1) $D = 10000$

$k = \$20$

$C = \$4.40$

$h = 0.20(4.40)$

a) $EOQ = \sqrt{\frac{2kD}{h}} = \sqrt{\frac{2(20)10000}{.2(4.40)}} = 674.19$ $N = \frac{D}{Q^*} = \frac{10000}{674.19} = 14.8$

$TC = \frac{D}{Q^*}k + \frac{hQ^*}{2} + Dc = 44\,593$

b) $Q \leq 400$

$401 \leq Q \leq 800$

$800 < Q$

$$C(Q)\begin{cases} 4.40(Q) \\ 4.40(400) + 4.20(Q-400) = 80 + 4.2Q \\ 4.40(400) + 4.20(400) + 4.0(Q-800) = 320 + 4Q \end{cases}$$

$$\frac{C(Q)}{Q} = \begin{cases} 4.40 & Q \leq 400 \\ 4.2 + 80/Q & 401 \leq Q \leq 800 \\ 4 + 320/Q & 800 < Q \end{cases}$$

$$G(Q) = \frac{D \cdot C(Q)}{Q} + \frac{K \cdot D}{Q} + I[C(Q)/Q]\frac{Q}{2}$$

$$G_0(Q) = 10000(4.40) + \frac{20(10000)}{Q} + 0.20(4.40)\frac{Q}{2}$$

$$Q^{(0)} = \sqrt{\frac{2KD}{Ic_0}} = \sqrt{\frac{2(20)10000}{0.20(4.40)}} = 674.19$$

$$G_1(Q) = 10000\left(4.2 + \frac{80}{Q}\right) + \frac{20(10000)}{Q} + 0.20\left(4.20 + \frac{80}{Q}\right)\frac{Q}{2}$$

$$= 10000(4.2) + \frac{100(10000)}{Q} + 0.20(4.20)\frac{Q}{2} + \frac{0.20(80)}{2}$$

$$Q^{(1)} = \sqrt{\frac{2(100)10000}{0.20(4.20)}} = 1543.03$$

$$G_2(Q) = 10000\left(4 + \frac{320}{Q}\right) + \frac{20(10000)}{Q} + 0.20\left(4 + \frac{320}{Q}\right)\frac{Q}{2}$$

$$= 10000(4) + \frac{340(10000)}{Q} + 0.20(4)\frac{Q}{2} + \frac{0.20(320)}{2}$$

$$Q^{(2)} = \sqrt{\frac{2(340)10000}{0.20\,(4)}} = 2915.48$$

$\Rightarrow Q^{(2)}$ falls in the correct interval

$$G_2(Q^{(2)}) = 42.36440$$

(2)

	D	p
1- men's casual	60×52	14
2 men's formal	20×52	18
3- Women's casual	100×52	16
4- Women's formal	30×52	20
5 childrens	80×52	15

$K = \$100$

$h = v \cdot r = 0.2(v)$

capacity 400

$$EOQ_1 = \sqrt{\frac{100(2)\,60\times52}{0.2(14)}} = 472 \quad \Rightarrow \quad Q_1 = m \cdot EOQ_1 = 90.4$$

$EOQ_2 = \quad = 240.3 \qquad Q_2 = 46.02$

$EOQ_3 = \quad = 570.1 \qquad Q_3 = 109.1$

$EOQ_4 = \quad = 279.3 \qquad Q_4 = 53.5$

$EOQ_5 = \quad = 526.7 \qquad Q_5 = 100.9$

$ \; 2088.3$

$$m = \frac{400}{\Sigma EOQ_i} = \frac{400}{2088.3} = 0.19$$

but we cannot use Q_i's because $\frac{1}{h_i}$ are not equal !

$$Q_i^* = \sqrt{\frac{2 \cdot K_i \cdot D_i}{h_i + 2\theta w_i}}$$ where $w_i = 1$ must be used

use $Q_1 = 90$ to determine θ

$$\theta_1 = \frac{1}{2}\left(\frac{2 \cdot K_1 D_1}{Q_1^2} - h_1\right) = \frac{1}{2}\left(\frac{2 \cdot 100 \cdot 60 \cdot 52}{90^2} - 0.2(14)\right) = 37.11$$

$$\theta_2 = \frac{1}{2}\left(2\frac{K_2 D_2}{Q_2^2} - h_2\right) = 47.3$$

$\theta_3 = \quad = 42.2$

$\theta_4 = \quad = 51.5$

$\theta_5 = \quad = 39.2$

$37.11 < \theta < 51.5$

$\Rightarrow \theta = 40 \qquad Q_1 = 86.8 \qquad Q_2 = 49.9 \qquad Q_3 = 111.8 \qquad Q_4 = 60.9 \quad Q_5 = 100.1$

$\Sigma w_i Q_i = 409.56$

$\theta = 42 \qquad Q_1 = 84.7 \quad Q_2 = 48.7 \quad Q_3 = 109.2 \quad Q_4 = 59.5 \quad Q_5 = 97.8$

$\Sigma = 400$

③ $D_1 = 26000$ /yr
$D_2 = 42000$
$D_3 = 15000$
$D_4 = 23000$

Production rates — setup times — h'

2500 × 250 cases/yr — 6 hr
3000 × 250 — 4
1700 × 250 — 8
1600 × 250 — 4

setup cost \$200/hr
i = 21 %

250 × 8 hrs/yr
cost = \$.30/case

$$T^* = \sqrt{\frac{2\sum_{J=1}^{4} K_J}{\sum_{J=1}^{4} h'_J D_J}}$$

$$h'_J = h_J\left(1 - \frac{D_J}{P_J}\right)$$

$$h'_1 = .30(.21)\left(1 - \frac{26000}{2500 \times 250}\right) = 0.06$$
$h'_2 = 0.0594$
$h'_3 = 0.0607$
$h'_4 = 0.0594$

$$T^* = \sqrt{\frac{2(6+4+8+4)200}{\sum_{J=1}^{4} h'_J D_J}} = \underline{1.18 \text{ yr}}$$

$$T_{min} = \frac{\sum S_J}{1 - \sum \frac{D_J}{P_J}} = \frac{\frac{6+4+8+4}{250 \times 8}}{1 - 0.19} = 0.013$$

$T^* > T_{min}$ ✓

Lot size

$LS_i = T^* D_i$

$LS_1 = 1.18(26000) = 30680$
$LS_2 = 1.18(42000) = 49560$
$LS_3 = 1.18(15000) = 17700$
$LS_4 = 1.18(23000) = 27140$

$$GT = \sum_{J=1}^{4}\left(\frac{K_J}{T} + \frac{h'_J D_J T}{2}\right) = \frac{6 \times 200}{1.18} + \frac{0.06(26000)1.18}{2}$$
$$+ \cdots + \frac{4 \times 200}{1.18} + \frac{0.0594(23000)(1.18)}{2}$$

$= \underline{7464.39}$