

Example Suppose  $X_1, \dots, X_{50}$  each have mean 1.6, variance 2.2  $\leftarrow 3$   
 and  $Y_1, \dots, Y_{150}$  each have mean 3, variance 2.2  $\leftarrow 2.2$ .

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.

$$\begin{aligned}
 P(X_1 + \dots + X_{50} + Y_1 + \dots + Y_{150} < 400) &= P\left(\frac{X_1 + \dots + X_{50} + Y_1 + \dots + Y_{150} - (50)(1.6) - (150)(3)}{\sqrt{50(2.2) + 150(2.2)}} < \frac{400 - (50)(1.6) - (150)(3)}{\sqrt{50(2.2) + 150(2.2)}}\right) \\
 &= P(Z < -0.42) \\
 &= P(Z > 0.42) \quad \left. \begin{array}{l} \text{by symmetry} \end{array} \right\} \\
 &= 1 - P(Z \leq 0.42) \\
 &= 1 - F_Z(0.42) \\
 &= 1 - 0.6628 \\
 &= 0.3372
 \end{aligned}$$