STATISTICS
SECTION I
Question 1
Spend 25 minutes on this part of the exam.
Percent of Exam Weight – 55

Directions: Show all your work. Indicate clearly the methods you use, because you will be scored on the correctness of your methods as well as on the accuracy and completeness of your results and explanations.

AP Statistics Formula Sheet: You may print and access the formula sheet during this exam. (https://apcoronavirusupdates.collegeboard.org/media/pdf/formula-sheet-and-tables-2020.pdf)

1. The goal of a nutritional study was to compare the caloric intake of adolescents living in rural areas of the United States with the caloric intake of adolescents living in urban areas of the United States. A random sample of ninth-grade students from one high school in a rural area was selected. Another random sample of ninth graders from one high school in an urban area was also selected. Each student in each sample kept records of all the food he or she consumed in one day.

    The back-to-back stemplot below displays the number of calories of food consumed per kilogram of body weight for each student on that day.

```
        Urban           Rural

  9 9 9 9 8 8 7 6 | 2 |
        4 4 3 1 0 | 3 | 2 3 3 4
        9 7 6 6 5 | 3 | 5 6 6 6 7
              2 0 | 4 | 0 2 2 2 4
                  | 4 | 5 6 8 8 9
                  | 5 | 1
```

                                        Stem: tens
                                        Leaf: ones

    (a) Write a few sentences comparing the distribution of daily caloric intake of ninth-grade students in the rural high school with the distribution of the daily caloric intake of ninth-grade students in the urban high school.

(b) Is it reasonable to generalize the findings of this study to all rural and urban ninth-grade students in the United States? Explain.

(c) Researchers who want to conduct a similar study are debating which of the following two plans to use:

> **Plan I:**
> Have each student in the study record all the food he or she consumed in one day. Then researchers would compare the number of calories of food consumed per kilogram of body weight for each student for that day.

> **Plan II:**
> Have each student in the study record all the food he or she consumed over the same 7-day period. Then researchers would compute the average daily number of calories of food consumed per kilogram of body weight for each student during that 7-day period.

Assuming that the students keep accurate records, which plan, I or II, would better meet the goal of the study? Justify your answer.

Assume the conditions for inference have been met. Researchers want to determine if there is a difference in the caloric intake of adolescents living in rural areas compared to adolescents living in urban areas. A test of significance will be conducted at a significance level of α = 0.05 for the following hypotheses:

$$H_0: \mu_1 - \mu_2 = 0$$

$$H_a: \mu_1 - \mu_2 \neq 0,$$

where μ_1 is the true mean caloric intake of adolescents in rural schools and μ_2 is the true mean caloric intake of adolescents in urban schools.

(d) The researchers calculated the p-value of the test to be 0.000052. What does this p-value lead you to conclude?

(e) Describe what a Type II error would be in the context of this study and also describe a consequence of making this error.