Quiz 7.3A AP Statistics Name:

1. The customer care manager at a cell phone company keeps track of how long each help-line caller spends on hold before speaking to a customer service representative. He finds that the distribution of wait times for all callers has a mean of 12 minutes with a standard deviation of 5 minutes. The distribution is moderately skewed to the right. Suppose the manager takes a random sample of 10 callers and calculates their mean wait time, $\bar{x}$.

(a) What is the mean of the sampling distribution of $\bar{x}$?

(b) Is it possible to calculate the standard deviation of $\bar{x}$? If it is, do the calculation. If it isn't, explain why.

(c) Do you know the approximate shape of the sampling distribution of $\bar{x}$? If so, describe the shape and justify your answer. If not, explain why not.

2. The weights of Granny Smith apples from a large orchard are Normally distributed with a mean of 380 gm and a standard deviation of 28 gm.

(a) A single apple is selected at random from this orchard. What is the probability that it weighs more 400 gm?

(b) Three apples are selected at random from this orchard. What is the probability that their mean weight is greater than 400 gm.?

(c) Explain why the probabilities in (a) and (b) are not equal.

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1. (a) $\mu_{\bar{x}} = 12$ minutes (the same as the population mean). (b) Yes. It seems reasonable to assume that the sample of 10 is less than 10% of the entire population calls. $\sigma_{\bar{x}} = \frac{5}{\sqrt{10}} = 1.58$. (c) No. The population distribution is skewed, and $n = 10$, which is not large enough for the central limit theorem to apply.

2. (a) $P(x > 400) = P\left(z > \frac{400 - 380}{28}\right) = P(z > 0.71) = 0.2389$

(b) $P(\bar{x} > 400) = P\left(z > \frac{400 - 380}{\left(\frac{28}{\sqrt{3}}\right)}\right) = P(z > 1.24) = 0.1075$.

(c) he mean weight of a random sample of three apples is less variable than the weight of a single randomly-selected apple, so we are less likely to get a mean weight that is 20 gm above the mean when we take a sample of three apples.