$k = \$40 \quad p = \$25/\text{unit (shortage cost)}$

$\lambda = 30/\text{year} \quad \delta = 6$

$h = 0.12 \times 100 = \$12/\text{unit/year}$

a) $Q_0 = \sqrt{\frac{2k\lambda}{h}} = \sqrt{\frac{2(40)30}{12}} = \sqrt{200} = 14.14 \simeq 15$

$1 - F(R_0) = \frac{Q_0 h}{p\lambda} = \frac{15(12)}{25(30)} = 0.24$

$z$ value with right tail of .06 is 0.71

Annual demand $N(30, 6)$

Lead time $= 1$ month

Demand during lead time $\sim N\left(\frac{30}{12}, \frac{6}{12}\right) = N(2.5, 13)$

Solving $R = s_2 + \mu$ gives $R = 2.5 + 0.071\sqrt{3} = 3.73 \simeq 4$

$L(z) = 0.1405, \quad n(R) = 6 L(z) = \sqrt{3}(0.1405) = 0.2434$

Find $Q_1 = \sqrt{\frac{2\lambda[e^{h}(R) + p\lambda(R)]}{h}} = \sqrt{\frac{2(30)[40 + 6.08]}{12}} = 15.18 \simeq 16$

$1 - F(R_1) = \frac{Q_1 h}{p\lambda} = \frac{16(12)}{25(30)} = 0.256$

$z$ value with right tail of .256 is 0.66

Solving $R = s_2 + \mu$ gives $R = 2.5 + 0.66\sqrt{3} = 3.54 \simeq 4$

Since $Q_1$ and $R_1$ are within one unit of $Q_0$ and $R_0$, skip.

$q = 16 \quad R = 4 \quad (nR = 6L(z) = \sqrt{3}(0.1528) = 0.2646$

b) $s = R - \mu = 4 - 2.5 = 1.5 \simeq 2$

c) Holding cost $h[Q/2 + R - \mu] = 12[8 + 4 - 2.5] = $114$

Setup cost $K\lambda/Q = 40 \times 30/16 = $75$

Stock-out penalty cost $p\lambda n(R)/Q = (25)30(0.2646)/16 = $12.40$

Total cost $= $114 + $75 + $12.40 = $201.4$

d) $P\{0 \leq R \leq 3\} = F(R) = 1 - .256 = 0.744, 74.4\%$

e) Expected # of stockouts: $\frac{n(R)}{Q} = \frac{0.2646}{16} = 0.0165, 1.65\%$