AP Statistics Chapter 7 Review

Name Key Hr___

Free Response:

1. Taxi fares are normally distributed with mean fare of \$22.27 and standard deviation \$2.20.
   a) Which should have the greater probability of falling between \$21 and \$24- the mean of 10 random taxi fares or the amount of a single taxi fare? Why?

   has less variability, so more likely to be close to the true mean

   b) Which should have the greater probability of being greater than \$24- the mean of 10 random taxi fares or the amount of a single taxi fare? Why?

   has more variability, so more likely to be an extreme value

2. Suppose a sample of $n = 50$ Peyton Manning bobbleheads is drawn from a population and the weight, x, of each bobblehead is recorded. Prior experience has shown that the weight has a mean of 6 ounces and standard deviation of 2.5 ounces.

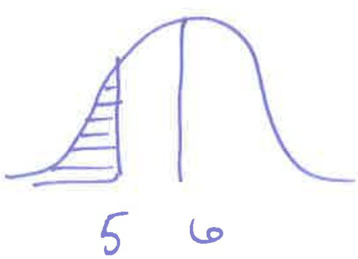
   a) What is the shape of the sampling distribution of $\bar{x}$? Explain.

   Approx. normal b/c $n > 30$

   b) What is the mean and standard deviation of the sampling distribution?

   $\mu_{\bar{x}} = 6 \qquad \sigma_{\bar{x}} = \frac{2.5}{\sqrt{50}} = .3536$

   c) What is the probability that the manufacturer's sample has a mean weight of less than 5 ounces? Does this indicate the manufacturing process may be faulty? Explain.



   $z = \frac{5-6}{.3536} = -2.83$

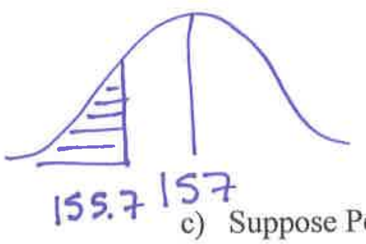
   $\boxed{.0023}$

3. Suppose Pepsi claims that its production process is normally distributed and yields bottles with a mean internal strength of 157 psi (pounds per square inch) and a standard deviation of 3 psi. As part of its vendor surveillance, Pepsi strikes an agreement with the vendor that permits the bottler to sample from the vendor's production to verify the vendor's claim.

   a) Suppose the Pepsi randomly selects a single bottle to sample. What are the mean and standard deviation?

   $\mu = 157 \qquad \sigma = 3$

   b) What is the probability that the psi of the single bottle is 1.3 psi or more below the process mean?

   $$z = \frac{155.7 - 157}{3} = -.43$$

   $\boxed{.3324}$

   c) Suppose Pepsi randomly selected 40 bottles from the last 10,000 produced. What is the mean and standard deviation of the sampling distribution?

   $\mu_{\bar{x}} = 157 \qquad \sigma_{\bar{x}} = \frac{3}{\sqrt{40}} = .4743$

   d) What is the probability that the sample mean of the 40 bottles is 1.3 psi or more below the process mean?

   $$z = \frac{155.7 - 157}{.4743} = -2.74$$

   $\boxed{.0031}$

   e) In order to reduce the standard deviation 50% (by half), how large would the sample size need to be?

   $1.5 = \frac{3}{\sqrt{n}} \qquad \boxed{n = 4}$

4. About 80% of the residents of the United States are right-handed.
   a) In a random sample of 500 residents, what proportions of right-handed residents are reasonably likely (within two standard deviations)?

$\mu_{\hat{p}} = .8$

$\sigma_{\hat{p}} = \sqrt{\frac{.8(.2)}{500}} = .0179$

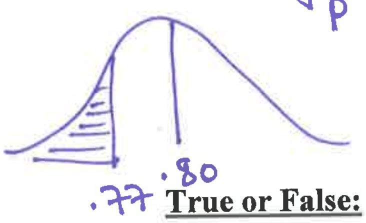
$.8 \pm 2(.0179)$

$= \boxed{(.76, .84)}$

   b) If 1000 residents are selected at random, would it be unusual to find that fewer than 77% of the residents in the sample are right-handed? Explain your reasoning and show your calculations.

$\sigma_{\hat{p}} = \sqrt{\frac{.8(.2)}{1000}} = .0126$

$\boxed{.0086}$ → yes unusual



$z = \frac{.77 - .80}{.0126} = -2.38$

True or False:

Identify whether the statements are **true** or **false**. If false, explain why.

5. The sampling distribution of both proportions and means are always approximately normal.

F

Only when n is sufficiently large

6. When comparing sampling distributions of sample proportions, for any given sample size n, the standard error for $p = .8$ is less than for $p = .5$.

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$\sqrt{.8(.2)} < \sqrt{.5(.5)}$

7. For any given sample size n, the sampling distribution of the sample proportion when $p = .2$ is more skewed than the sampling distribution of the sample proportion when $p = .5$.

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Multiple Choice:

8. Which of the following statements is *not* true? (Only **one** is not true.)

   A. One purpose of creating sampling distributions is to observe how a statistic, such as a sample mean, varies in repeated sampling from the same population.
   B. For purposes of generating a sampling distribution, it doesn't matter much whether you sample with or without replacement as long as the sample size is small compared to the population size.
   C. It is appropriate to use the normal approximation for a sampling distribution of the sample proportion if *n= 80 and p= .05.* $(.80)(.05) < 10$
   D. The spreads of the sampling distributions for sample proportions decrease as the sample size increases for any fixed value of *p,* the population proportion.
   E. If a population proportion *p* is close to 0 or 1, then the sample size must be relatively large to produce an approximately normal sampling distribution for the sample proportion.

9. The distribution of SAT II Math scores is approximately normal with the mean 660 and standard deviation 90. The probability that 100 randomly selected students will have a mean SAT II Math score greater than 670 is approximately

   A. Less than .0001
   B. .1333
   C. 2665
   D. 4558
   E. .5442

$\mu_{\bar{x}} = 660$

$\sigma_{\bar{x}} = \frac{90}{\sqrt{100}} = 9$