Hypothesis testing worksheet

The mean yield of corn in the United States is about 135 bushels per acre. A survey of 40 farmers this year gives a sample mean yield of 138.8 bushels per acre. We want to know whether this is good evidence that the national mean this year is not 135 bushels per acre. Assume that the standard deviation of the population is 10 bushels per acre.

1. State the assumptions needed in order to conduct a hypothesis test:

2. State the null and alternative hypotheses

3. Conduct the test and report the p-value and make a decision using $\alpha = .05$:

4. Are you convinced that the population mean is not 135 bushels per acre? Why?

5. Is your conclusion correct if the distribution of corn yields is somewhat normal? Why?

Every user of statistics should understand the distinction between statistical significance and practical importance. A sufficiently large sample will declare very small effects statistically significant. Let us suppose that SAT mathematics (SATM) scores in the absence of coaching vary Normally with mean 515 and standard deviation 100. Suppose further that coaching may change mu but does not change sigma. An increase in the SATM score from 515 to 518 is of no importance in seeking admission to college, but this unimportant change can be statistically very significant. To see this, calculate the P-value for the test of

$$H_0 : \mu = 515$$
$$H_a : \mu > 515$$

In the following situations:

a) A coaching service coaches 100 students, and their average score is 518:

b) By the next year, the service has coached 1000 students, and their mean is 518:

c) An advertising campaign brings the number of students coached to 10,000, and their average score is still 518:

Calculate 99% confidence intervals for each of the above situations:

a)

b)

c)