Example Suppose $X_1, \ldots, X_{50}$ each have mean 1.6, variance 2.2 and $Y_1, \ldots, Y_{150}$ each have mean 3, variance 2.7. Also suppose all two hundred random variables are Normal and independent. Find the probability that the sum of the 200 random variables does not exceed 400.

\[
P(X_1 + \ldots + X_{50} + Y_1 + \ldots + Y_{150} < 400) = \Phi \left( \frac{X_1 + \ldots + X_{50} + Y_1 + \ldots + Y_{150} - (50)(1.6) - (150)(3)}{\sqrt{50(2.2) + 150(2.7)}} \right)
\]

\[
= \Phi \left( \frac{400 - (50)(1.6) - (150)(3)}{\sqrt{50(2.2) + 150(2.7)}} \right)
\]

\[
= \Phi (-0.42) = 1 - \Phi (0.42)
\]

\[
= 1 - F_2 (0.42)
\]

\[
= 1 - 0.6628
\]

\[
= 0.3372
\]