

General Instructions:

All work must reflect individual work, be completed on separate paper and attached to the rear of the Assessment packet. The cover page should be filled out completely. Work for multiple choice questions is advised, though not always necessary. The Free-Response and Investigative Tasks typically require a considerable amount of writing. It is advised that the reading packets are not used for reference during an assessment, however it is permissible.

A TI-83 or TI-84 calculator is ALWAYS permitted.

Student Name: _____

Date Completed: ____ / ____ / 2008

Time Begin: _____

Time Start: _____

Postmark Deadline: 15 August 2008

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Chapter 4 Assessment

MULTIPLE-CHOICE QUESTIONS

Use the following information to answer questions 1–3.

A personnel director at a large company studied the eating habits of employees by watching the movement of a selected group of employees at lunchtime. The purpose of the study was to determine the proportion of employees who buy lunch in the cafeteria, bring their own lunches, or go out to lunch.

1. The study would best be categorized as:
 - (A) a census.
 - (B) a survey sample.
 - (C) an observational study.
 - (D) a designed experiment.
 - (E) none of these.
2. If the director includes only the employees in one department in her study, she is performing a
 - (A) simple random sample.
 - (B) quota sample.
 - (C) convenience sample.
 - (D) multi-stage cluster sample.
 - (E) census.
3. If the director selects 50 employees at random from throughout the company and categorizes their lunchtime practices by gender, she is:
 - (A) blocking for gender.
 - (B) testing for a lurking variable.
 - (C) promoting sexual harassment.
 - (D) testing for bias.
 - (E) none of these.

4. Which of the following is *not* a concern in data collection?
- (A) lurking variables
 - (B) blocking
 - (C) bias
 - (D) non-response
 - (E) All of these are concerns.
5. You have been given the task of determining if right-handed persons have stronger right hands than left hands. A sample of 10 right-handed persons is selected randomly. Which of the following designs would be most appropriate for this study?
- (A) an observational study.
 - (B) a design blocked for gender to determine if right-hand strength differs by gender.
 - (C) a matched pair blocked experiment in which each subject represents a block wherein the strength of the right hand and the left hand is measured in random order.
 - (D) five of the subjects are randomly placed in the control group and the other in the treatment group. All are tested and the results of each group are compared.
 - (E) None of these is appropriate.

Use the following information to answer questions 6–8.

An insurance company conducted a study to determine the percent of cardiologists who had been sued for malpractice during the past five years.

6. The variable of interest is:
- (A) the doctor's specialty, e.g. cardiology, obstetrics, etc.
 - (B) the number of doctors who are cardiologists.
 - (C) all cardiologists in the American Medical Association directory.
 - (D) a random sample of 100 cardiologists.
 - (E) none of these.
7. The population of interest is:
- (A) the set of all doctors who were sued for malpractice.
 - (B) the set of cardiologists who were sued for malpractice.
 - (C) all doctors.
 - (D) all cardiologists.
 - (E) all doctors who have malpractice insurance.

8. Which of the following could be used to gather the data?
- (A) a designed experiment
 - (B) a census of all cardiologists
 - (C) an observational study of randomly selected cardiologists
 - (D) a survey sent to randomly selected cardiologists
 - (E) any answer except (A).
9. Which of the following is *not* a valid sample design?
- (A) Code every member of a population and select 100 randomly chosen members.
 - (B) Divide a population by gender and select 50 individuals randomly from each group.
 - (C) Select individuals randomly and place into gender groups until you have the same proportion in the groups as in the population.
 - (D) Select five homerooms at random from all of the homerooms in a large high school.
 - (E) All of these are valid.
10. Which of the following is *not* a source of bias in sample surveys?
- (A) non-response
 - (B) wording of questions
 - (C) voluntary response
 - (D) use of a telephone survey
 - (E) All are sources of bias.
11. Which of the following is *not* a requirement of a valid sampling technique?
- (A) All members of the population are coded.
 - (B) There is a definite procedure for selecting participants in the sample.
 - (C) The interviewer has no choice in the selection of whom they interview.
 - (D) The procedure for selection involves the use of probability.
 - (E) All of these are required.
12. Which of the following is *not* a requirement of a controlled experiment?
- (A) control
 - (B) comparison
 - (C) replication
 - (D) randomization
 - (E) All of these are required.

