

STA 2023

Name

KEY

Spring 2012

UFID #

section

## EXAM 2 Test Form Code A

## Instructions:

This exam contains 33 Multiple Choice questions. Please select the best answer among the alternatives given. Each question is worth 3 points, for a total of 99 points. One point will be given for correctly bubbling in the scantron your personal information and test form code.

You may write whatever you want on this test, but only the answers bubbled in the scantron sheet will be graded. This test **MUST BE SUBMITTED** to the instructors together with the scantron sheet for you to receive a grade on the exam.

Honor pledge: "On my honor, I have neither given nor received unauthorized aid on this examination."

Signature: \_\_\_\_\_

**Questions 1 – 3** Are horoscopes accurate? Professional astrologers prepared individualized horoscopes for 83 adults. Each participant was then shown three horoscopes: the one prepared for them, and two others that were randomly chosen from those prepared for other participants. Each adult had to select the one that was prepared for them. Of the 83 subjects, 28 chose correctly.

1. Construct a 95%CI for the true proportion of adults that would recognize their own horoscope.

- a) (0.3320, 0.3426)
- ☒ b) (0.2356, 0.4390)
- c) (0.2124, 0.4622)
- d) (0.2854, 0.3892)

$$\hat{p} \pm z \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$$

$$.3373 \pm 0.1017$$

$$\hat{p} = \frac{28}{83} = .3373$$

$$z = 1.96$$

2. Use this study's results to find the approximate sample size needed to estimate p to within 0.05 with 95% confidence.

- a) 1500
- b) 750
- c) 500
- ☒ d) 350
- e) 100

$$n = \frac{\hat{p}(1-\hat{p})z^2}{m^2} = 343.48$$

$$\hat{p} = .3373$$

$$m = .05$$

$$z = 1.96$$

3. When conducting a significance test to see if horoscopes are accurate, we would like to prove that people can recognize their horoscopes with a higher probability than if they were randomly guessing. Which set of hypotheses is the correct one?

- a)  $H_0: p = 0.33$       $H_a: \hat{p} = 0.337$
- b)  $H_0: p = 0.33$       $H_a: p < 0.33$
- ☒ c)  $H_0: p = 0.33$       $H_a: p > 0.33$
- d)  $H_0: \hat{p} = 0.337$       $H_a: \hat{p} > 0.337$
- e)  $H_0: \hat{p} = 0.337$       $H_a: \hat{p} < 0.337$

$$p_0 = 1/3 = .333$$

4. When testing  $H_0: p = .30$  vs  $H_a: p > .30$ , the data shows 17 successes out of 50 trials. Compute the test statistic.

- a) 0.597
- b) 0.065
- c) 0.340
- ☒ d) 0.617

$$z = \frac{\hat{p} - p_0}{\sqrt{p_0(1-p_0)}} = .6173$$

$$\hat{p} = \frac{17}{50} = .34$$

$$p_0 = .30$$

$$n = 50$$

5. If the p-value for a significance test is 0.08, then:

- a) we cannot reject  $H_0$  at  $\alpha = 0.10, 0.05$  or  $0.01$
- b) we can reject  $H_0$  at  $\alpha = 0.05$ , but not at  $0.01$
- c) we can reject  $H_0$  at  $\alpha = 0.10, 0.05$  and  $0.01$
- d) we can reject  $H_0$  at  $\alpha = 0.10$ , but not at  $0.05$

6. If we wanted to estimate the true average credit card debt for all UF students, with 95% confidence, to within \$100, how large a sample would we need to take? Use  $s = \$1500$ .

- a) 866
- ☒ b) 865
- c) 864
- d) 863

$$n = \left( \frac{z^* \sigma}{m} \right)^2 = \left( \frac{1.96 \times 1500}{100} \right)^2 = 864.36 \text{ round UP}$$

7. Which of the following statements is true about the distribution of  $\bar{x}$ :

- ☒ a) it always has the same mean as the original distribution ✓
- b) it always has the same standard deviation as the original distribution. ✗
- c) it always has the same shape as the original distribution. ✗
- d) all of the above

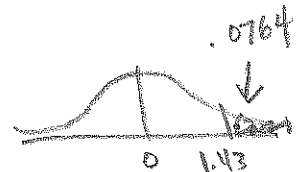
$\bar{x} \sim N\left(\mu, \frac{\sigma}{\sqrt{n}}\right)$   
if  $n \geq 30$  or orig. pop.  $\sim N$

8. 60% of migraine sufferers get some relief from taking ibuprofen. Find the probability that, in a random sample of 100 migraine sufferers, more than 67 say they get some relief from it.

