

**MIDTERM EXAM I**  
**(80 points)**

Name \_\_\_\_\_

**Read each question carefully.** Write your work and answers on this test paper or, if you prefer, you may attach printed sheets to this test paper. If you need more space to write, you may continue your answer on the reverse but please indicate that you have done so. You may use resources including SPSS, applets, and your books and notes.

- 1) **(15 points)** Most people think that the “normal” adult body temperature is  $98.6^{\circ}\text{F}$ . That figure was recently challenged in a research article that said that a more accurate figure for the mean is  $98.2^{\circ}\text{F}$  with a standard deviation of  $0.7^{\circ}\text{F}$ . Assume these new findings are correct and that body temperatures have a Normal distribution to answer the questions below:
- a) What fraction of people would be expected to have body temperatures below  $98.6^{\circ}\text{F}$ ?
- b) Find the lower and upper quartiles of body temperatures using the information provided. (Hint: What proportion of all temperatures fall below the lower quartile? above the upper quartile?)

**Question 1) continued...**

- c) A feverish K student on study abroad goes to a rural clinic to have his temperature checked. Knowing that the K student might not know the Celsius scale but would certainly know statistics (☺), the doctor tells him that his standardized temperature is  $Z=3.22$ . What is his temperature in degrees Fahrenheit?

- 2) (20 points) Read the following brief report of a research study and answer the questions that follow:

After menopause many women take supplemental estrogen. There is some concern that if these women also drink alcohol, their estrogen levels will rise too high. Twenty-four volunteers, 12 who were receiving supplemental estrogen and 12 who were not, were randomly divided into two groups. One group drank an alcoholic beverage and the other group drank a nonalcoholic beverage. An hour later everyone's estrogen level was checked. Only those on supplemental estrogen who drank alcohol showed a marked increase.

- a) Explain briefly but specifically why this study fits the definition of an experiment.

- b) Identify the factor(s) and factor levels in this experiment.

- c) Identify the treatment(s) in this experiment.

Question 2) continued...

d) What is the response variable measured in the experiment?

e) Identify the experimental design by name and sketch a diagram of the experiment.

- 3) (15 points) Read the following brief report of a statistical study and answer the questions that follow:

A question posed on the Lycos Web site on June 18, 2000 asked visitors to the site to say whether they thought that marijuana should be legally available for medicinal purposes.

- a) Identify the sampling method employed and say whether it is a probability or non-probability method.
- b) What is the sample?
- c) Identify by name one potential source of bias and explain why it would make it difficult to generalize to the population of U.S. adults 18 and over.

- 4) (30 points) The SPSS data set `tbirths.sav` stored in the SPSS data sets directory (accessed from the course webpage) contains year 2002 teen birth rates for 21 states categorized by region: 1) Nine (9) Northeastern states (NE) and 2) Twelve (12) Southern states (SO) respectively. Below is a table containing information from the data set:

Teen Birth Rates (number of births per 1000 females age 15-19)			
Northeastern States (NE)		Southern States (SO)	
State	Rate	State	Rate
Connecticut	25.8	Alabama	54.5
Maine	25.4	Delaware	46.3
Massachusetts	23.3	Florida	44.5
New Hampshire	20.0	Georgia	55.7
New Jersey	26.8	Kentucky	51.0
New York	29.5	Maryland	35.4
Pennsylvania	31.6	Mississippi	64.7
Rhode Island	35.6	North Carolina	52.2
Vermont	24.2	South Carolina	53.0
		Tennessee	54.3
		Virginia	37.6
		West Virginia	45.5

- a) A portion of a stemplot comparing the two regions is given below. Please complete the table by adding the data representing the Northeastern states following the rules used for the Southern states.

Northeastern (NE)		Southern (SO)
	2	
	2	
	3	
	3	58
	4	
	4	566
	5	1234
	5	56
	6	
	6	5

- b) Write down the 5-number summary for the Northeastern states by inspecting the data and stemplot (not using SPSS).

**Question 4) continued...**

- c) For the Northeastern States, find the “upper fence” used in outlier detection ( $1.5 \times IQR$  rule) and say whether you find any states that are outliers because of extraordinarily high teen birth rates.
- d) Explain why a stemplot is preferable to a histogram for comparing the birth rates of the two regions for this data set.
- e) How are teen birth rates related to region? Give a complete answer as illustrated in class, using **the 4-step process** in reporting your work. You may, however, explicitly reference earlier parts of this problem, where appropriate, to support your answer.

Use this page to continue your answer to Question 4.