

JULY 2023

MARKS: 100

TIME: 3 HOURS

INSTRUCTIONS: Answer any **four** questions.

Where necessary, illustrate your answers with diagrams.

Question 1

Read the following study and answer the questions.

A baking company selected 36 women weighing different amounts and randomly assigned them to four different groups. The four groups were white bread only, brown bread only, low-fat white bread only, and low-fat brown bread only. Each group could eat only the type of bread assigned to the group. The study lasted for eight weeks. No other changes in any of the women's diets were allowed. A trained evaluator was used to check for any differences in the women's diets. The results showed that there were no differences in weight gain between the groups over the eight-week period.

- (a) Did the researchers use a population or a sample for their study? [3]
- (b) Based on who conducted this study, would you consider the study to be biased? Justify your answer fully. [5]
- (c) Which sampling method do you think was used to obtain the original 36 women for the study? Explain [5]
- (d) Which sampling method would you use? Why? [5]
- (e) How would you collect a random sample for this study? [5]
- (f) Why should random numbers be used when you are selecting a random sample? [2]
- [25]**

Question 2

- A.** What is the level of measurement for each of the following variables? (*DO NOT RE-WRITE THE SENTENCE*)
- i.** Student IQ ratings. [3]
 - ii.** Distance students travel to class. [3]
 - iii.** The jersey numbers of a sorority soccer team. [3]
 - iv.** A student's state of birth. [3]
 - v.** A student's academic class—that is, freshman, sophomore, junior, or senior. [4]
 - vi.** Number of hours' students study per week. [3]

B. For each of the following, determine whether the group is a sample or a population. (*DO NOT RE-WRITE THE SENTENCE*)

- i. The participants in a study of a new cholesterol drug. [2]
 - ii. The drivers who received a speeding ticket in Kansas City last month. [2]
 - iii. People on welfare in Cook County (Chicago), Illinois. [2]
 - iv. The 30 stocks that make up the Dow Jones Industrial Average. [2]
- [25]**

Question 3

Colorado, plans to conduct a study of how much a beginning skier spends on his or her initial purchase of equipment and supplies. Based on these figures, it wants to explore the possibility of offering combinations, such as a pair of boots and a pair of skis, to induce customers to buy more. A sample of 44 cash register receipts revealed these initial purchases:

Table 3: Cash Register Receipts

\$140	\$82	\$265	\$168	\$90	\$114	\$172	\$230	\$142
86	125	235	212	171	149	156	162	118
139	149	132	105	162	126	216	195	127
161	135	172	220	229	129	87	128	126
175	127	149	126	11	118	172	126	

- a. With an interval of \$35, construct a 6-class frequency table, using lower class limit of \$70. The frequency table should display class limits, boundaries and frequencies. [15]
 - b. Construct an Ogive Curve for the data. [5]
 - c. Use the frequency table/Ogive curve to interpret your findings in relation to the range as well as the concentration of purchases. [5]
- [25]**

Question 4

Consider the following data:

Table 4: Applewood Auto Group Vehicle Profit Data

Profit	Frequency
200-600	8
600-1000	11
1000-1400	23
1400-1800	38
1800-2200	45
2200-2600	32
2600-3000	19
3000-3400	4

Determine the following per vehicle.

- (a) Arithmetic mean profit [3]
- (b) Median [3]
- (c) Mode [3]
- (d) Standard Deviation [10]
- (e) In June, an investor purchased 300 shares of Oracle (an information technology company) stock at \$20 per share. In August, she purchased an additional 400 shares at \$25 per share. In November, she purchased an additional 400 shares, but the stock declined to \$23 per share. What is the weighted mean price per share? [6]
[25]

Question 5

Jamestown Steel Company manufactures and assembles desks and other office equipment at several plants in western New York State. The weekly production of the Model A325 desk at the Fredonia Plant follows a normal probability distribution with a mean of 200 and a standard deviation of 16. Recently, because of market expansion, new production methods have been introduced and new employees hired. The vice president of manufacturing would like to investigate whether there has been a change in the weekly production of the Model A325 desk. Is the mean number of desks produced at the Fredonia Plant different from 200 at the .01 significance level?

- (a) State the hypothesis and explain whether or not it is a one/two-tailed test. [8]
- (b) Find the critical value [2]
- (c) Compute the test value [10]
- (d) Interpret the result and make a decision. [5]
[25]

Question 6

A recent article in Bloomberg Businessweek listed the “Best Small Companies.” We are interested in the current results of the companies’ sales and earnings. A random sample of 12 companies was selected and the sales and earnings, in millions of dollars, are reported below.

Table 6: Sales and Earnings of Best Small Companies in (\$ Millions)

Company	Sales (\$ millions)	Earnings (\$Millions)
Papa John’s International	89.2	4.9
Checkmate Electronics	17.5	2.6
Applied Innovation	18.6	4.4
Royal Grip	11.9	1.7
Integracare	18.2	1.3
M-Wave	19.6	3.5
Wall Data	71.7	8.0
Serving-N-Slide	51.2	8.2
Davidson & Associates	58.6	6.0
Chico’s FAS	48.6	4.1
Cobra Golf	69.2	12.8

Let sales be the independent variable and earnings be the dependent variable.

- i. Compute the correlation coefficient. [8]
- ii. Determine the regression equation and describe the relationship. [10]
- iii. Draw a scatter graph and fit in the regression line. [5]

- iv. For a small company with \$50.0 million in sales, estimate the earnings. [2]
[25]