Math 153 - Quiz 9
November 6, 2014

Name key

Score _____

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

1. (5 points) You write the population values 1, 2, 3, 4 on slips of paper and put them in a box. Then you randomly choose two slips of paper with replacement.

   (a) List all possible samples along with the mean of each sample.

{1,1} -- 1	{2,1} -- 1.5	{3,1} -- 2	{4,1} -- 2.5
{1,2} -- 1.5	{2,2} -- 2	{3,2} -- 2.5	{4,2} -- 3
{1,3} -- 2	{2,3} -- 2.5	{3,3} -- 3	{4,3} -- 3.5
{1,4} -- 2.5	{2,4} -- 3	{3,4} -- 3.5	{4,4} -- 4

   (b) Determine the probability distribution for your sample means.

$\bar{x}$	1	1.5	2	2.5	3	3.5	4
$P(\bar{x})$	$\frac{1}{16}$	$\frac{2}{16}$	$\frac{3}{16}$	$\frac{4}{16}$	$\frac{3}{16}$	$\frac{2}{16}$	$\frac{1}{16}$

   (c) Find the mean of the sampling distribution.

$$\mu_{\bar{x}} = 1\left(\tfrac{1}{16}\right) + 1.5\left(\tfrac{2}{16}\right) + 2\left(\tfrac{3}{16}\right) + 2.5\left(\tfrac{4}{16}\right) + 3\left(\tfrac{3}{16}\right) + 3.5\left(\tfrac{2}{16}\right) + 4\left(\tfrac{1}{16}\right)$$

$$= 2.5$$

   (d) Find the population mean.

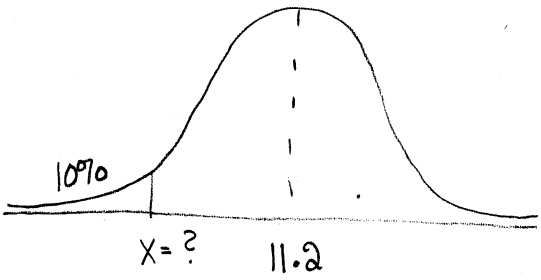
$$\mu = \frac{1+2+3+4}{4} = \frac{10}{4} = 2.5$$

   (e) Compare the population mean and the mean of the sampling distribution.

Amazing! $\mu_{\bar{x}} = \mu$

The sampling mean targets the population mean.

2. (2.5 points) The lengths of time employees have worked at a corporation are normally distributed with mean 11.2 years and standard deviation 2.1 years. In a company cutback, the lowest 10% in seniority are laid off. What is the maximum length of time an employee could have worked and still be laid off?



$X = \text{invNorm}(0.10, 11.2, 2.1) \approx 8.5$ years

3. (2.5 points) A machine is set to fill cans with a mean volume of 500 cm^3 and a standard deviation of 4.3 cm^3. In a random sample of 35 cans, find the probability that the mean volume is greater than 503 cm^3.

NORMAL SAMPLING.

$\mu_{\bar{x}} = 500$

$\sigma_{\bar{x}} = \frac{4.3}{\sqrt{35}}$

$P(\bar{x} > 503) = \text{normalcdf}(503, 99999, 500, 4.3/\sqrt{35})$

$\approx 1.83 \times 10^{-5}$