STATISTICS 20 Practice Midterm 2

There are 4 questions, worth a total of 14 points. Most explanations require only 1 or 2 sentences. On calculations, show your work.

1. [2 points] It is often asserted that the average body temperature of healthy people is 98.6^oF. As part of a medical study of 93 healthy people, their temperatures were measured and found to have an average of 98.12^oF and a s.d. of 0.63^oF. Assuming these 93 people were a simple random sample of all healthy people, what does this data tell us about the original assertion?

2. [4 points] There are about 25,000 high schools in the U.S.A. Each has one principal. As part of a national survey of education, a simple random sample of 225 high schools is chosen.
(a) In 202 of the sampled high schools, the principal has an advanced degree. If possible, find a 95% confidence interval for the percentage of all high school principals who have an advanced degree.
(b) The 25,000 high schools employ a total of about 1 million teachers. The 225 sampled schools employed a total of 10,000 teachers, of whom 5,010 had advanced degrees. If possible, find a 95% confidence interval for the percentage of all high school teachers who have an advanced degree.

[If either or both are impossible to do with the information given, explain why]

3. [3 points] Freshmen at public universities work for pay 12.2 hours a week, on average, with a s.d. of 10.5 hours; at private universities, the average is 9.2 hours and the s.d. is 9.9 hours. Assume this data comes from two independent simple random samples of size 1,000 each.
(a) Is the difference real, or could it just be chance?
(b) If the difference seems real, what might explain it?

4. [5 points]. Comment briefly on the following three examples of statistical reasoning (no calculations required).

(a) In 1960 the U.S. population was 179 million, of whom 11.3% were under the age of 5 years. In 1970 the population had increased to 203 million, of whom 8.3% were under the age of 5 years. The figures are based on the Census, which you may assume is a complete count of the population. A statistician does a 2-sample z-test, and concludes that the difference between the 1960 and 1970 percentages is "highly statistically significant".

(b) You buy a new sports car, and are eager to test its performance. Finding an empty stretch of freeway, you make a series of accelerations from 0 to 80 mph and measure the time (in seconds) taken.

10.0, 9.1, 8.7, 8.4, 10.8, 8.2, 8.0, 7.9, 7.9 (ave = 8.77, s.d. = 1.02)

before being arrested by the Highway Patrol. While waiting for your parents to post bail, you figure

SE for ave $= \frac{\sqrt{9} \times 1.02}{9} = 0.34$

95% confidence interval for (ave time accelerate) $= 8.77 \pm 0.68$ seconds.

(c) An investigator in the Statistics Dept of a large university is interested in the effect of exercise in maintaining mental ability. The investigator decides to study the faculty members aged 40-50 at the university, looking separately at two groups: those who exercise regularly, and those who don't. There are several hundred people in each group, so a simple random sample of 25 persons is chosen from each group. Part of the study involves a standardized test of mental ability, which has the following results.

.	regular exercise	no regular exercise
sample size	25	25
average score	132	121
s.d. of scores	15	15

According to a 2-sample z-test, the difference is highly statistically significant. The investigator concludes that regular exercise does indeed help to maintain mental ability, at least among faculty members aged 40-50 at that University.