STAT 1030 Exam 3 In-class Practice Questions Monday Week 13

DIRECTIONS:

- Actual Exam 3 questions will <u>differ</u> from these practice questions. But the practice questions show the exam *style* and will help you to review some concepts from Topics 7–8.
- Practice questions do not substitute for Homework in exam preparation.
- Additional Exam 3 Practice Questions are available as a PDF file on the Exams link from the main Stats website (not ICON.) Answers for those questions are shown on the last page.
- Check answers with TAs during today's class.
- Try to answer <u>all</u> questions associated with each word problem before checking answers.

Questions 1–4.

The following measurements were recorded for the drying time, in hours, of small quantities of a certain brand of latex paint:

Assume that the drying time is normally distributed.

- 1. Find a 95% confidence interval for the mean drying time μ for all small quantities of the paint.
 - (a) (1.34, 5.74) hours
 - (b) (2.84, 4.24) hours
 - (c) (2.94, 4.14) hours
 - (d) (3.23, 3.85) hours
 - (e) (3.32, 3.76) hours

(continued)

2. The company which makes and sells this brand of paint advertises it as very convenient since the average drying time is less than three hours. Is this claim *plausibly* true, with 95% confidence?

(a) Yes (b) No (c) More information is needed before this question can be answered.

3. The company which makes and sells this brand of paint advertises it as very convenient since the average drying time is less than three hours. Is this claim *definitely* true, with 95% confidence?

4. How many small quantities of paint should be sampled in order to have a 95% chance of estimating the average drying time to within 15 minutes of the true value μ ?

(a) 1 (b) 8 (c) 59 (d) 60 (e) None of the answers is correct

Question 5.

5. Suppose that the *P*-value for a hypothesis test is

$$P$$
-value = 0.2610

The interpretation is

- (a) There is a 26.10% risk of error if the alternative hypothesis H_A is accepted on the basis of the sample (or stronger) evidence, assuming that H_A is true.
- (b) There is a 26.10% chance that the alternative hypothesis is true.
- (c) The maximum tolerated risk of error in this hypothesis test is 26.10%.
- (d) There is a 26.10% risk of error if the null hypothesis H_0 is rejected on the basis of the sample (or stronger) evidence, assuming that H_0 is true.
- (e) None of the above.

⁽a) Yes (b) No (c) More information is needed before the question can be answered.

Questions 6–18.

A recent poll of UI students conducted by the Daily Iowan newspaper found that 432 out of 642 respondents disagreed with U.S. policy in Iraq, while the remainder agreed with U.S policy in Iraq. Is it true that the fraction of all UI students who agree with U.S. policy in Iraq differs from one-third? Use 10% significance.

- 6. Define the parameter.
 - (a) p =proportion of UI students surveyed who agree with U.S. policy in Iraq
 - (b) \hat{p} = proportion of UI students surveyed who agree with U.S. policy in Iraq
 - (c) μ = average number of UI students who agree with U.S. policy in Iraq
 - (d) μ = percentage of UI students who agree with U.S. policy in Iraq
 - (e) None of the above
- 7. Define hypotheses.
 - (a) $H_{A}: p < 1/3$ (b) $H_{A}: \mu \neq 1/3$ (c) $H_{A}: p \neq 1/3$ $H_{0}: p \ge 1/3$ $H_{0}: \mu = 1/3$ $H_{0}: p = 1/3$
 - (d) $H_{A}: p = 1/3$ $H_{0}: p \neq 1/3$ (e) $H_{A}: \hat{p} = .6729$ $H_{0}: \hat{p} \neq .6729$
- 8. Determine the rejection region.
 - (a) Reject H_0 if t > 1.290
 - (b) Reject H_0 if t > 1.660
 - (c) Reject H_0 if t < -1.290 or t > 1.290
 - (d) Reject H_0 if t < -1.660 or t > 1.660
 - (e) None of the answers is correct
- 9. Calculate the value of the test statistic.
 - (a) -0.2747
 - (b) -0.3349
 - (c) 0.6651
 - (d) 18.2514
 - (e) None of the answers is correct to the fourth decimal place
- 10. Make a decision based on the rejection region.
 - (a) Reject H_0 since the test statistic is in the rejection region.
 - (b) Fail to Reject H_0 since the test statistic is in the rejection region.
 - (c) Reject H_0 since the test statistic is not in the rejection region.
 - (d) Fail to Reject H_0 since the test statistic is not in the rejection region.
 - (e) More information is needed before the question can be answered.

