Sample Multiple Choice Questions for the material since Midterm 2. Sample questions from Midterms 1 and 2 are also representative of questions that may appear on the final exam.

1. A randomly selected sample of 1,000 college students was asked whether they had ever used the drug Ecstasy. Sixteen percent (16% or 0.16) of the 1,000 students surveyed said they had. Which one of the following statements about the number 0.16 is correct?
   A. It is a sample proportion.
   B. It is a population proportion.
   C. It is a margin of error.
   D. It is a randomly chosen number.

2. In a random sample of 1000 students, $\hat{p} = 0.80$ (or 80%) were in favor of longer hours at the school library. The standard error of $\hat{p}$ (the sample proportion) is
   A. .013
   B. .160
   C. .640
   D. .800

3. For a random sample of 9 women, the average resting pulse rate is $\bar{x} = 76$ beats per minute, and the sample standard deviation is $s = 5$. The standard error of the sample mean is
   A. 0.557
   B. 0.745
   C. 1.667
   D. 2.778

4. Assume the cholesterol levels in a certain population have mean $\mu = 200$ and standard deviation $\sigma = 24$. The cholesterol levels for a random sample of $n = 9$ individuals are measured and the sample mean $\bar{x}$ is determined. What is the z-score for a sample mean $\bar{x} = 180$?
   A. –3.75
   B. –2.50
   C. –0.83
   D. 2.50

5. In a past General Social Survey, a random sample of men and women answered the question "Are you a member of any sports clubs?" Based on the sample data, 95% confidence intervals for the population proportion who would answer "yes" are .13 to .19 for women and .247 to .33 for men. Based on these results, you can reasonably conclude that
   A. At least 25% of American men and American women belong to sports clubs.
   B. At least 16% of American women belong to sports clubs.
   C. There is a difference between the proportions of American men and American women who belong to sports clubs.
   D. There is no conclusive evidence of a gender difference in the proportion belonging to sports clubs.

6. Suppose a 95% confidence interval for the proportion of Americans who exercise regularly is 0.29 to 0.37. Which one of the following statements is FALSE?
   A. It is reasonable to say that more than 25% of Americans exercise regularly.
   B. It is reasonable to say that more than 40% of Americans exercise regularly.
   C. The hypothesis that 33% of Americans exercise regularly cannot be rejected.
   D. It is reasonable to say that fewer than 40% of Americans exercise regularly.

7. In hypothesis testing, a Type 2 error occurs when
   A. The null hypothesis is not rejected when the null hypothesis is true.
   B. The null hypothesis is rejected when the null hypothesis is true.
   C. The null hypothesis is not rejected when the alternative hypothesis is true.
   D. The null hypothesis is rejected when the alternative hypothesis is true.

8. Null and alternative hypotheses are statements about:
   A. population parameters.
   B. sample parameters.
   C. sample statistics.
   D. it depends - sometimes population parameters and sometimes sample statistics.

9. A hypothesis test is done in which the alternative hypothesis is that more than 10% of a population is left-handed. The p-value for the test is calculated to be 0.25. Which statement is correct?
   A. We can conclude that more than 10% of the population is left-handed.
   B. We can conclude that more than 25% of the population is left-handed.
   C. We can conclude that exactly 25% of the population is left-handed.
   D. We cannot conclude that more than 10% of the population is left-handed.

10. Which of the following is NOT true about the standard error of a statistic?
    A. The standard error measures, roughly, the average difference between the statistic and the population parameter.
    B. The standard error is the estimated standard deviation of the sampling distribution for the statistic.
    C. The standard error can never be a negative number.
    D. The standard error increases as the sample size(s) increases.

11. A prospective observational study on the relationship between sleep deprivation and heart disease was done by Ayas, et. al. (Arch Intern Med 2003). Women who slept at most 5 hours a night were compared to women who slept for 8 hours a night (reference group). After adjusting for potential confounding variables like smoking, a 95% confidence interval for the relative risk of heart disease was (1.10, 1.92). Based on this confidence interval, a consistent conclusion would be
    A. Sleep deprivation is associated with a modestly increased risk of heart disease.
    B. Sleep deprivation is associated with a modestly decreased risk of heart disease.
    C. There was no evidence of an association between sleep deprivation and heart disease.
    D. Lack of sleep causes the risk of heart disease to increase by 10% to 92%.

