{45}}} = 1.7635$$

$z_\alpha = 2.33$

$1.76 < 2.33$

$z < z_\alpha$ not enough evidence to reject H_0

9.19 $\alpha = 0.01$, $H_0: \mu_1 - \mu_2 = -10$, $H_a: \mu_1 - \mu_2 < -10$

$m = 6$, $\bar{x} = 115.7$, $s_1 = 5.03$

$n = 6$ $\bar{y} = 129.3$, $s_2 = 5.38$

$$t = \frac{115.7 - 129.3 + 10}{\sqrt{\frac{5.03^2}{6} + \frac{5.38^2}{6}}} = -1.197$$

$$df = \frac{\left(\frac{5.03^2}{6} + \frac{5.38^2}{6}\right)^2}{\frac{\left(\frac{5.03^2}{6}\right)^2}{5} + \frac{\left(\frac{5.38^2}{6}\right)^2}{5}}$$

$= 9.96 \approx 9$.

$t_{0.005, 9} = 3.250$

$-1.197 > -3.250$.

$t > -t_{\alpha/2, \nu}$, not enough evidence to reject H_0

9.25

$m=28 \quad \bar{x}=91.5 \quad s_1=5.5 \qquad CL=90\% \quad \alpha=0.1$

$n=31 \quad \bar{y}=88.3 \quad s_2=7.8$

$$df = \frac{\left(\frac{5.5^2}{28}+\frac{7.8^2}{31}\right)^2}{\frac{\left(\frac{5.5^2}{28}\right)^2}{27}+\frac{\left(\frac{7.8^2}{31}\right)^2}{30}} = 53.95 = 53$$

$t_{0.05,53} = 1.67$

$\bar{x}-\bar{y} = 3.2. \qquad \sqrt{\frac{s_1^2}{m}+\frac{s_2^2}{n}} = 1.74$

$CI = 3.2 \pm 1.67 \cdot 1.74$

$= (0.28, 6.11)$

Since the interval doesn't contain 0, it suggests they cannot be the same.

$\alpha=0.05$

$t_{0.025,53} = 2.01$

$CI = 3.2 \pm 2.01 \cdot 1.74$

$= (-0.31, 6.71)$

. Since the interval contain 0, it suggests that they can be the same.

9.34 b) c)

$$T = \frac{(\bar{X}-\bar{Y}) - (\mu_1 - \mu_2)}{s_p\sqrt{\frac{1}{m}+\frac{1}{n}}}$$

b) X 14, 14.3, 12.2, 15.1

Y 12.1, 13.6, 11.9, 11.2.

$df = 6$

$\bar{X} = 13.9$ $S_1 = 1.22$ $m = 4$

$\bar{Y} = 12.2$ $S_2 = 1.01$ $n = 4$

$\bar{X} - \bar{Y} = 1.7$

$$s_p = \sqrt{\frac{3}{6}\cdot 1.22^2 + \frac{3}{6}\cdot 1.01^2}$$

$= 1.12$

$\alpha = 0.05$, $t_{0.025, 6} = 2.447$

$CI = 1.7 \pm 2.447 \cdot 1.12 \cdot \sqrt{\frac{1}{2}}$

$= 1.7 \pm 1.94$

$= (-0.24, 3.64)$

c) $$df = \frac{\left(\frac{1.22^2}{4} + \frac{1.01^2}{4}\right)^2}{\frac{(1.22^2/4)^2}{3} + \frac{(1.01^2/4)^2}{3}} = 5.79 = 5$$, $t_{0.025, 5} = 2.571$

$CI = 1.7 \pm 2.571 \cdot \sqrt{\frac{1.22^2}{4} + \frac{1.01^2}{4}}$

$= 1.7 \pm 2.04$

$= (-0.34, 3.74)$

This interval spreads wider that the one calculated in b).

Both intervals contains zero

9.40 (a, c)

a) $D = P - L$.

$\Delta_0 = 25$. $\alpha = 0.05$.

$\bar{d} = 105.7$

$s_D = 103.85$

$H_0: \mu_D = 25$ $H_a: \mu_D > 25$. $t_{9, 0.05} = 1.833$

$$t = \frac{105.7 - 25}{103.85/\sqrt{10}} = 2.46 > 1.833$$

$t > t_{\alpha, \nu}$ reject H_0.

c) $\bar{x} = 2214.8$ $s_1 = 396.73$ $m = 10$

$\bar{y} = 2320.5$ $s_2 = 406.14$ $n = 10$

$$df = \frac{\left(\frac{396.73^2}{10} + \frac{406.14^2}{10}\right)^2}{\frac{(396.73^2/10)^2}{9} + \frac{(406.14^2/10)^2}{9}} = 17.9 = 17$$

$\bar{y} - \bar{x} = 105.7$, $\sqrt{\frac{s_1^2}{m} + \frac{s_2^2}{n}} = 179.54$

$$t = \frac{105.7 - 25}{179.54} = 0.45.$$ $t_{0.025, 17} = 2.11$

$H_0: \mu = 25$ $H_a: \mu > 25$

$0.45 < 2.11$

$t < t_{\alpha/2, 17}$ not enough evidence to reject H_0.

It is not the same conclusion as the one in a).