- 11. Interpret the test.
 - (a) There is insufficient evidence to show that the fraction of all UI students who agree with U.S. policy in Iraq is one-third.
 - (b) There is insufficient evidence to show that more than one-third of all UI students agree with U.S. policy in Iraq.
 - (c) There is sufficient evidence to show that the fraction of all UI students who agree with U.S. policy in Iraq differs from one-third.
 - (d) There is insufficient evidence to show that the fraction of all UI students who agree with U.S. policy in Iraq differs from one-third.
 - (e) None of the answers is correct.
- 12. Calculate the P-value.
 - (a) 0.0000 (b) 0.2514 (c) 0.3707 (d) 0.7414
 - (e) None of the answers is correct to the fourth decimal place

13. Make a decision based on the P-value.

- (a) Reject H_0 since P-value $\leq 0.10 = \alpha$
- (b) Reject H_0 since P-value > 0.10 = α
- (c) Fail to Reject H_0 since P-value $\leq 0.10 = \alpha$
- (d) Fail to Reject H_0 since P-value > 0.10 = α
- (e) None of the above
- 14. Find a 90% confidence interval for the percentage of all UI students who agree with U.S. policy in Iraq.
 - (a) (29.1, 36.3)
 - (b) (29.7, 35.8)
 - (c) (63.7, 70.9)
 - (d) (64.2, 70.3)
 - (e) None of the answers is correct to the first decimal place

(continued)

- 15. With 90% confidence, is it definitely true that the fraction of all UI students who agree with U.S. policy in Iraq differs from one-third?
 - (a) Yes (b) No (c) More information is needed before the question can be answered.
- 16. With 90% confidence, is it plausibly true that the fraction of all UI students who agree with U.S. policy in Iraq differs from one-third?
 - (a) Yes (b) No (c) More information is needed before the question can be answered.
- 17. How many UI students should be interviewed to estimate the percentage of all UI students who agree with U.S. policy in Iraq to within 5% of the correct percentage, with 90% confidence?
 (a) 165 (b) 271 (c) 1029 (d) 1692 (e) None of the answers is correct
- 18. How many UI students should be interviewed to estimate the percentage of all UI students who agree with U.S. policy in Iraq to within 2% of the correct percentage, with 90% confidence?
 (a) 165 (b) 271 (c) 1029 (d) 1692 (e) None of the answers is correct

(end of practice questions)

Solution

1. (b)

$$\bar{x} \pm t^* \frac{s}{\sqrt{n}} = 3.54 \pm (2.262) \frac{0.973196337}{\sqrt{10}} = 3.54 \pm 0.696 = \boxed{(2.844, 4.236) \text{ hours}}$$

- 2. (a) Yes since numbers less than 3 are included in the CI.
- 3. (b) No since numbers greater than 3 are included in the CI.
- 4. (c)

$$n = \frac{(z^*)^2 \sigma^2}{m^2} = \frac{(1.96)^2 (0.973196337)^2}{(0.25)^2} = 58.215 \uparrow 59$$

- 5. (d) See Topic 8 Notes.
- 6. (e) p = proportion of all UI students who agree with U.S. policy in Iraq
- 7. (c)
- 8. (e)

Reject H_0 if Z < -1.645 or Z > 1.645

9. (b)

$$Z = \frac{\widehat{p} - p_0}{\sqrt{\frac{p_0(1-p_0)}{n}}} = \frac{(210/642) - (1/3)}{\sqrt{\frac{(1/3)(2/3)}{642}}} = -0.3349$$
10. (d) Fail to Reject H_0 since $-1.645 < -0.33 = Z < 1.645$
11. (d)

12. (d)

$$P$$
-value = $0.3707 + 0.3707 = 0.7414$

- 13. (d)
- 14. (b)

$$\widehat{p} \pm (z^*) \sqrt{\frac{\widehat{p}(1-\widehat{p})}{n}} = 210/642 \pm (1.645) \sqrt{\frac{(210/642)(432/642)}{642}} = 0.3270 \pm 0.0305 = (0.2966, 0.3576)$$

15. (b)

No since the value p = 1/3 is contained in the CI.

16. (a) Yes since values of p other than 1/3 are contained in the CI.

17. (b)

$$n = \frac{(z^*)^2}{4m^2} = \frac{(1.645)^2}{4(0.05)^2} = 270.60 \ \uparrow \ \boxed{271}$$

18. (d)

$$1691.27 \uparrow 1692$$