12. Consider a random sample of 100 females and 100 males. Suppose 15 of the females are left-handed and 12 of the males are left-handed. What is the estimated difference between population proportions of females and males who are left-handed (females – males)? Select the choice with the correct notation and numerical value.
    A. $p_1 - p_2 = 3$
    B. $p_1 - p_2 = 0.03$
    C. $\hat{p}_1 - \hat{p}_2 = 3$
    D. $\hat{p}_1 - \hat{p}_2$ ***= 0.03***

13. A result is called "statistically significant" whenever
    A. The null hypothesis is true.
    B. The alternative hypothesis is true.
    C. The p-value is less or equal to the significance level.
    D. The p-value is larger than the significance level.

14. The *confidence level* for a confidence interval for a mean is
    A. the probability the procedure provides an interval that covers the sample mean.
    B. the probability of making a Type 1 error if the interval is used to test a null hypothesis about the population mean.
    C. the probability that individuals in the population have values that fall into the interval.
    D. the probability the procedure provides an interval that covers the population mean.

For the next two questions: It is known that for right-handed people, the dominant (right) hand tends to be stronger. For left-handed people who live in a world designed for right-handed people, the same may not be true. To test this, muscle strength was measured on the right and left hands of a random sample of 15 left-handed men and the difference (left - right) was found. The alternative hypothesis is one-sided (left hand stronger). The resulting t-statistic was 1.80.

15. This is an example of:
    A. A two-sample t-test.
    B. A paired t-test.
    C. A pooled t-test.
    D. An unpooled t-test.

16. Assuming the conditions are met, based on the t-statistic of 1.80 the appropriate conclusion for this test using $\alpha = .05$ is: ***(Table would be provided with exam.)***
    A. Df = 14, so p-value < .05 and the null hypothesis can be rejected.
    B. Df = 14, so p-value > .05 and the null hypothesis cannot be rejected.
    C. Df = 28, so p-value < .05 and the null hypothesis can be rejected.
    D. Df = 28, so p-value > .05 and the null hypothesis cannot be rejected.

17. A test of H_0: $\mu = 0$ versus Ha: $\mu > 0$ is conducted on the same population independently by two different researchers. They both use the same sample size and the same value of $\alpha = 0.05$. Which of the following will be the same for both researchers?
    A. The *p*-value of the test.
    B. The power of the test if the true $\mu = 6$.
    C. The value of the test statistic.
    D. The decision about whether or not to reject the null hypothesis.

18. Which of the following is *not* a correct way to state a null hypothesis?
    A. H_0: $\hat{p}_1 - \hat{p}_2 = 0$ (Sample statistics do not go into hypotheses)
    B. H_0: $\mu_d = 10$
    C. H_0: $\mu_1 - \mu_2 = 0$
    D. H_0: $p = .5$

19. A test to screen for a serious but curable disease is similar to hypothesis testing, with a null hypothesis of no disease, and an alternative hypothesis of disease. If the null hypothesis is rejected treatment will be given. Otherwise, it will not. Assuming the treatment does not have serious side effects, in this scenario it is better to increase the probability of:
    A. making a Type 1 error, providing treatment when it is not needed.
    B. making a Type 1 error, not providing treatment when it is needed.
    C. making a Type 2 error, providing treatment when it is not needed.
    D. making a Type 2 error, not providing treatment when it is needed.

