

M3070 – FALL 2003 – Quiz 4

NAME: _____

Problem 1. Yield strength for a certain steel is normally distributed with $\mu = 43$ and $\sigma = 4.5$.

- (a) What is the probability that yield strength is at most 40? Greater than 60?
- (b) What yield strength value separates the strongest 75% from the others?

Solution. Let X denote the strength.

$$\begin{aligned}P(X \leq 40) &= P\left(\frac{X - 43}{4.5} \leq \frac{40 - 43}{4.5}\right) \\&= P(Z \leq -0.67) \\&= \Phi(-0.67) \\&= 1 - \Phi(0.67) \\&= 1 - 0.7486 \\&= 0.2514\end{aligned}$$

As well,

$$\begin{aligned}P(X > 60) &= P\left(\frac{X - 43}{4.5} > \frac{60 - 43}{4.5}\right) \\&= P(Z > 3.78) \\&= 1 - \Phi(3.78) \\&\leq 1 - 0.998 \\&\leq 0.002.\end{aligned}$$

Since $P(X < 40) \approx 0.25$, we have that 40 is the 25th percentile. Hence 75% of the time, X will have a value of at least 40. \square