Math 10 Spring 2015 FORM A Name Last:_____ First: _____
Exam 3: Chapters 8, 9 & 10 Class Time:_____

- Print your **NAME** and **CLASS TIME** on **THIS EXAM**
- Print your **NAME** and **CLASS TIME** on your **SCANTRON**.
- Write **FORM A** on your **SCANTRON**.
- Turn your cell phone OFF. Any noise from a cell phone will signal that your exam is over.
- Each question has exactly one BEST answer. There are 21 questions.
- You may write on this exam. There is no scratch paper allowed.
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- **FAILURE TO FOLLOW ALL INSTRUCTIONS WILL COST YOU 5 POINTS!**

Questions 1 – 3 refer to the following: http://www.gallup.com/poll/182180/support-nuclear-energy.aspx

A March 2015 Gallup Poll survey polled a random sample of 1025 American adults about their opinions on energy policy. 79% of those polled think the US should place more emphasis on solar power.

1. Find the error bound for the true proportion of all Americans who support placing more emphasis on solar power.

   A. 0.0445 B. 0.0249 C. 0.0223 D. 0.0499

2. When planning this study, which two actions would we expect to result in a **larger** error bound?

   A. Increase the confidence level and increase the sample size.
   B. Increase the confidence level and decrease the sample size.
   C. Decrease the confidence level and increase the sample size.
   D. Decrease the confidence level and decrease the sample size.

3. A similar poll in 2013 showed that 76% of a sample of randomly selected American adults supported placing more emphasis on solar power. (Assume that the sample had 1000 people.) To test whether the true proportion of all American adults who support placing more emphasis on solar power has changed between the 2013 survey and the 2015 survey, the most appropriate alternate hypothesis would be:

   A. Ha: $p_{2015} \geq p_{2013}$ B. Ha: $p_{2015} > p_{2013}$ C. Ha: $p_{2015} \neq 0.76$ D. Ha: $p_{2015} \neq p_{2013}$

Questions 4 – 8 refer to the following:

A university housing office website claims that the average rent for a room in shared housing near the university is $850. A new student is concerned that the true average rent is higher.
Rents for a random sample of 6 rooms in shared housing are shown below.
(Assume that the underlying population of rents for individual rooms is approximately normally distributed.)

$749 $800 $850 $875 $925 $960

4. Perform a hypothesis test of these claims using the given data. Find the p-value.

A. 0.7701 B. 0.3851 C. 0.3677 D. 0.7354

5. The correct conclusion for this test at a 5% level of significance is

A. The true average rent for a room in shared housing is $850 or less.
B. The true average rent for a room in shared housing is more than $850.
C. The true average rent for a room in shared housing is between $850 and $859.83.
D. There is a high probability that the true average rent for a room in shared housing is $859.83.

6. The p-value represents

A. the probability that the rent for an individual apartment is $859.83.
B. the percent of apartments with rent equal to $859.83, if the population average rent is $850.
C. the probability of getting a sample average rent of $859.83 or more if the population average rent is $850.
D. the probability that the population average rent is $850 if the sample average rent is $859.83.

7. The distribution to use for a confidence interval estimate of the average rent is

A. N (0, 1) B. N (859.83, 78.07) C. t_6 D. t_5

8. Construct and interpret a 95% confidence interval for the true average rent for a room in shared housing, rounded to the nearest whole dollar.

A. 95% of all samples will give a confidence interval estimate of $778 and $942.
B. We estimate that 95% of rooms in shared housing have rents between $803 and $917.
C. We estimate with 95% confidence that the true average rent for a room in shared housing is between $778 and $942.
D. We estimate with 95% confidence that the true average rent for a room in shared housing is between $803 and $917.

9. We do NOT use the Student's t distribution in which of the following situations?

A. Hypothesis test with matched pair samples
B. Hypothesis test for a mean when we know both the population standard deviation and the sample standard deviation
C. Confidence Interval for a mean when we only know the sample standard deviation
D. All of the above

10. Suppose that the p-value for a hypothesis test is 0.0245.
At which significance levels would you FAIL TO REJECT the null hypothesis?

