1. The probability distribution of the time to complete an assembly operation is

\[ f(x) = \begin{cases} 
0.1 & 30 < x < 40 \text{ seconds} \\
0 & \text{o.w.}
\end{cases} \]

a. Determine the proportion of assemblies that requires more than 38 seconds to complete.

\[ P(X > 38) = \int_{38}^{40} 0.1 \, dx = 0.1 \left[ x \right]_{38}^{40} = 0.2 \]

b. What time is exceeded by 90% of assemblies?

\[ P(X > x) = \int_{x}^{40} 0.1 \, dx = 0.1 \left[ x \right]_{x}^{40} = 0.1(40 - x) = 0.9 \Leftrightarrow x = 31 \]

c. Determine the mean and variance of time of assembly.

Continuous Uniform \( a=30 \, b=40 \) so

\[ E(X) = \frac{30 + 40}{2} = 35 \quad \text{and} \quad V(X) = \frac{(40 - 30)^2}{12} = \frac{100}{12} = 8 \frac{1}{3} \]

2. Let \( Z \) be the standard normal random variable.

a. Find \( P(Z > 1.79) = 0.036727 \)

b. Find \( z \) such that \( P(Z < z) = 0.75 \quad z = 0.67 \)

3. Let \( X \) be a normal random variable with \( \mu = 100 \) and \( \sigma = 20 \).

a. Find \( P(X < 85) \)

\[ P(X < 85) = P\left( \frac{X - 100}{20} < \frac{85 - 100}{20} \right) = P(Z < -0.75) = 0.226627 \]

b. Find \( x \) such that \( P(X < x) = 0.75 \)

\[ P(X < x) = 0.75 \Leftrightarrow P\left( \frac{X - 100}{20} < \frac{x - 100}{20} \right) = 0.75 = P\left( Z < \frac{x - 100}{20} \right) \]

\[ \Leftrightarrow \frac{x - 100}{20} = 0.67 \Leftrightarrow x = 113.4 \]