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

Questions 1 - 5 According to national surveys on basic scientific knowledge, 80% of Americans can correctly state that the Earth revolves around the Sun. But do they know how long it takes? The GSS asked the question: How long does it take for the Earth to go around the Sun: one day, one month, or one year? 977 respondents out of 1255 answered correctly. Conduct a significance test to determine if the percentage of Americans who know how long it takes for the Earth to go around the Sun is different from 80%.

1. In order to check the assumptions it's important to note that:
   a) There were 977 successes and 278 failures observed in the data.
   b) There were 278 successes and 977 failures observed in the data.
   c) There were 1004 successes and 251 failures expected under the null hypothesis.
   d) There were 251 successes and 1004 failures expected under the null hypothesis.
   e) All of the above

2. State the null and alternative hypotheses:
   a) Ho: \( p = .8 \) Ha: \( \hat{p} \neq .7785 \)
   b) Ho: \( \hat{p} = .7785 \) Ha: \( p = .8 \)
   c) Ho: \( \hat{p} = .7785 \) Ha: \( \hat{p} \neq .7785 \)
   d) Ho: \( p = .8 \) Ha: \( p \neq .8 \)
   e) Ho: \( \hat{p} = .8 \) Ha: \( \hat{p} = .8 \)

3. Compute the standard error used in the test statistic:
   a) 0.00013
   b) 0.01219
   c) 0.01172
   d) 0.02151
   e) 0.04303

4. The p-value for this test was computed to be 0.0574. Which of the following interpretations is correct?
   a) we can reject the null hypothesis at \( \alpha = 0.1 \) but not at 0.05 or 0.01
   b) we can reject the null hypothesis at \( \alpha = 0.01 \) and 0.05 but not at 0.10
   c) we can reject the alternative hypothesis at \( \alpha = 0.1 \) but not at 0.05 or 0.01
   d) we can reject the alternative hypothesis at \( \alpha = 0.01 \) and 0.05 but not at 0.10
   e) we can reject the alternative hypothesis at \( \alpha = 0.05 \) and the null at \( \alpha = 0.1 \)

5. The p-value for this test was computed to be 0.0574. Then we have \( \square \) to say the percentage of Americans who know how long it takes for the Earth to go around the Sun is different from 80%.
   a) very strong evidence
   b) pretty strong evidence
   c) some evidence
   d) not enough evidence
   e) no evidence at all

6. What is the z-value that should be used for a 91% confidence interval?
   a) 1.695
   b) 1.341
   c) 0.5179
   d) 0.536
   e) 1.819

7. The Healthy Gator Student Survey was administered to a random sample of UF students. One of the questions asked was whether the student had used a tanning booth or a sunlamp in the previous 30 days. Two out of the 455 males in the sample and 56 out of the 715 females said yes. Can we make confidence intervals for the true proportion of male students and the true proportion of female students at UF who do these things?
   a) we can make a CI for females, but we cannot make one for males
   b) we can make a CI for males, but we cannot make one for females
   c) we can make a CI for males using the small sample formula, and for females with the usual formula
   d) we can make a CI for females using the small sample formula, and for males with the usual formula
   e) we can make CI with the usual formulas for both males and females

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males: 2 succ \( \checkmark \) females: 56 succ (not included in calculation)
453 fail 715 fail
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Questions 8 – 10 A poll was conducted by telephone from March 19-23, 2014 among 1,016 adults nationwide. Data collection was conducted on behalf of CBS News by Social Science Research Solutions of Media, PA. Phone numbers were dialed from samples of both standard land-line and cell phones. The question asked was: Do you expect to play any pranks on anyone for April Fool’s Day this year, or not? Of the 250 people aged 45 and under, 32% said yes.