I α=0.05 II. α=0.03 III. α=0.02 IV. α= 0.01

A. I and II only B. IV only C. I, II , III, IV D. III and IV only

Questions 11 – 13 refer to the following two hypothesis tests :

Study I. To test if there is an average increase in textbook prices when buying from the college bookstore, as compared to buying from a popular online textbook website, a sample of 25 textbooks is selected.
For each of these 25 textbooks, the price is obtained at both the college bookstore and at the online textbook website.

Study II. A study is done to determine if there is a difference in average prices of bestselling fiction ebooks at two online booksellers BookSite and eRead.
A random sample of 20 bestselling fiction ebooks is selected from BookSite 's website and another random sample of of 20 bestselling fiction ebooks is selected from eRead 's website.

11. Which hypothesis test is a one-tailed test?

A. Both B. Neither C. Study I D. Study II

12. Which hypothesis test is a test of two means, independent samples?

A. Both B. Neither C. Study I D. Study II

13. For Study II, a Type II Error would be to decide that

A. there is a difference between the average price of ebooks at BookSite and eRead, when in reality there is no difference.
B. there is no difference between the average price of ebooks at BookSite and eRead, when in reality the average prices are different.
C. the average price of ebooks BookSite is higher when in reality the average price is higher at eRead.
D. there is a difference between the average price of ebooks at BookSite and eRead, when in reality the true average prices is higher at eRead.

Questions 14–15 refer to the following:

A police captain believes that the proportion of drivers who exceed (drive faster than) the speed limit on H Street is higher than on M Street. A hypothesis test is conducted at a 3% significance level.

In a sample of 180 vehicles on H St., 36 vehicles exceeded the speed limit.
In a sample of 250 vehicles on M St., 44 vehicles exceeded the speed limit.

14. The p-value for this test is

A. 0.4719 B. 0.5281 C. 0.2640 D. 0.7360

15. The correct conclusion for this hypothesis test is

A. The true proportion of vehicles that exceed the speed limit on H St. is at most that of M St.
B. There is no difference in the true proportions of vehicles that exceed the speed limit on both roads.
C. The true proportion of vehicles that exceed the speed limit on H St. is higher than on M St.
D. The maximum permitted speed limits on both roads are the same

Questions 16 – 17 refer to the following:

An archeologist is studying the size of snail fossils found at two different sites. The following results were found:

Site	Sample mean (cm)	Sample standard deviation (cm)	n
A	3.7	0.3	16
B	3.4	0.2	16

16. To test whether the population average length for these fossils is longer at Site A than at Site B, what are the appropriate hypotheses?

A. H_0: $\mu_d \leq 0$ H_A: $\mu_d > 0$
B. H_0: $\mu_A \geq \mu_B$ H_A: $\mu_A < \mu_B$
C. H_0: $\mu_A \leq \mu_B$ H_A: $\mu_A > \mu_B$
D. H_0: $\mu_A > \mu_B$ H_A: $\mu_A \leq \mu_B$

17. To test whether the population average length for these fossils found **ONLY at Site A** is less than 4 cm, the p-value is 0.00058 . The appropriate conclusion for this test is

A. The population average length for fossils at Site A is 4 cm or longer.
B. The population average length for fossils at Site A is less than 4 cm.
C. The population average length for fossils at Site A is 4 cm.
D. The population average length for fossils at Site A is not 4 cm.

18. A sample of runners was enrolled in a training program to see if training produced an average difference in the time a runner could run without tiring out.
The time each runner ran without tiring was recorded before and after the training program.

Time (minutes)	Anu	Binh	Carlita	Dan	Sari	Tomas	Van	Wei
Before training	19	20	21	21	22	25	17	23
After training	22	18	20	24	26	28	17	26

Find the p-value.

