Math 153 - Quiz 10

November 9, 2017

Name key

Score ________

Show all work to receive full credit. Supply explanations when necessary.

1. (6 points) The *geometric mean* of n positive numbers is the nth root of the product of the n numbers. In symbols, the geometric mean of $x_1, x_2, \ldots, x_n$ is given by

$$G = \sqrt[n]{x_1 \cdot x_2 \cdots x_n}.$$

For example, the geometric mean of 5 and 6 is $\sqrt{30} \approx 5.48$, while the geometric mean of 2, 4, and 9 is $\sqrt[3]{72} \approx 4.16$.

(a) Find the geometric mean of the three numbers 2, 3, and 4. Round to the nearest hundredth.

$$\sqrt[3]{2 \cdot 3 \cdot 4} = \sqrt[3]{24} \approx 2.88$$

(b) Two numbers are selected at random with replacement from set $\{2, 3, 4\}$. List all possible two-number samples (there are nine) along with the geometric mean of each sample. Round to the nearest hundredth.

(2,2) -- 2
(2,3) -- 2.45
(2,4) --- 2.83
(3,2) --- 2.45
(3,3) --- 3
(3,4) --- 3.46
(4,2) --- 2.83
(4,3) --- 3.46
(4,4) --- 4

(c) Determine the sampling distribution for the geometric means of the samples. Give your answer in the form of a table.

X	2	2.45	2.83	3	3.46	4
P(x)	1/9	2/9	2/9	1/9	2/9	1/9

(d) Find the mean of the sampling distribution.

$$2\left(\tfrac{1}{9}\right) + 2.45\left(\tfrac{2}{9}\right) + 2.83\left(\tfrac{2}{9}\right) + 3\left(\tfrac{1}{9}\right) + 3.46\left(\tfrac{2}{9}\right) + 4\left(\tfrac{1}{9}\right)$$

$$= \frac{26.48}{9} \approx 2.94$$

(e) Do the sample geometric means target the population geometric mean? Explain.

SINCE $2.94 \neq 2.88$, THE SAMPLE MEANS DO NOT TARGET THE POP. MEAN.

2. (4 points) Employees at a large manufacturing plant worked an average (mean) of 62.2 hours of overtime last year, with a standard deviation of 14.8 hours. Assume the distribution of hours is normally distributed. A simple random sample of 36 employees is obtained.

(a) What is the probability that the mean number of hours of the sample is greater than 64.0?

$$P(\bar{x} > 64) = \text{normalcdf}(64, 999999, 62.2, 14.8/\sqrt{36})$$

$$\approx 0.2328 = 23.28\%$$

(b) If a single employee is selected at random, what is the probability that the employee worked more than 64.0 hours overtime?

$$P(x > 64) = \text{normalcdf}(64, 999999, 62.2, 14.8)$$

$$\approx 0.4516 = 45.16\%$$

(c) How would your answers above be different if the overtime hours were not normally distributed?

(a) WOULD NOT BE ANY DIFFERENT --- $n = 36 \geq 30$

SO THE CENTRAL LIMIT THM APPLIES

AND THE SAMPLING DISTRIBUTION IS NORMAL

(b) SIMPLY COULD NOT BE COMPUTED, UNLESS

WE COULD FIND OUT MORE ABOUT THE

DISTRIBUTION OF OVERTIME HOURS.