1. $H_0 : \mu = 200$

$H_1 : \mu < 200$

$n = 8$

$$\bar{x} = \frac{1}{8}(210 + 198 + 195 + 202 + 197.4 + 196 + 199 + 195.5)$$

$$\Rightarrow \bar{x} = 199.1125$$

$$s^2 = \frac{1}{8-1}\{(210 - 199.1125)^2 + (198 - 199.1125)^2 + (195 - 199.1125)^2$$

$$+ (202 - 199.1125)^2 + (197.4 - 199.1125)^2 + (196 - 199.1125)^2$$

$$+ (199 - 199.1125)^2 + (195.5 - 199.1125)^2\}$$

$$= 24.386$$

$$\therefore s = 9.94$$

$$T_{obs} = \frac{\bar{x} - \mu}{s/\sqrt{n}} = \frac{199.1125 - 200}{9.96/\sqrt{8}}$$

$$= -.508$$

$T_{.05,7} = -1.895$

$T_{obs} > T_{.05,7}$

So, null accepted, T_{obs} has not fallen in the critical region $(-\alpha, -1.895)$. So, we can't conclude that the mean breaking strength of the fiber is less than the target.

2. $H_0 : \sigma^2 = .16$

$H_1 : \sigma^2 < .16$

$\bar{x} = 5.24$

$n = 10$

$$s^2 = \frac{1}{10-1}\{(5.28-5.24)^2 + (5.31-5.24)^2 + (5.22-5.24)^2 + (5.19-5.24)^2 + (5.27-5.24)^2 + (5.24-5.24)^2 + (5.18-5.24)^2 + (5.26-5.24)^2 + (5.23-5.24)^2 + (5.22-5.24)^2\}$$

$= .00164$

$$\chi^2 = \frac{(n-1)s^2}{\sigma^2}$$

$$= \frac{9 \times .00164}{.16}$$

$$\chi^2_{obs} = .09225$$

for $(\alpha = .10)$

$$\chi^2_{.90,9} = 4.168$$

$$\chi^2_{obs} < \chi^2_{.90,9}$$

So, null rejected. the new method be adopted.

3. $H_0 : \mu_1 = \mu_2$ $\quad \mu_1 \longrightarrow$ mean of female bats

$H_1 : \mu_1 > \mu_2$ $\quad \mu_2 \longrightarrow$ mean of male bats

$n = 12$

$m = 10$

$\mu_1 = 180$

$S_1 = 92$

$\mu_2 = 136$

$S_2 = 86$

$$S_p^2 = \frac{(n-1)S_1^2 + (m-1)S_2^2}{n+m-2}$$

$$= \frac{11 \times 92^2 + 9 \times 86^2}{12+10-2}$$

$$= 7983.4$$

$\Rightarrow S_p = 89.35$

$$T = \frac{\mu_1 - \mu_2}{S_p\sqrt{\frac{1}{n} + \frac{1}{m}}}$$

$$\Rightarrow T = \frac{180 - 136}{89.35\sqrt{\frac{1}{12} + \frac{1}{10}}}$$

$$\Rightarrow T_{obs} = 1.15$$

$$T_{.05,20} = 1.725$$

$$T_{obs} < T_{.05,20}$$

Null accepted. T_{obs} isn't fallen in the critical region $(1.725, \alpha)$. Female bats between feedings is more than that of male bats.

4.

x	y	$x-\bar{x}$	$y-\bar{y}$	$(x-\bar{x})^2$	$(x-\bar{x})(y-\bar{y})$
10	5	-10	-5	100	50
15	7	-5	-3	25	15
20	11	0	1	0	0
25	12	5	2	25	10
30	15	10	5	100	50

$\bar{x} = 20 \quad \bar{y} = 10$

$$\hat{\beta} = \frac{\Sigma (x-\bar{x})(y-\bar{y})}{\Sigma (x-\bar{x})^2}$$

$$= \frac{125}{250} = .5$$

$$\bar{Y} = \hat{\alpha} + \hat{\beta}\bar{x}$$

$$\Rightarrow 10 = \hat{\alpha} + .5 \times 20$$

$$\Rightarrow \hat{\alpha} = 0$$

a) $\bar{Y} = 0 + .5 \times$ missing rivets.

b) $SS_e = \sum (Y_i - \alpha - \beta x_i)^2$

$\therefore SS_e = (5 - .5 \times 10)^2 + (7 - .5 \times 15)^2 + (11 - .5 \times 20)^2$

$(12 - .5 \times 25)^2 + (15 - .5 \times 30)^2$

$= 1.5$

$\therefore$ Error Variance $= \frac{SS_e}{n-2} = \frac{1.5}{5-2}$

$= .5$