Chapter 2: Frequency Distributions

Chapter Outline

2.1 Frequency Distributions and Frequency Distribution Tables
- Frequency Distribution Tables
- Proportions and Percentages

2.2 Grouped Frequency Distribution Tables
- Real Limits and Frequency Distributions

2.3 Frequency Distribution Graphs
- Graphs for Interval or Ratio Data (Histograms and Polygons)
- Graphs for Nominal or Ordinal Data (Bar Graphs)
- Graphs for Population Distributions (Relative Frequencies and Smooth Curves)
- The Shape of a Frequency Distribution

Learning Objectives and Chapter Summary

1. Students should understand the concept of a frequency distribution as an organized table showing the number of scores observed in each category on a scale of measurement.

> Note that one goal of descriptive statistics is to organize research results so that researchers can see what happened. Also note that a frequency distribution does not simply summarize the scores but rather shows the entire set of scores.

2. Students should be able to organize data into a regular or a grouped frequency distribution table, and understand data that are presented in a table, including calculating ΣX, ΣX^2, and proportions and percentages of each group or score.

> If scores are presented in a regular table, students should be able to retrieve the complete list of original scores.
>
> The purpose for a grouped table is to keep the presentation relatively simple, organized, and easy to understand. The guidelines for constructing a grouped table are intended to help make the results simpler and easier to understand. Note, however, that after the scores have been put into a grouped table, individual scores are lost.

3. Students should be able to organize data into frequency distribution graphs, including bar graphs, histograms, and polygons, and identify when each type of graph should be used. Also, students should be able to understand data that are presented in a graph.

> Bar graphs (those with space between bars) are used to display data from nominal and ordinal scales. Polygons and histograms are used for data from interval or ratio scales. If scores are presented in a frequency distribution graph, students should be able to retrieve the complete list of original scores.

4. Students should understand that most graphs of population distributions are drawn with smooth curves showing relative proportions rather than absolute frequencies.

5. Students should be able to identify the shape of a distribution shown in a frequency distribution graph. Students should recognize symmetrical distributions (including but not limited to normal distributions) and skewed distributions (both positive and negative).

Other Lecture Suggestions

1. Begin with an unorganized list of scores as in Example 2.1, and then organize the scores into a table. Using a set of 20 or 25 scores will make it easier to compute proportions and percentages for the data set.

2. Present a relatively simple, regular frequency distribution table (for example, use scores of 5, 4, 3, 2, and 1 with corresponding frequencies of 1, 3, 5, 3, 2). Ask students to determine the values of N and ΣX for the scores. Note that ΣX can be obtained two different ways: 1) by multiplying each X value by its frequency and summing those products, or 2) by retrieving the complete list of individual scores and computing the sum while working outside the table.

Next, ask students to determine the value of ΣX^2. You probably will find a lot of wrong answers from students who are trying to use the fX values within the table. The common mistake is to compute $(fX)^2$ and then sum these values. This does not work because each score must be squared separately. You might advise students that whenever it is necessary to do complex calculations with a set of scores, the safest method is to retrieve the list of individual scores from the table before you try any computations.

3. It sometimes helps to make a distinction between graphs that are being used in a formal presentation and sketches that are used to get a quick overview of a set of data. Graphs used in formal presentations should be drawn precisely with appropriately sized and labeled axes so they can be understood without any outside explanation. In contrast, a sketch intended for your own personal use can be much less precise. As an instructor, if you are expecting precise, detailed graphs from your students, you should be sure that they know your expectations.

Answers to Even-Numbered Problems

2.

X	*f*	*p*	*%*
8	2	0.10	10%
7	3	0.15	15%
6	3	0.15	15%
5	4	0.20	20%
4	5	0.25	25%
3	2	0.10	10%
2	0	0	0%
1	1	0.05	5%

4. a. $n = 12$
   b. $\Sigma X = 93$
   c. $\Sigma(X - 1) = 81$

6. a. An interval width of 5 points would require around 9 intervals.
   b.

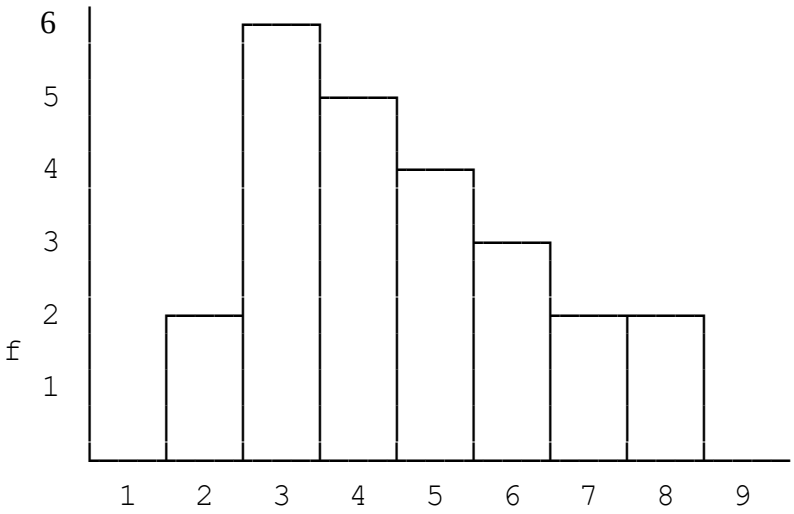
X	*f*
45-49	1
40-44	4
35-39	3
30-34	4
25-29	3
20-24	4
15-19	2
10-14	2
5-9	1

8. A regular table reports the exact frequency for each category on the scale of measurement. After the categories have been grouped into class intervals, the table reports only the overall frequency for the interval but does not indicate how many scores are in each of the individual categories.