13. A randomized block design is *not*
- (A) similar to a stratified random sample for surveys.
 - (B) a strategy to control for an influence that would affect the outcome of the experiment.
 - (C) a strategy that depends on randomization.
 - (D) only used for gender comparisons.
 - (E) All of these describe a randomized block design.

Use the following information to answer questions 14 and 15.

A research team wished to compare performance in AP Statistics based on whether the students were taught using activity-based or traditional lecture methods. The final grades in AP Statistics for 500 students were collected.

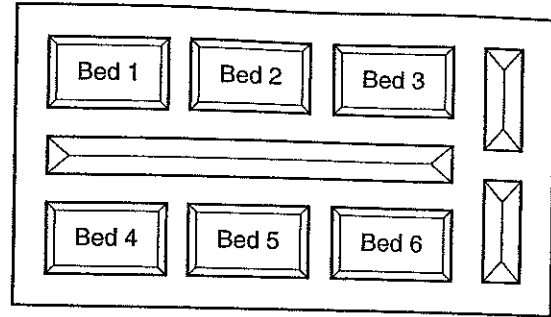
14. The population of interest is:
- (A) the 500 students chosen.
 - (B) the students taught by activity-based methods.
 - (C) the students taught by traditional lecture methods.
 - (D) all students in high school.
 - (E) none of these.
15. An appropriate design for the study is:
- (A) a blocked designed experiment.
 - (B) a stratified random sample.
 - (C) a completely randomized design.
 - (D) a simple random sample.
 - (E) none of these.

FREE-RESPONSE QUESTIONS

Open-Ended Questions

1. A survey is to be conducted in your high school. There is to be a total of 40 students in the sample. Describe how you would choose the participants if:
- a. there are to be the same number of freshmen, sophomores, juniors, and seniors in the sample.
 - b. there are to be the same number of males and females in the sample.
 - c. there are no restrictions on the choice of the participants.

2. A hothouse for young plants has immovable planting beds and artificial lights as indicated in the figure below:



A new quick-grow fertilizer is to be tested in the hothouse. The treatment group is administered the new fertilizer while the control group receives the traditional fertilizer. All other conditions (cultivating, water, and so on) are applied uniformly to both groups of beds. Describe how you would assign the beds to the treatment and control group so that the amount of light does not confound the result. Also discuss the consequences of your design relative to the analysis of data.

Investigative Tasks

1. The following table lists the heights in inches of all 80 of the 8th graders in a suburban middle school:

65	63	58	67	71	56	64	64	63	65
66	70	51	55	57	64	63	69	59	60
62	62	67	66	64	63	72	68	66	63
62	65	56	59	66	68	62	61	58	59
66	67	65	64	66	69	70	70	68	65
63	65	67	68	69	69	71	72	55	58
61	64	68	65	66	69	59	70	70	60
60	65	68	67	63	61	58	68	65	69

Assume that each data value is coded by its position in the list such that the heights in the first row are coded 1 – 10, in the second row 11 – 20, etc.

- a. Perform a simple random sample of 10 heights from this population 5 times using a table of random digits or technology. In each case, list the coding number and the value for each element in the sample.

SAMPLE 1

Code
Value

SAMPLE 2

Code
Value

SAMPLE 3

Code
Value

SAMPLE 4

Code
Value

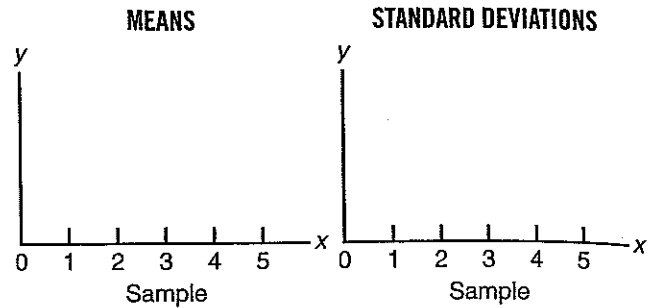
SAMPLE 5

Code
Value

- b. Calculate the mean and standard deviation of the heights in each sample.