- ☒ a) 0.08
- b) 0.05
- c) 0.40
- d) 0.33
- e) 0.25

$p = .6$   
 $\hat{p} \sim N(.60, .049)$   
Check  $np = (100)(.6) = 60 \geq 15$   
 $n(1-p) = (100)(.4) = 40 \geq 15$  ✓

Find prob  $\hat{p} > .67$   
 $z = \frac{.67 - .60}{.049} = 1.43$



9. When making a small sample Confidence Interval for  $p$ , our data shows that 11 out of 20 people say yes to the question. What value of  $\hat{p}$  should be used?

- a) 11/22
- b) 13/22
- c) 11/20
- ☒ d) 13/24
- e) 13/20

TRICK: +2 succ +2 fail  
 $\hat{p} = \frac{13}{24}$

10. If the p-value for a test were 0.35, then, at any of the usual  $\alpha$  levels we would:

- a) reject the null hypothesis
- b) reject the alternative hypothesis
- ☒ c) fail to reject the null hypothesis
- d) fail to reject the alternative hypothesis

11. In conducting a Significance Test, a small p-value:

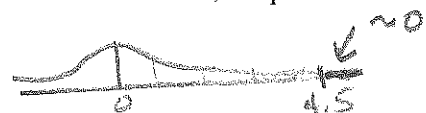
- ☒ a) supports the alternative hypothesis
- b) supports the null hypothesis
- c) supports the parameter
- d) supports the statistic

12. In conducting a Significance Test, a negative p-value indicates:

- a) that we got a negative test statistic
- b) that  $\hat{p}$  was smaller than  $p_0$
- ☒ c) a mistake in the computations
- d) results that are significant at any  $\alpha$  level

13. Suppose we are testing  $H_0: p = .45$  vs  $H_a: p > .45$  and the test statistic is  $z = 4.5$ . Then, the p-value will be closest to:

- a) 0.45
- ☒ b) 0.00
- c) 0.90
- d) 0.224
- e) 10.00



14. Draw a simple random sample of size  $n$  from any population. When  $n$  is large,  $\bar{x}$  has an approximately Normal distribution. This is explained by:

- a) the Central Limit Theorem      b) the Confidence Interval  
c) the Significance Test      d) the Probability Distribution      e) the Margin of Error

15. Statistically significant results mean that:

- a) we got a very large p-value.  
b) we are unable to reject the null hypothesis.  
c) we believe the parameter is different from the value postulated in  $H_0$ . ✓  
d) the observed sample statistic was a lot bigger than the value postulated in  $H_0$ . or smaller, in distn  
e) all of the above.

16. When doing statistical inference, what is the hardest assumption to check, and the most crucial one for our conclusions to be correct?

- a) categorical vs quantitative data      b) simple random sample      c) Normal distribution  
d) no outliers      e) sample size large enough

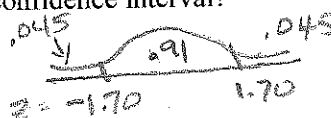
17. What would be the appropriate value of  $t$  to use for a 99% confidence interval with a sample of size 20?

- a) 2.576      b) 2.845  
c) 2.539      d) 2.528      e) 2.861

$$df = n - 1 = 19$$

18. What would be the appropriate value of  $z$  to use for a 91% confidence interval?

- a) 1.75      b) 0.69  
c) 1.34      d) 1.68      e) 1.70



19. We check that both  $np$  and  $n(1-p)$  are at least 15 to determine if the distribution of \_\_\_\_\_ is approximately Normal.