8. Construct a 95% confidence interval for \( p \).
   a) (0.29, 0.35)
   b) (0.18, 0.46)
   c) (0.17, 0.47)
   d) (0.26, 0.38)
   e) (0.15, 0.49)

9. In this problem, \( p \) represents the proportion of Americans in that age group:
   a) who planned to play a prank for April Fool’s Day last year – 32%
   b) who planned to play a prank for April Fool’s Day last year – unknown
   c) who plan to play a prank for April Fool’s Day this year – 32%
   d) who plan to play a prank for April Fool’s Day this year – unknown
   e) who have ever played a prank for April Fool’s Day – unknown

10. Are there any problems with the assumptions necessary for this interval to be valid?
    a) No – all assumptions seem to be satisfied.
    b) Yes – we question whether the data was randomly selected.
    c) Yes – we question whether the sample size was large enough.
    d) Yes – we question both the sample size and randomness assumptions.
    e) Yes – we question whether the data is categorical or quantitative.

Questions 11 – 13 Manufacturing employees in Florida have an average weekly salary of $20.34 with a standard deviation of $12.70.

11. If we pick one random employee from this population, what is the probability that his salary is more than $22 per week?
    a) 0.4483
    b) 0.3050
    c) 0.2033
    d) Cannot compute this probability because the original distribution is not normal
    e) Cannot compute this probability because the sampling distribution of \( \bar{x} \) is not normal

12. If we select 15 random employees from this population, what is the probability that their average salary is more than $22 per week?
    a) 0.4483
    b) 0.3050
    c) 0.2033
    d) Cannot compute this probability because the original distribution is not normal
    e) Cannot compute this probability because the sampling distribution of \( \bar{x} \) is not normal

13. If we select 40 random employees from this population, what is the probability that their average salary is more than $22 per week?
    a) 0.4483
    b) 0.3050
    c) 0.2033
    d) Cannot compute this probability because the original distribution is not normal
    e) Cannot compute this probability because the sampling distribution of \( \bar{x} \) is not normal
Questions 14 – 16  People are waiting longer to get married. Age at first marriage for women was 20 in 1960, and 23 in 1990, and it continues to climb, particularly for college educated women. A sample of 12 recently married, college educated women found an average age of 27.29 years and a standard deviation of 4.84 years.

14. Construct a 95% confidence interval for the average age at first marriage for college educated women in 2015.
   a) (24.35, 30.23)
   b) (24.08, 30.50)
   c) (24.21, 30.37)
   d) (24.11, 30.47)
   e) (24.55, 30.03)

\[
\begin{align*}
27.29 \pm 2.201 \frac{4.84}{\sqrt{12}} &= 27.29 \pm 2.201 \times \frac{4.84}{3.46} \\
&= 27.29 \pm 2.201 \times 1.40 \\
&= (24.21, 30.37)
\end{align*}
\]

15. Which of the following figures from the story are parameters?
   a) 20 and 23
   b) 27.29 and 4.84
   c) 27.29
   d) 4.84
   e) 20, 23, 27.29 and 4.84

16. How large a sample would we need to estimate the average age at first marriage for men to within 2 years of the truth with 95% confidence, assuming the standard deviation for males is the same as females?
   a) 20
   b) 21
   c) 22
   d) 23
   e) 24

\[
n = \left[ \frac{Z \cdot \sigma}{\varepsilon} \right]^2 = \left[ \frac{2 \times 4.84}{2} \right]^2 = 22.497
\]

Questions 17 – 18 Traditionally, in the US, the bride’s parents pay for the wedding expenses, but recent studies show that about 30% of all couples now pay for their own wedding. If we take a sample of 100 recently married couples, what is the probability that at least 25% say they paid for their own wedding?

