

A.P. Statistics
Assignment 7.9

Remember to show your thinking through your work.

- 1) Describe in simple terms what a Type I error is (yes, again). In a study of possible iron deficiency in infants, researchers believe that breast feeding children reduces iron deficiency in babies. They compared several groups of infants who were following different feeding patterns.

- 2) Statisticians prefer large samples. Describe briefly the effect of increasing the size of a sample (or the number of subjects in an experiment) on each of the following:
- (a) The width of a level C confidence interval.

- (b) The P -value of a test, when H_0 is false and all facts about the population remain unchanged as n increases.

- 3) A researcher looking for evidence of extrasensory perception (ESP) tests 500 subjects. Four of these subjects do significantly better ($P < 0.01$) than random guessing.
- (a) Is it proper to conclude that these four people have ESP? Explain your answer.

- (b) What should the researcher now do to test whether any of these four subjects have ESP?

- 4) In the past, the mean score of the seniors at South High on the American College Testing (ACT) college entrance examination has been 20. This year a special preparation course is offered, and all 53 seniors planning to take the ACT test enroll

in the course. The mean of their 53 ACT scores is 22.1. The principal believes that the new course has improved the students' ACT scores.

- (a) Assume that ACT scores vary normally with standard deviation 6. Is the outcome $\bar{x} = 22.1$ good evidence that the population mean score is greater than 20? State H_0 and H_a , compute the test statistic and the P-value, and answer the question by interpreting your result.

- (b) The results are in any case inconclusive because of the design of the study. The effects of the new course are confounded with any change from past years, such as other new courses or higher standards. Briefly outline the design of a better study of the effect of the new course on ACT scores.

- 5) The financial aid office of a university asks a sample of students about their employment and earnings. The report says that "for academic year earnings, a significant difference ($P = 0.038$) was found between the sexes, with men earning more on the average. No difference ($P = 0.476$) was found between the earnings of black and white students." Explain both of these conclusions, for the effects of sex and of race on mean earnings, in language understandable to someone who knows no statistics.