Name: _____ Andrew ID: _____

Minitab Problems 5-10

Statistical Reasoning 90-707 Dr. Nancy Pfenning

5. Are the lead characters in top grossing movies in the U.S. from the past couple of decades representative of the country's racial distribution? We note that in the year 2010, just about a third (proportion 0.33) of U.S. Census respondents were people of color.

   (a) What variable is involved? Is it quantitative or categorical?

   (b) **Before you even look at the data**, hypothesize whether you believe the race of movie lead roles will be representative of that in the general population. Formulate null and alternative hypotheses to test your suspicions: H_0 :
   H_a :
   Do you suspect that there will be enough evidence to reject H_0?_____

   (c) Use **MINITAB Basics Example S** to find the 95% confidence interval for population proportion of people of color, if we take races of lead roles in the top-grossing 100 movies as our sample. _____
   Test your hypotheses, making sure to opt for the correct alternative: the p-value is _____. Do you reject H_0?_____

   (d) **State your results**: since you did or did not reject H_0, what do you conclude? 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).

6. We will assume that calories for beverage servings have a standard deviation of 50. Based on a sample of fifty items, can we conclude that the population of beverages average less than 60 calories a serving?

   (a) Tell whether the relevant variable is quantitative or categorical.

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

   (c) Use **MINITAB Basics Example N** to carry out a z test, specifying σ and 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?_____
   Give a 95% confidence interval for μ:_____
   (Note: this was automatically provided if your alternative was $\neq$; otherwise, repeat the procedure, this time opting for a one-sided alternative.)

   (d) **State your results**: since you did or did not reject H_0, what do you conclude about the unknown population mean? 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).

7. Does the population of beverages average less than 60 calories a serving? Now we will test our hypothesis on a random sample of just 10 items whose mean and standard deviation are close to those for the larger random sample featured in the preceding problem.

   (a) Tell whether the relevant variable is quantitative or categorical.

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

   (c) Note: When σ is unknown, you should carry out a test of your hypotheses using a t procedure, not z. Use **MINITAB** to carry out the one-sample t procedure, making sure to opt for the alternative that matches your suspicions ($<$, $\neq$, or $>$); include a display of the data. What is the p-value?_____Do you reject H_0?_____
   Give a 95% confidence interval for μ:_____[Note: this was automatically provided if your alternative was $\neq$; otherwise, repeat the t procedure, this time opting for a one-sided alternative.]

   (d) **State your results**: since you did or did not reject H_0, what do you conclude about the unknown population mean? 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).

   (e) Compare your conclusions for this test and the one in the preceding problem; discuss.

8. Is the mean amount of caffeine the same for regular and sugar-free beverages?

   (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 difference $\mu_1 - \mu_2$ between population means for the two groups. [The null hypothesis usually states that this difference is zero.]
   H_0 :
   H_a :
   Do you suspect that there will be enough evidence to reject H_0?_____

   (c) Use **MINITAB Basics Example P** to carry out a two-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 difference between population means? 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).

9. Overall, is there positive or negative mean difference between amount of fat and amount of protein in servings of fast food items? (Or are they the same?)

   (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).

10. In general, will the percentage of global refugees differ for countries whose type of government is classified as authoritarian, flawed democracy, full democracy, or hybrid regime?

    (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 means.
    H_0 :
    H_a :
    Do you suspect that there will be enough evidence to reject H_0?_____

    (c) Use **MINITAB Basics Example R** to carry out an ANOVA procedure; 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 various population means? 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).

    (e) Can you explain why it isn't actually appropriate to use this data set to perform inference?