This is a closed-book, closed-note exam. No outside assistance is allowed. Members of the 9:00 class may not talk about exam items with members of the 10:00 class.

There are 100 points worth of questions on this exam. Relative problem weights are given in brackets. Unless the problem specifically indicates otherwise, you are to use the traditional confidence level of 95% and the traditional significance level of $\alpha = 0.05$.

**Question 1** [12 points; 2 each part]:
Indicate whether each of the following statements is TRUE or FALSE.

a) The variance is the square root of the standard deviation. TRUE FALSE

b) It is theoretically possible for a covariance to be negative. TRUE FALSE

c) If the data are skewed right, then the mean is greater than the median. TRUE FALSE

d) Increasing the sample size will increase the width of a confidence interval, all else being equal. TRUE FALSE

e) One advantage of a prospective observational study over a retrospective study is better data quality. TRUE FALSE

f) Income data are typically skewed left. TRUE FALSE

**Question 2** [10 points; 5 each part]:
a) If the data are normally distributed, then approximately __________ percent of the data will lie within one standard deviation of the mean.

b) If the data follow Student’s $t$ distribution (with 6 degrees of freedom) rather than a normal distribution, then what impact will this have on your answer to Part A?

_____ increase it  _____ no change  _____ decrease it

**Question 3** [10 points]:
Horatio Wajberlinski is conducting a hypothesis test to see whether the amount of sleep a student gets the night before the test is related to the grade on the test. He gets a p-value of 0.002. What conclusion should he draw?

_____ reject the null hypothesis  _____ don’t reject the null hypothesis

**Question 4** [5 points]:
Property appraiser Wilhelmina Tempusfugit is constructing a regression model to examine the relationship between the sales price for existing homes in the DeLand market, and the number of bedrooms in the house. What is her “X” variable for the model and what is her “Y” variable?
Question 5 [16 points; 4 each part]:

Many major corporations purchase “naming rights” for the stadiums used by professional sports teams. Thus, for example, the Orlando Magic basketball team plays its home games in the Amway Center. The Amway Corporation paid $40 million to have the arena named after them for a ten-year period.

In theory, the company obtains significant advertising from attaching its name to the sports facility. However, there is some thought that companies overpay for these rights. Financial analyst Clorinda Cragdingle is investigating the research question: Do companies owning naming rights to sports facilities perform significantly better or worse financially, than companies without naming rights? She began her study back in 2004 by identifying twenty companies which had naming rights to professional sports facilities. For each company with naming rights, she then randomly selected a company in the same industry and of a similar size which did not have naming rights. She then examined overall performance of the each company’s stock (percent return), over the five-year period 2004-2009.

a) Clorinda should answer her research question with a …
   _____ … confidence interval.           _____ … hypothesis test.

b) Clorinda has a …
   _____ … retrospective study.           _____ … prospective study.

c) Clorinda should analyze her data using procedures for …
   _____ … independent samples.          _____ … paired data.

d) Clorinda’s analysis will use …
   _____ … a z-score.                    _____ … a t-score.

Question 6 [8 points]:

Child psychologist Gracetta Squornshellous is studying the impact that television viewing has upon intellectual development in children. She theorizes that children who watch large amounts of television will suffer stunted intellectual growth. She obtains data from one hundred fourth-grade children. Her two variables are the number of hours of television the child watches, per week, on average, and the child’s score on an IQ test. She fits a regression model to these data. She obtains an intercept of 108 and a slope of –0.2. Interpret these numbers.
Question 6 [5 points]:
A recent Gallup Poll found that only 17% of those surveyed approved of the job that Congress was doing. [This is a true story, by the way.] At the bottom of the webpage discussing the survey results, Gallup Poll notes

Results for this Gallup poll are based on telephone interviews conducted Nov. 4-7, 2010, with a random sample of 1,021 adults, aged 18 and older, living in the continental U.S., selected using random-digit-dial sampling.

For results based on the total sample of national adults, one can say with 95% confidence that the maximum margin of sampling error is ±4 percentage points.

Which of the following statements is the best conclusion, from the Gallup Poll statement?

_____ Not everyone responds to surveys. This causes error in surveys. It is entirely plausible, because of this, that the true percentage might be as low as 13% or as high as 21%

_____ Somewhere between 133 (13% of 1021) and 214 (21% of 1021) of the people in their survey responded that they approved of the job Congress was doing.

_____ If they were to repeat the survey again, using exactly the same procedures but with a different random-digit-dial sample, then they probably would get a result between 13% and 21%.

_____ The practical difficulties of reaching a cross-section of the country’s population means that no survey is completely accurate. Hence there will always some uncertainty, but it is 95% likely that somewhere between 13% and 21% of those surveyed approve of the job Congress is doing.

Question 7 [16 points, divided as indicated]:
Todenkopf Pharmaceuticals is investigating a new drug, dimethylbenzantracene (DMBA), which it believes will be effective in treating terminal halitosis. They test

\[ H_0: \text{the drug is not effective} \]
\[ H_A: \text{the drug is effective} \]

a) [10] If they get a “not reject” result from their hypothesis test, what conclusion should they draw (in context of the problem)?

_____ There is enough evidence to believe the drug is not effective.

_____ There is enough evidence to believe the drug is effective.

_____ There is not enough evidence to believe the drug is not effective.

_____ There is not enough evidence to believe the drug is effective.

b) [6] What would a Type I error be, in context of this test?
Question 8 [5 points]:
Alphonso Ferrabosco II computes a 95% confidence interval for the mean amount of time Stetson students slept last night, based upon responses from a random sample of sixty students. He obtained a result of 6 hours ± 1 hour. Which of the following is the best interpretation of this result?

_____ He is pretty sure that, if he obtained data from every student on campus, that the average amount of sleep time for ALL students is between 5 and 7 hours.
_____ Fifty-seven (95% of 60) of the students in his sample got somewhere between 5 and 7 hours of sleep last night.
_____ The sample mean from his study is between 5 and 7 hours, 95% of the time.
_____ He is pretty sure (95% confident) that a randomly chosen student on campus got somewhere between 5 and 7 hours of sleep last night.

Question 9 [5 points]:
Dietrich Buxtehude uses Alphonso’s data, from the previous problem, to conduct a hypothesis test on the true campuswide population mean amount of sleep. He tests

\[ H_0: \mu = 8 \quad \text{vs.} \quad H_A: \mu \neq 8 \]

Which of the following best describes the conclusion from his hypothesis test?

_____ He should reject his null hypothesis.
_____ He should not reject his null hypothesis.
_____ We cannot tell, from the information given, whether he should reject or not.
_____ He should not conduct a hypothesis test at all, since he doesn’t have data for the entire population.

Question 10 [8 points; 2 each part]:
Indicate whether each of the following statements is TRUE or FALSE.

a) If the correlation is positive, then “X” causes “Y”, while if the correlation is negative then “Y” causes “X.”

b) As the sample size increases, the sampling distribution of the sample mean tends to become normal.

c) All else being equal, increasing the confidence level will increase the width of a confidence interval.

d) The product life cycle is an example of a saturation model.