A. 0.3500 B. 0.0409 C. 0.1750 D. 0.0819

Questions 19–21 refer to the following:
The human resources department at a company believes that **at least half** of its employees use public transportation to commute to work.
A random sample of 200 employees shows that 88 use public transportation, while 112 drive.

19. A Type I error for this test would be to decide that

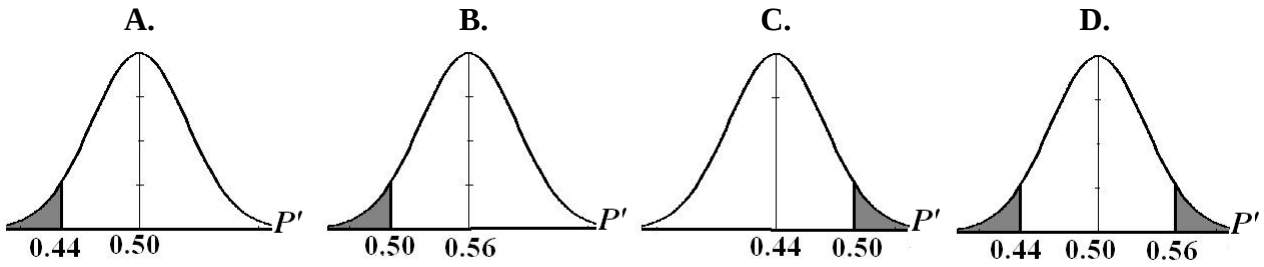
A. at least half of all employees use public transportation when in reality less than half do.

B. less than half of all employees use public transportation when in reality at least half do.

C. exactly half of the employees in the sample use public transportation.

D. more than half of all employees use public transportation when in reality at most half do.

20. Which of the following is the appropriate graph for this hypothesis test?



21. Find the best point estimate for the proportion of all employees who use public transportation to commute to work

A. 0.44

B: 0.50

C. 0.56

D. Unable to determine because we are not told what confidence level to use.

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2. To test whether the population average length for these fossils found **ONLY at Site A** is less than 4 cm, the p-value is 0.00058 . The appropriate conclusion for this test is

A. The population average length for fossils at Site A is 4 cm or longer.
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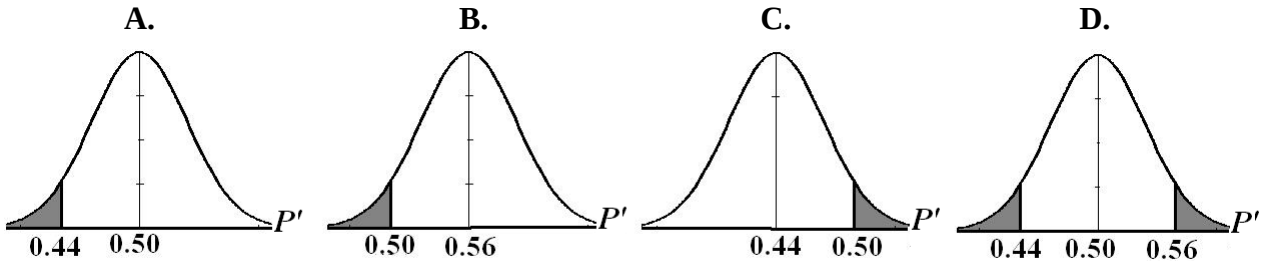

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   B: 0.50

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   D. Unable to determine because we are not told what confidence level to use.

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	Form A	Form B
1	C	C
2	B	B
3	D	B
4	B	A
5	A	A
6	C	D
7	D	C
8	C	D
9	B	B
10	D	B
11	C	D
12	D	B
13	B	A
14	C	C
15	A	D
16	C	C
17	B	C
18	D	B
19	B	D
20	A	C
21	A	A
	A = 4	A = 4
	B = 6	B = 6
	C = 6	C = 6
	D = 5	D = 5