**November 2001 Course 1 Examination, Problem No. 40, also P Sample Exam
Questions, Problem No. 84, and Dr. Ostaszewski's online exercise posted July 11,
2009**
Let X and Y be the number of hours that a randomly selected person watches movies and
sporting events, respectively, during a three-month period. The following information is
known about X and Y: $E(X) = 50$, $E(Y) = 20$, $\text{Var}(X) = 50$, $\text{Var}(Y) = 30$,
$\text{Cov}(X,Y) = 10$. One hundred people are randomly selected and observed for these three
months. Let T be the total number of hours that these one hundred people watch movies
or sporting events during this three-month period. Approximate the value of
$\Pr(T < 7100)$.

A. 0.62   B. 0.84   C. 0.87   D. 0.92   E. 0.97

Solution.
We have
$$E(X+Y) = E(X) + E(Y) = 50 + 20 = 70,$$
and
$$\text{Var}(X+Y) = \text{Var}(X) + \text{Var}(Y) + 2\text{Cov}(X,Y) = 50 + 30 + 20 = 100.$$
for a randomly selected person. It follows from the Central Limit Theorem that T is
approximately normal with mean $E(T) = 100 \cdot 70 = 7000$ and variance
$$\text{Var}(T) = 100 \cdot 100 = 100^2.$$
Therefore, denoting a standard normal random variable by Z,
$$\Pr(T < 7100) = \Pr\left(\frac{T - 7000}{100} < \frac{7100 - 7000}{100}\right) \approx \Pr(Z < 1) = 0.8413.$$
Answer B.