

Math 3 Honors Unit Eight Practice Test

Use this scenario for problems 1 & 2. You are on the staff of a member of Congress who is considering a bill that would provide government sponsored insurance for nursing home care. You report that 1128 letters have been received on the issue, of which 871 oppose the legislation.

- 1- Are the people who sent the letters a representative group? Why or Why not?
- 2- Is the sample proportion (871/1128) an underestimate, an overestimate, or is it approximately the same as the actual population proportion? Explain your answer.

Use this scenario for problems 3 & 4. An educator wants to compare the effectiveness of computer software for teaching biology with that of a textbook presentation. She gives a biology pretest to a group of high school juniors, then divides them into two groups. One group uses the computer and the other the text. At the end of the year she will administer a post test.

- 3- Based on the design, what type of study is she conducting? Explain.
- 4- How should randomization be used in the design of her study? Explain.

Use this scenario for problems 9-12. A study of elite distance runners found a mean body weight of 139.1 pounds (lbs), with a standard deviation of 10.6 lbs.

- 5- Label a normal curve using the mean and standard deviation given.

Identify the interval(s) that contain the given approximate areas under the curve.

- 6- 2.5%
- 7- 84%
- 8- 15.85%

Use this scenario for problems 9-10. A drink company makes bottles filled with 355 mL of flavored water. In the production process the filling machine's mean is set at 360 mL and a standard deviation of 2.13 mL.

- 9- Find the limits for the control chart in this case.
- 10- Is the following data from an in control or out of control process? Explain.
358.9, 360.4, 359.5, 361.4, 356.3, 355.8, 357.3, 360.8, 354.4, 361.2, 360.7, 359.9, 366.8

Use this scenario for problems 11-15. The weights of adult male Labrador Retrievers are approximately normally distributed with a mean of 87 pounds and a standard deviation of 8 pounds.

- 11- What percentage of Labs weighs below 80?
- 12- What percentage of Labs weighs above 100?
- 13- What percentage of Labs weighs between 70 and 90?
- 14- What weight would a lab need to be in the top 15%?
- 15- Ten percent of labs weighed less than what weight?
- 16- Crop researchers are interested in the productivity of a new variety of corn. They plant 25 plots with randomly-selected seeds of the new variety, record the yield in bushels per acre, and find that a 99% confidence interval for the true mean yield is 118 to 130 bushels per acre. What is the point estimator used? What is the point estimate? What is the margin of error for this confidence interval?
- 17- A university health services physician is concerned about how much sleep freshman are getting in the first few months of school. She asks a simple random sample of 20 students how much sleep they got the previous night and constructs a 95% confidence interval for the mean amount of sleep in hours. If, instead of constructing a 95% confidence interval, the physician constructed a 90% confidence interval, would the 90% interval be wider, narrower, or the same width as the 95% interval? Explain.
- 18- A researcher is deciding between a sample size of 1500 or 1000. Describe the change in the margin of error and risk of being inaccurate of the sample size of 1500 compared to 1000.

- 19- An insect ecologist reports a 95% confidence interval for the mean length of full-grown aquatic larvae of the Phantom Midge *Chaoborus albatrus* to be 6.9 to 8.5 mm, based on a sample of 9 individual larvae. If the ecologist is unhappy with how wide this interval is, what should he do to produce a narrower interval? Explain.
- 20- Identify the confidence level: 80%, 90%, or 99% and the sample size: 200, 400, or 600 that would yield the widest confidence interval. Explain.

Use the following scenario for problems 21-22. Nationally, the proportion of red cars on the road is 0.12. A statistically-minded fan of the Philadelphia Phillies (whose team color is red) wonders if fans who park at Citizens Bank Park (the Phillies home field) are more likely to drive red cars. One day during a home game, he takes an SRS of 210 cars parked in the lot while a game is being played, and counts 35 red cars.

- 21- Construct a 99% confidence interval for the proportion of red cars that park at Citizens Bank Park during a Phillies game?
- 22- Does the confidence interval give you evidence to support that Phillies fans have more red cars than the general populace? Explain.
- 23- A local newspaper in a large city wants to assess support for the construction of a highway by-pass around the central business district to reduce downtown traffic. They survey a random sample of 1152 city residents and find that 543 of them support the bypass. Construct and interpret a 90% confidence interval to estimate the proportion of residents who support construction of the bypass.

Use the following scenario for problems 24-25. The Environmental Protection Agency has determined that safe drinking water should contain no more than 1.3 mg/liter of copper. You are testing water from a new source, and take 300 water samples. The mean copper content in your samples is 1.36 mg/l and the standard deviation is 0.18 mg/l.

- 24- Construct a 95% confidence interval for the mean copper content in the new water source you are testing?
- 25- Does the confidence interval give evidence that this new water source is not a safe one according to the EPA?

Solutions to this practice test can be found at the following link:

https://drive.google.com/file/d/0B_daxRpQslH_RTVjdIyQm5vM2M/view?usp=sharing