Name: _____

Lab Problems 9-12 (worth 20 pts.)

Statistics 1000 Dr. Nancy Pfenning

9. Is there a difference in mean hours slept for students in various years at college?

   (a) Give at least one reason why students in earlier years may get more sleep.

   (b) Give at least one reason why students in later years may get more sleep.

   (c) Use software to access the student survey data, and report the mean hours of sleep for sampled students in each of the five year levels:
   1st _____2nd _____3rd _____4th _____Other _____
   Which sample mean is highest?_____Which is lowest? _____

   (d) Use software to carry out the appropriate test; report the p-value. _____

   (e) Two of these express the correct conclusions to draw, given the size of the p-value; which **two** are they?

      i. There is a relationship between students' year at school and how much sleep they get, for populations of students in the various years.

      ii. There is no relationship between students' year at school and how much sleep they get, for populations of students in the various years.

      iii. Mean amount of sleep may be equal for populations of students in various years.

      iv. Mean amount of sleep is not equal for populations of students in any of the various years.

      v. Mean amount of sleep is not equal for populations of students in at least two of the various years.

10. Is there a relationship between gender and whether or not a student has a tattoo?

   (a) What variable or variables are involved? For each variable, tell if it is quantitative or categorical. Which, if any, would be the obvious choice for explanatory variable?

   (b) **Before you even look at the data**, formulate null and alternative hypotheses about the relationship between those variables. H_0 :
   H_a :
   Do you suspect that there will be enough evidence to reject H_0?_____

   (c) Use **MINITAB Basics Example U** to construct a two-way table of counts and row percents, and carry out a chi-square test. What is the p-value?_____
   Do you reject H_0?_____

(d) **State your results**: since you did or did not reject H_0, do you conclude that those variables are related? Be sure to express your results specifically in terms of the variable(s) of interest, and mention to what extent the results match your suspicions in (b).

11. Overall, is there a positive mean difference between the ages of students' fathers and mothers? (I suspect the fathers to be older.)

    (a) What variable or variables are involved? For each variable, tell whether it is quantitative or categorical.

    (b) **Before you even look at the data**, formulate null and alternative hypotheses about the population mean difference μ_d.
    H_0 :
    H_a :
    Do you suspect that there will be enough evidence to reject H_0?_____

    (c) Use **MINITAB Basics Example O** to carry out a paired-sample t procedure, making sure to opt for the correct alternative ($<$, $\neq$, or $>$); include a display of the data. What is the p-value?_____
    Do you reject H_0?_____

    (d) **State your results**: since you did or did not reject H_0, what do you conclude about the unknown population mean difference? Be sure to express your results specifically in terms of the variable(s) of interest, and mention to what extent the results match your suspicions in (b).

12. Can we predict the age of a student's mother, based on the father's age?

    (a) What variable or variables are involved? For each variable, tell whether it is quantitative or categorical. How is this situation different from the situation in problem 11?

    (b) Explain why we may expect the relationship between mother's and father's age to be positive.

    (c) Explain why in this situation there is no clear best choice, in terms of which variable is explanatory and which is response.

    (d) Display the data. Regress mother's age on father's age; test against the **one-sided alternative** $\beta_1 > 0$ and report the value of correlation r _____and the p-value. _____

    (e) Apparently, there is (Circle one:) extremely weak/fairly weak/fairly strong/extremely strong evidence of a (Circle one:) extremely weak/fairly weak/fairly strong/extremely strong relationship between mother's and father's ages.