Quiz 7

STAT 381, Applied Statistical Methods I, Spring 2015

Name:

Problem 1. (5 points) At an order fulfillment center it takes on average 5 minutes to complete an order with a standard deviation of 2 minutes. 65 orders have to be completed, what is the probability it will take less than 5 hours?

$S_{65} \sim N(325, 65 \cdot 2^2)$

16.125^2 $\quad z = \frac{300-325}{16.125}$

$P(S_{65} < 300) = P(Z < -1.55) = .0606$

Problem 2. (5 points) Two independent random samples of sizes 33 and 45 are drawn from a population with $\mu = 7$ and $\sigma = 3$. What is the probability that the absolute difference of sample means is greater than 1, i.e. what is $P(|\bar{X}_1 - \bar{X}_2| > 1)$?

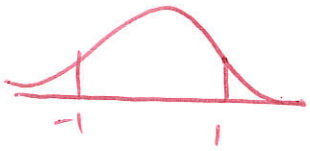
$\bar{X}_1 - \bar{X}_2 \sim N\left(\mu_1 - \mu_2, \frac{\sigma_1^2}{n_1} + \frac{\sigma_1^2}{n_2}\right)$

$= N\left(0, \frac{9}{33} + \frac{9}{45}\right) = N(0, .688^2)$ $\quad z = \frac{-1-0}{.688} = -1.45$

$P(|\bar{X}_1 - \bar{X}_2| > 1) = 2P(\bar{X}_1 - \bar{X}_2 < -1) = 2P(Z < -1.45)$

$= 2(.0735)$

$= .147$



Bonus (3 points) If X follows a Gamma distribution with $\alpha = 50, \beta = 3$, what precise distribution could we use to approximate X, justified by the Central Limit Theorem?

$E(X) = 50 \cdot 3 = 150$

$Var(X) = 50 \cdot 3^2 = 450$

Since $\alpha > 30$, X can be approximated by $N(\mu = 150, \sigma^2 = 450)$

as X can be thought of

a sum of 50 indep exp(3) random variables.