Name: Key

Quiz 3-B /15

Math 345 Elementary Statistics – Crawford

04 April 2018

Books and notes (in any form) are not allowed. Use may use a calculator, but *show your set-up and work.* Good Luck!

Formulas and syntax that may or may not be helpful

$$\mu = \sum x \cdot P(x) \qquad \mu_{\bar{x}} = \mu \qquad \sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$$

`normalcdf(min, max, mean, st.dev.)` `invNorm(area, mean, st.dev.)`

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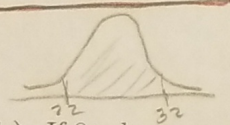
1. (7 pts) Biologists have studied the Chinook Salmon that return from Pacific Ocean to spawn in the Salmon River in the Idaho Sawtooth Mountains. The lengths of the adult salmons are normally distributed with mean of 25.8 inches and a standard deviation of 3.6 inches. [Keep 4 decimal places for answers.]

(a). If 1 salmon is randomly selected, find the probability that its length will be between 22.0 inches and 32.0 inches.

$P(22.0 < X < 32.0)$

$= \text{normalcdf}(22.0, 32.0, 25.8, 3.6)$

$\approx \boxed{0.8119}$



Version A

$P(24.0 < X < 30.0)$

$= \text{normalcdf}(24, 30, 25.8, 3.6)$

$\approx \boxed{0.5698}$

(b). If 8 salmon are randomly selected, find the probability that the mean length will be between 22.0 inches and 32.0 inches.

$n = 8 \Rightarrow \sigma = \frac{3.6}{\sqrt{8}}$

$P(22 < \bar{X} < 32)$

$= \text{normalcdf}(22, 32, 25.8, \frac{3.6}{\sqrt{8}})$

$\approx \boxed{.9986}$

Version A

$n = 10 \Rightarrow \sigma = \frac{3.6}{\sqrt{10}}$

$P(24 < \bar{X} < 30)$

$= \text{normalcdf}(24, 30, 25.8, \frac{3.6}{\sqrt{10}})$

$\approx \boxed{0.9430}$

(c). Why can we use the normal distribution in part (b) even though the sample size does not exceed 30?

Because the population data is normally distributed

lengths of adult salmon

See *

2. (8 pts) Consider the *population* $\{2, 3, 8\}$.

(a). Find the proportion of the *population* that are odd numbers.

$\frac{1}{3}$

Version A
prop. even numbers: $\frac{2}{3}$

(b). If two values are randomly selected with replacement from the population, the first column in the following table gives all possible samples. Find the proportion of each *sample* that are odd numbers and enter your answers in the second column of the table.

Version A

Sample	Sample Proportion of Odd Numbers	Sample Prop of Even Numbers
2, 2	$0/2 = 0$	$2/2 = 1$
2, 3	$1/2$	$1/2$
2, 8	$0/2 = 0$	$2/2 = 1$
3, 2	$1/2$	$1/2$
3, 3	$2/2 = 1$	$0/2 = 0$
3, 8	$1/2$	$1/2$
8, 2	$0/2 = 0$	$2/2 = 1$
8, 3	$1/2$	$1/2$
8, 8	$0/2 = 0$	$2/2 = 1$

(c). Using the table from part (b), complete the probability distribution table for the Sample Proportion of Odd Numbers.

Sample Proportion of Odd Numbers	Probability
0	$4/9$
$1/2$	$4/9$
1	$1/9$

Version A

Sample Prop of Even Numbers	Probability
0	$1/9$
$1/2$	$4/9$
1	$4/9$

(d). Find the mean of the sample proportion distribution.
[i.e., Find the mean of the probability distribution found in part (c). You must show work.]

$\mu_{\hat{p}} = \sum \hat{p} P(\hat{p})$
$= 0(\frac{4}{9}) + (\frac{1}{2})(\frac{4}{9}) + 1(\frac{1}{9})$
$= \frac{1}{3} \approx 0.\overline{3}$

Version A

$\mu_{\hat{p}} = 0(\frac{1}{9}) + \frac{1}{2}(\frac{4}{9}) + 1(\frac{4}{9})$
$= \frac{2}{3} = 0.\overline{6}$

(e). Based on the above results, is the sample proportion an unbiased estimator of the population proportion?
[i.e., Does the sample proportion mean target the population proportion?]

Yes.

The population proportion p from part (a) is the same as the mean of the sample proportions from part (d).