1) E[demand] = .1*3 + .1*4 + .4*5 + .2*6 + .1*7 + .1*8 = 5.4 \Rightarrow 540
\text{variance} = \sum (x_i^2 f(x)) - \mu^2 = 18400
\text{std dev} = 135.6

b) C_u = 34
C_o = 15
F(Q) = C_u / (C_u + C_o) = 0.694

<table>
<thead>
<tr>
<th>D</th>
<th>f(q)</th>
<th>F(q)</th>
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<tbody>
<tr>
<td>3</td>
<td>.1</td>
<td>.1</td>
</tr>
<tr>
<td>4</td>
<td>.1</td>
<td>.2</td>
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<tr>
<td>5</td>
<td>.4</td>
<td>.6</td>
</tr>
<tr>
<td>6</td>
<td>.2</td>
<td>.8 &lt;= 600</td>
</tr>
</tbody>
</table>

Expected cost = 15((6-3)*.1 + (6-4)*.1 + (6-5)*.4) + 34((7-6)*.1 + (8-6)*.1)
= 23.7 \Rightarrow $2370 since demand is in hundreds

or use linear interpolation to get exact Q : 547
\Rightarrow Expected cost = 15((547-300)*.1 + (547-400)*.1 + (547-500)*.4) + 34((700-547)*.1 + (800-547)*.1)
= 873 + 1380.3 = 2253.3

c) N \sim (540, 135.6^2)
F(Q) = C_u / (C_u + C_o) = 0.694
z corresponding to F(Q*) = 0.51
Q* = \mu + \sigma z = 540 + 135.6(0.51) = 609.156

Expected Cost = C_o \int_0^Q (Q-x) f(x) dx + C_u \int_0^\infty (x-Q) f(x) dx
= C_o \left( \int_0^Q (Q-x) f(x) dx - \int_0^\infty (Q-x) f(x) dx + \int_Q^\infty (x-Q) f(x) dx \right)
= C_o (Q-\mu) + C_u (\mu - Q) f(x)
= C_o (Q-\mu) + C_u (\mu - Q) f(x)
= C_o ((Q-\mu) + \sigma L(z)) + C_o \sigma L(z) = 15*(609.156-540+ 135.6(.1947)) +
34*135.6*.1947
= 2331.00
For L(z) values look at table A-4 in the back of the book z=0.51
d) if the discrete distribution is the true one, what cost penalty is incurred by approximating with normal distribution?

Since we carry more than the optimum level, we may incur higher cost mainly due to overstocking: 2331-2253 = 78.00

2) 20 - a)

\[ D = 12 \times 52 = 624 \]
\[ \mu = 12 \times 3 = 36 \text{ units per lead time} \]
\[ \sigma = 4 \sqrt{3} = 6.9282 \]
\[ h = 0.2(4) = 0.80 \]
\[ K = 75 \]
\[ P = 25 \]

\[ \text{EOQ} = \sqrt{\frac{2 \times 75 \times 624}{0.8}} = 342 \]

\[ 1 - F(R_0) = \frac{Q_0 h}{pD} = \frac{342 \times 0.8}{25 \times 624} = 0.0174 \]

\[ z = 2.11 \quad L(z) = 0.0063 \quad n(R) = \sigma L(z) = 0.04365 \]

\[ Q_1 = \sqrt{\frac{2D}{h} \left( K + pn(R) \right)} = \sqrt{\frac{2 \times 624(75 + 25 \times 0.04365)}{0.8}} = 345 \]

\[ 1 - F(R_1) = \frac{Q_1 h}{pD} = \frac{345 \times 0.8}{25 \times 624} = 0.0177 \]

\[ z = 2.105 \quad L(z) = 0.0064 \quad n(R) = \sigma L(z) = 0.04365 \]

close enough to stop

\[ R = \mu + z\sigma = (6.9282)(2.105) + 36 = 51 \]

\[ Q = 345 \]

Optimal solution is \((Q, R) = (345, 51)\)

Expected cost:
\[ G(Q, R) = KD/Q + h(Q/2 + R - \mu) + pDn(R)/Q = 135.65 + 150 + 2.005 = 287.66 \]