- a)  $\mu$       b)  $X$       c)  $\hat{p}$       d)  $\bar{x}$       e)  $p$

**Questions 20 – 24** Students are allotted one hour for each try of the online quizzes, and typically take the longest on their first try. How long do they take on average? A random sample of 35 students gave a 95% Confidence Interval for the average time it takes students to complete their first try of the quiz of (19.09, 26.19) minutes. For each of the following statements, determine if they are True or False.

20. We are 95% confident that it takes students, on average, between 19.09 and 26.19 minutes to complete their first try at the quiz. (a) True b) False

21. 95% of all students take between 19.09 and 26.19 minutes on their first try of the quiz. a) True (b) False

22. The probability that  $\mu$  is between 19.09 and 26.19 minutes is .95 a) True (b) False

23. The margin of error of this interval is 7.1 divided by 2.  $\frac{26.19 - 19.09}{2}$  (a) True b) False

24. 95% of all samples will have averages between 19.09 and 26.19 minutes. a) True (b) False

25. As part of a class project, 37 UF students were randomly selected and asked how many hours they spend exercising on a typical week. The sample had an average of 4.15 hours, with a standard deviation of 3.29 hours. Construct a 95% confidence interval for the average number of hours UF students exercise each week.

- a) (3.09, 5.21)  
b) (2.75, 5.55)  
c) (-2.3, 10.6)  
d) (3.64, 4.66)  
e) (3.26, 5.04)

$$\bar{x} \pm t \frac{s}{\sqrt{n}}$$

$$4.15 \pm 1.96 \frac{3.29}{\sqrt{37}}$$

$$(3.09, 5.21)$$

**Questions 26 – 30** A recent survey of 500 13- to 17-year-olds found 90 of them had come face-to-face with a stranger they first met on Facebook. The main researcher was shocked by the results. "We know the dangers, we know how to protect ourselves but in reality . . . adolescents think that nothing will happen to them". We will conduct a test to determine whether the true proportion is greater than 15%. The Minitab output appears below.

**Test and CI for One Proportion**

Test of  $p = 0.15$  vs  $p > 0.15$

Sample	X	N	Sample p	95% CI	Z-Value	P-Value
1	90	500	0.180000	(0.147, 0.217)	1.88	0.030

26. According to this interval, we are 95% confident that proportion of 13-17 year olds who have come face-to-face with a stranger they first met on Facebook:

- a) is exactly 15%
- b) is more than 15%
- c) is less than 15%
- ☒ d) could be 15%

**Matching** (Note – answers can be used more than once):

- e 27. Proportion of all 13-17 year olds who have come face-to-face with a stranger they first met on Facebook. a) 1.88
- b 28. Proportion of 13-17 year olds in the sample who have come face-to-face with a stranger they first met on Facebook. b) 0.18
- a 29. Distance between 0.15 and 0.18 in number of standard errors. z-score c) 0.15
- d 30. Probability that the sample proportion turns out to be greater than 18% if in fact the population proportion is 15%. p-value d) 0.03
- e) unknown

**Questions 31 – 33** Studies show that, during school hours, teenagers send an average of **1.6** text messages an hour with a standard deviation of **1.2**. We will take a sample of the phone records of 200 teenagers for one hour and compute the average number of text messages sent.

31. Which of the following statements is true about the two bold numbers?

- a) They are both statistics.
- ☒ b) They are both parameters.
- c) 1.2 is a parameter, 1.6 is a statistic.
- d) 1.6 is a parameter, 1.2 is a statistic.

32. We can use the formulas learned in class to find probabilities about  $\bar{x}$  because:

- a) the sample is large, and the population is Normally distributed.
- b) the sample is small and the population is not Normally distributed.
- c) even though the sample is small, the original population is probably Normal.
- ☒ d) even though the original population is not Normally distributed, the sample is large.

33. Find the probability that the mean number of text messages in the sample is greater than 1.8.

- a) 0.9906
- b) 0.4325
- c) 0.5675
- d) 0.0359
- ☒ e) 0.0091

$$\bar{X} \sim N(1.6, \frac{1.2}{\sqrt{200}})$$

$$Z = \frac{1.8 - 1.6}{1.2/\sqrt{200}} = 2.36$$