Sample	Mean	Standard Deviation
1		
2		
3		
4		
5		

- c. Plot the results of part b.



- d. What information do your graphs provide regarding the nature of the distribution of means and standard deviations of all possible samples of 10 heights from the population? Explain your answer.

2. A medical researcher is interested in testing a new medicine for migraine headaches. She decides to conduct a clinical trial on 100 randomly selected adults who get migraine headaches at a rate of one per week or more. Although age and gender are not of primary interest in the trials, the researcher is concerned that these factors may impact the effectiveness of the drug.

- Describe how she should set up her experiment for the 100 subjects without considerations of age and gender. (A graphic is an acceptable answer.)
- Describe how she should set up her experiment for the 100 subjects if she wishes to control for gender. (A graphic is an acceptable answer.)
- Describe how she should set up her experiment for the 100 subjects if she wishes to control for age. She decides on age categories of young (21–35), middle (36–55) and elderly (over 55). (A graphic is an acceptable answer.)
- Describe how she should set up her experiment for the 100 subjects if she wishes to control both for age and gender. (A graphic is an acceptable answer.)

Review Exercises

FREE-RESPONSE QUESTIONS

Open-Ended Questions

1. Suppose that the probability of finding a special prize in a box of popcorn is .35. Describe how you would set up a simulation to answer each of the following questions:
 - a. What is the probability that of 10 boxes randomly selected, only one will contain the special prize?
 - b. How many boxes of popcorn would you expect to have to buy in order to get a box with a special prize?

2. It has been determined that a mining company will find gold in 10% of the mines that they dig after they complete their geological research. Describe how you would design a simulation that will address each of the following probabilities.

- a. What is the probability that 2 mines out of the next 20 dug will strike gold?
- b. How many mines would you expect will have to be dug so that the company finds 2 that contain gold?

(This is a problem whose exact solution is not part of the AP Statistics curriculum. However, the exact solution can be approximated with simulation.)

Use this random digit table to answer questions 3 and 4

9435974025	9083188611	4668782925	1470195054	0580964187
3381121120	4399198753	3936252594	9546634112	0034026187
9807010099	5189983326	2209784733	3694814382	0078387869
9351587791	1080114624	0062633066	5489861799	8555803142
9770842465	2783088265	2752142947	1217901355	0525898067
2237931570	1256556214	2111829173	0763515019	7220777198
2881701368	3781148461	8123118520	5080954298	4662442672
4532817630	1745017524	9276426494	6183977490	5219829504
2790944111	3850776965	4332199854	0887976326	2867533123
2844570857	3714719971	7769219809	2028398363	8516117032

3. Studies indicate that the proportion of women in management positions of companies in a particular industry is .3. A watchdog group has found that the proportion of women at a local company that has 250 employees is only .2. The company claims that this is not an unusual proportion. The watchdog organization decides to run a simulation to determine how likely it is that a company has only 20% female managers when the expectation is 30%.
 - a. Would you choose a standard simulation or a wait-time simulation? Explain the reasons for your answer.
 - b. Describe the method of assignment of numbers to this situation so that the random digits table given above can be used in the simulation.
 - c. Show using only the first four rows of the random digits table above how your simulation operates.
 - d. Use the results of your simulation to determine the probability that a company has only 20% female managers when the industry standard is 30%. Explain your calculations.
4. A manufacturer of sound systems claims that their best model will fail during customer events only 5% of the time when installed by the manufacturer's technicians. Your school is thinking about buying the best model but would like you to run a simulation to estimate how many events will occur before the system fails twice.
 - a. Would you choose a standard simulation or a wait-time simulation? Explain the reasons for your answer.
 - b. Describe the method of assignment of numbers to this situation so that the random digits table given above can be used in the simulation.
 - c. Show using only the *last* four rows of the random digits table above how your simulation operates.
 - d. Use the results of your simulation to determine the number of events that must occur before the system fails twice. Explain your calculations.