10. a.

X	*f*
8	2
7	2
6	3
5	4
4	5
3	6
2	2

b.



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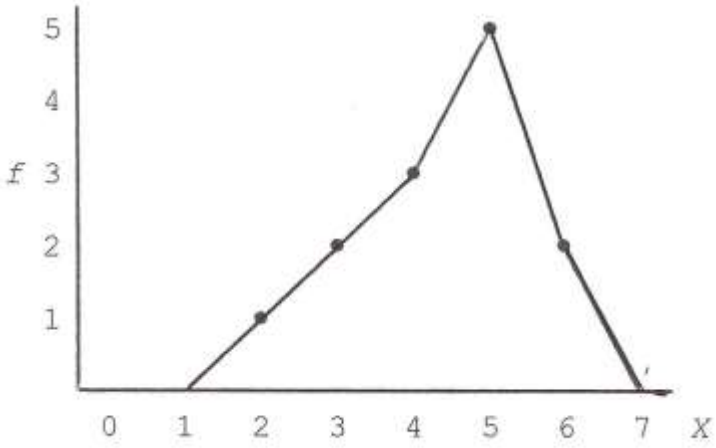


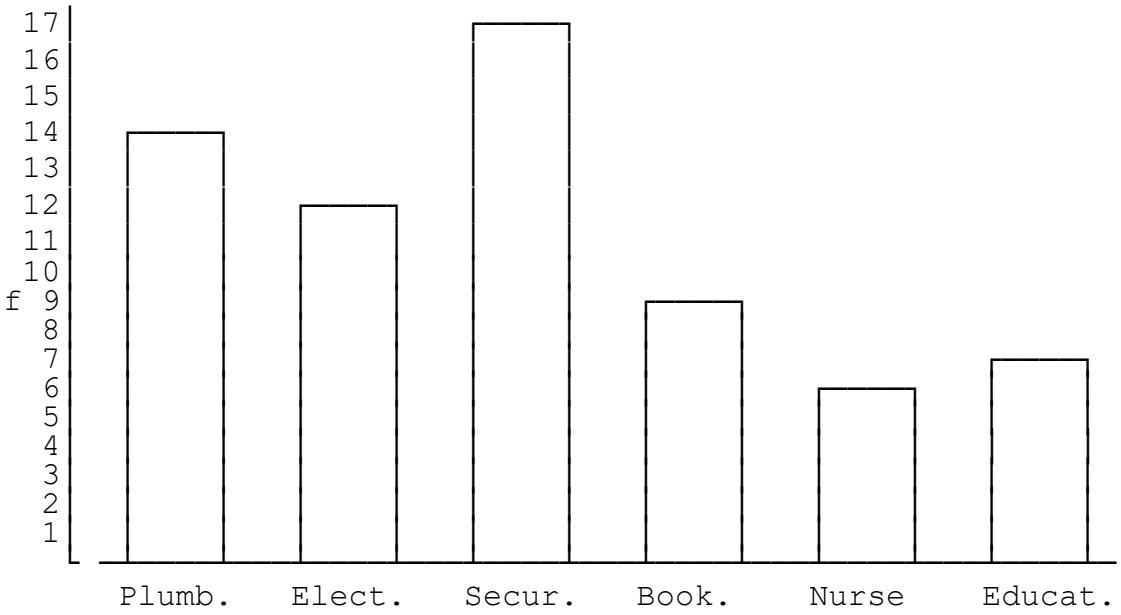
12.

14.

X	*f*	
15	2	The scores pile up at the high end of the scale. The distribution is negatively
14	5	skewed.
13	4	

12	3
11	2
10	1
9	1

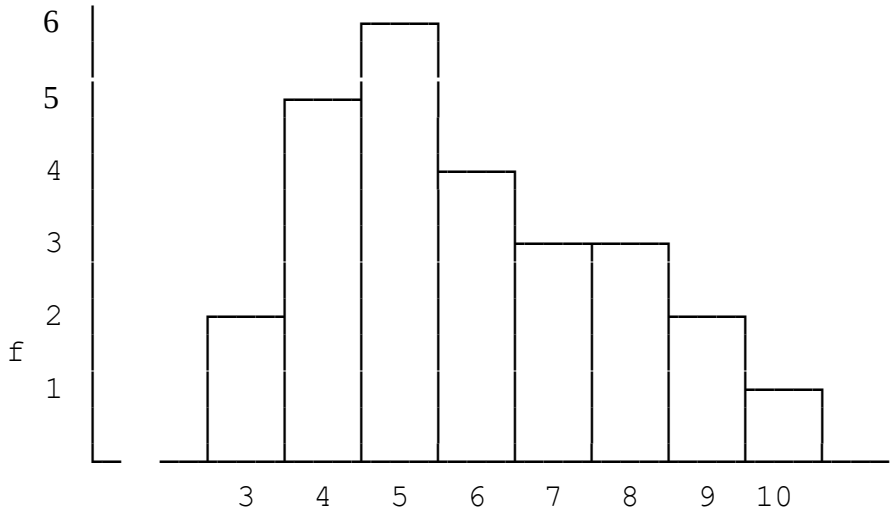
16. A bar graph is appropriate for data measured on a nominal scale.



18. a.

X	*f*
10	1
9	2
8	3
7	3
6	4
5	6
4	5
3	2

b.



c. The distribution is positively skewed. The average score is around 5 or 6. Most of the scores are clustered within 1 or 2 points of $X = 6$.

20.

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