MATH 10B
Section 205
GSI: Theo McKenzie

Quiz 11

Student:
SID:
Tue 4/16/19

True/False - No explanation needed. (For each: 1 point if correct, 0 points if not answered, -1 points if incorrect)

1. For a geometric random variable, the associated parameter p of success can be estimated by

$$\hat{p} = \frac{1}{\overline{x} + 1}$$

   where $\overline{x}$ is the average of our samples. True/False

   True. We solve for $\hat{p}$ in the equation $\hat{\mu} = \frac{1-\hat{p}}{\hat{p}}$.

2. $E(\overline{X}^2) = \frac{\sigma^2}{n} + \mu^2$. True/False

   True. This is a reformulation of $E(\overline{X}^2) - E(\overline{X})^2 = \text{Var}(\overline{X})$

Problems - Needs justification.

1. The number of pieces of cereal in a box is well described by a normal variable with unknown mean and standard deviation of 50. If you count the number of pieces of cereal in 16 boxes, what is the probability your sample mean is within 20 of the true mean? Write your answer in terms of z-scores.

The sample mean is a normal random variable with mean μ and standard deviation $50/\sqrt{16} = 12.5$. Therefore this probability is

$$\int_{\mu-20}^{\mu+20} \frac{1}{12.5\sqrt{2\pi}} e^{-\frac{(x-\mu)^2}{2(12.5)^2}}$$

by substituting $u = \frac{x-\mu}{12.5}$ we get

$$\frac{1}{\sqrt{2\pi}} \int_{-20/12.5}^{20/12.5} e^{-u^2/2} du = 2z(1.6)$$