17. For this problem, the sampling distribution of p-hat has:
   a) mean 0.25 and standard error 0.025
   b) mean 0.25 and standard error 0.046
   c) mean 0.30 and standard error 0.025
   d) mean 0.30 and standard error 0.046
   e) none of the above

18. For this problem, the sampling distribution of p-hat has:
   a) an approximately Normal shape, because n > 30
   b) an approximately Normal shape, because n > 15
   c) an approximately Normal shape, because the number of successes and failures are ≥ 30
   d) an approximately Normal shape, because the number of successes and failures are ≥ 15
   e) a shape that is NOT approximately Normal

19. Recent studies show that about 2.5% of Americans are vegan – that is, they consume no animal products at all. We would like to estimate the proportion of UF students who are vegan to within 0.01 of the true value, with 95% confidence. How many students should we sample? Approximately:
   a) 61
   b) 25
   c) 47,775
   d) 368
   e) 937

\[
n = \frac{Z^2 \cdot \hat{p} \cdot (1-\hat{p})}{\varepsilon^2} = \frac{(1.96)^2 \cdot (0.025) \cdot (0.975)}{(0.01)^2} = 934.39
\]

20. When we make a 95% confidence interval we don’t have 100% confidence in it because we need to account for the fact that:
   a) the sample may not be truly random.
   b) we don’t have the whole population.
   c) the original distribution may not be normal
   d) all of the above
   e) none of the above

21. When making confidence intervals and conducting significance tests we need to check certain assumptions regarding the sample size - assumptions that are necessary for the __________ to have an approximately normal distribution.
   a) sample  b) population  c) statistic  d) parameter  e) inference
Questions 22 – 26 The following Sampling Distribution plots for p-hat made with a simulation program for different values of n and p. Match the correct parameters to each plot.

22.  
![Graph A]

\( n = 100 \quad p = 0.1 \)

23.  
![Graph B]

\( n = 30 \quad p = 0.3 \)

24.  
![Graph C]

\( n = 100 \quad p = 0.5 \)

25.  
![Graph D]

\( n = 10 \quad p = 0.8 \)

26.  
![Graph E]

\( n = 10 \quad p = 0.6 \)

Sampling distribution graphs are centered at \( p \) and as \( n \) increases each get more smooth/continuous (more bars, smaller gaps between).

27. UF’s enrollment of black students has been declining in recent years, which some attribute in part to the elimination of affirmative action programs. In 2013, 395 or 6.2% of the 6370 incoming freshmen were black. If we wanted to know the true proportion of incoming freshmen to UF in 2013 who were black: 1. \( p = 6.2\% \)

   a) we would need to make a 95% confidence interval  
   b) we would need to conduct a significance test  
   c) we would need to find the sampling distribution  
   d) we would need to determine the sample size  
   e) we would not need to do anything

We know the parameter.

Questions 28 – 33 Each year the blog TheKnot.com and the website WeddingChannel.com conduct their Real Wedding Survey, where they ask nearly 20,000 brides that have gotten married in the last year. Questions about their wedding budget, style preferences, and other key details. Based on their study we constructed a 95% confidence interval for the average cost of a wedding, nationwide: (28,650, 29,066). Assuming all necessary conditions are satisfied, determine if the following interpretations are True or False.

28. 95% of all brides spend between $28,650 and $29,066 on their wedding, on average.  
   a) True  
   b) False

29. We are 95% confident that the average amount spent on their wedding by all brides in the sample is between $28,650 and $29,066.  
   a) True  
   b) False

30. The margin of error of this interval is $258. \[
    \frac{29066 - 28650}{2} = 208
    \]  
   a) True  
   b) False

31. The probability that \( \bar{X} \) is between $28,650 and $29,066 is 0.95.  
   a) True
   b) False

32. We are 95% confident that the average amount spent on their wedding by all brides in the population is between $28,650 and $29,066.  
   a) True  
   b) False

33. Do you suspect any problems with the assumption of randomness in this study?  
   a) No - the sample was very large so it is representative of the population of couples who got married that year.  
   b) No - random samples are not important when drawing inferences about population means.  
   c) No - they reach the population of interest by targeting brides who visit these websites.  
   d) Yes - brides who visit these websites are probably planning rather elaborate and expensive weddings.  
   e) Yes - they probably contacted brides who spent a lot to participate in the study and inflate the numbers.

Not sure how samples were taken, but most likely from visitors to websites - whether voluntary or "random" samples from their members. There will be bias.