20. A random sample of 25 college males was obtained and each was asked to report their actual height and what they wished as their ideal height. A 95% confidence interval for μ_d = average difference between their ideal and actual heights was 0.8" to 2.2". Based on this interval, which one of the null hypotheses below (versus a two-sided alternative) can be rejected?
    A. H_0: $\mu_d = 0.5$
    B. H_0: $\mu_d = 1.0$
    C. H_0: $\mu_d = 1.5$
    D. H_0: $\mu_d = 2.0$

21. The average time in years to get an undergraduate degree in computer science was compared for men and women. Random samples of 100 male computer science majors and 100 female computer science majors were taken. Choose the appropriate parameter(s) for this situation.
    A. One population proportion p.
    B. Difference between two population proportions $p_1 - p_2$.
    C. One population mean μ_1
    D. Difference between two population means $\mu_1 - \mu_2$

22. If the word significant is used to describe a result in a news article reporting on a study,
    A. the p-value for the test must have been very large.
    B. the effect size must have been very large.
    C. the sample size must have been very small.
    D. it may be significant in the statistical sense, but not in the everyday sense.

23. A random sample of 5000 students were asked whether they prefer a 10 week quarter system or a 15 week semester system. Of the 5000 students asked, 500 students responded. The results of this survey _____
    A. can be generalized to the entire student body because the sampling was random.
    B. can be generalized to the entire student body because the margin of error was 4.5%.
    C. should not be generalized to the entire student body because the non-response rate was 90%.
    D. should not be generalized to the entire student body because the margin of error was 4.5%.

24. In a report by ABC News, the headlines read "*City Living Increases Men's Death Risk"* The headlines were based on a study of 3,617 adults who lived in the United States and were more than 25 years old. One researcher said, "Elevated levels of tumor deaths suggest the influence of physical, chemical and biological exposures in urban areas… Living in cities also involves potentially stressful levels of noise, sensory stimulation and overload, interpersonal relations and conflict, and vigilance against hazards ranging from crime to accidents." Is a conclusion that living in an urban environment *causes* an increased risk of death justified?
    A. Yes, because the study was a randomized study.
    B. Yes, because many of the men in the study were under stress.
    C. No, because the study was a retrospective study.
    D. No, because the study was an observational study.

25. A significance test based on a small sample may not produce a statistically significant result even if the true value differs substantially from the null value. This type of result is known as
    A. the significance level of the test.
    B. the power of the study.
    C. a Type 1 error.
    D. a Type 2 error.

For the next two questions: An observational study found a statistically significant relationship between regular consumption of tomato products (yes, no) and development of prostate cancer (yes, no), with lower risk for those consuming tomato products.

26. Which of the following is *not* a *possible* explanation for this finding?
    A. Something in tomato products causes lower risk of prostate cancer.
    B. There is a confounding variable that causes lower risk of prostate cancer, such as eating vegetables in general, that is also related to eating tomato products.
    C. A large number of food products were measured to test for a relationship, and tomato products happened to show a relationship just by chance.
    D. A large sample size was used, so even if there were no relationship, one would almost certainly be detected.

27. Which of the following is a valid conclusion from this finding?
    A. Something in tomato products causes lower risk of prostate cancer.
    B. Based on this study, the relative risk of prostate cancer, for those who do not consume tomato products regularly compared with those who do, is greater than one.
    C. If a new observational study were to be done using the same sample size and measuring the same variables, it would find the same relationship.
    D. Prostate cancer can be prevented by eating the right diet.

28. The best way to determine whether a statistically significant difference in two means is of practical importance is to
    A. find a 95% confidence interval and notice the magnitude of the difference.
    B. repeat the study with the same sample size and see if the difference is statistically significant again.
    C. see if the *p*-value is extremely small.
    D. see if the *p*-value is extremely large.

29. A large company examines the annual salaries for <u>all</u> of the men and women performing a certain job and finds that the means and standard deviations are $32,120 and $3,240, respectively, for the men and $34,093 and $3521, respectively, for the women. The best way to determine if there is a difference in mean salaries for the population of men and women performing this job in this company is
    A. to compute a 95% confidence interval for the difference.
    B. to subtract the two sample means.
    C. to test the hypothesis that the population means are the same versus that they are different.
    D. to test the hypothesis that the population means are the same versus that the mean for men is higher.

30. One problem with hypothesis testing is that a real effect may not be detected. This problem is most likely to occur when
    A. the effect is small and the sample size is small.
    B. the effect is large and the sample size is small.
    C. the effect is small and the sample size is large.
    D. the effect is large and the sample size is large.