CHAPTER 9    Quiz                           Name:

1. What is the purpose of a plot, graph, or picture of data?
   ANSWER: TO GIVE YOU A QUICK VISUAL SUMMARY OF THE DATA THAT IS
   MORE INFORMATIVE THAN LOOKING AT A COLLECTION OF NUMBERS.

2. Name three basic characteristics that a good plot, graph, or picture of data should exhibit.
   ANSWER: ANY 3 OF THE FOLLOWING: 1) DATA SHOULD STAND OUT CLEARLY; 2)
   LABELING SHOULD BE COMPREHENSIVE AND CLEAR; 3) A SOURCE SHOULD BE
   GIVEN FOR THE DATA; AND 4) AS LITTLE “CHART JUNK” AS POSSIBLE.

For Question 3, use the following narrative
Narrative: Lottery dollar
Suppose you came across the following graph in the paper, accompanied by an article on where each dollar spent on lottery tickets goes.

![Where Your Lottery Dollar Goes](image)

3. {Lottery dollar narrative} This graph has a problem, according to the four characteristics that any good graph should have. What is the problem with this graph?
   ANSWER: THERE IS NO SOURCE GIVEN FOR THE DATA.

4. Which of the following is not a characteristic of a good plot, graph, or picture of data?
   a. A source must be given for the data.
   b. The picture should contain as much information, color, and extra material as possible to keep readers interested.
   c. The labels should be clear and informative.
   d. All of the above are good characteristics of a good plot, graph, or picture of data.
   ANSWER: B

5. Which of the following is not true about the plots, graphs, or pictures of data that you come across in the media?
   a. Most of these pictures can give you a clear, quick visual summary of that data.
   b. One purpose is to convey a message more quickly than if you had to study the data on your own.
   c. Very few of the pictures are misleading because they are checked for accuracy and fairness before being presented.
   d. None of the above.
   ANSWER: C
6. Which of the following should be indicated by the labels on a graph?
   a. The title or purpose of the picture.
   b. What each of the axes, bars, pie segments, etc., denotes.
   c. The scale of each axis, including starting points.
   d. All of the above.
   ANSWER: D

7. What is one advantage of a bar graph over a pie chart?
   ANSWER: A BAR GRAPH IS MUCH MORE VERSATILE. IT CAN BE USED TO
   REPRESENT ACTUAL FREQUENCIES INSTEAD OF PERCENTAGES, AND TO
   REPRESENT PROPORTIONS THAT ARE NOT REQUIRED TO SUM TO 100%.

8. It is easy to be misled by pictograms. Explain how.
   ANSWER: TO AVOID DISTORTING THE PICTURES, THE HEIGHTS ARE OFTEN PUT
   IN PROPER PROPORTION, BUT THEN THE AREAS BECOME INFLATED,
   MISLEADING THE READER.

9. What type of data situation is best for using a pie chart (discuss type of data and number of
   variables)?
   ANSWER: ONLY ONE CATEGORICAL VARIABLE.

10. The focus of each type of data picture for categorical data is conveying information about the relative
    size of groups compared to each other. Explain what is meant by ‘relative size.’
    ANSWER: THE PERCENTAGE OF THE WHOLE THAT FALLS INTO EACH GROUP
    (COMPAORED TO JUST THE NUMBER IN EACH GROUP).

11. Which of the following is not a type of picture for organizing categorical data?
    a. A pie chart.
    b. A bar graph.
    c. A pictogram.
    d. A histogram.
    ANSWER: D

12. The following is an example of what type of data picture?

   Where Your Lottery Dollar Goes*

   Prizes 50¢
   Education 38¢
   Lottery Operations 2.8¢
   Advertising 1.6¢
   Retailers 5.5¢
   Ticket Providers 2.1¢
   *Through fiscal year 2001-02

   a. A pie chart.
   b. A bar graph.
   c. A pictogram.
   d. A line graph.
   ANSWER: A
13. The following is an example of what type of data picture?

- a. A pie chart.
- b. A bar graph.
- c. A pictogram.
- d. A line graph.

**ANSWER:** B

14. Which of the following is not possible to include on a bar graph?

- a. Frequency in each category for a categorical variable.
- b. Information representing two or three categorical variables simultaneously.
- c. Proportions that are not required to sum to 100%.
- d. All of the above are possible with a bar graph.

**ANSWER:** D

15. A ______ can be used to represent two or three categorical variables simultaneously.

**ANSWER: BAR GRAPH**

16. A ______ is like a bar graph except that it uses pictures related to the topic of the graph.

**ANSWER: PICTOGRAM**

17. Name three types of statistical pictures that are used to represent measurement data.

**ANSWER: ANY 5 OF THE FOLLOWING ARE OK: 1) HISTOGRAM; 2) STEMPLOT; 3) LINE GRAPH; 4) SCATTERPLOT; OR 5) BOXPLOT.**

18. What does each dot on a scatterplot represent, in terms of both the individuals and their measurements?

**ANSWER: EACH DOT REPRESENTS ONE INDIVIDUAL, AND ITS CORRESPONDING PAIR OF MEASUREMENTS (SUCH AS HEIGHT AND WEIGHT).**

19. Although a scatterplot can be more difficult to read than a line graph, it displays more information. Explain why.

**ANSWER: A SCATTERPLOT SHOWS OUTLIERS, AS WELL AS THE DEGREE OF VARIABILITY THAT EXISTS FOR ONE VARIABLE AT EACH LOCATION OF THE OTHER VARIABLE.**
20. Name a situation in which a scatterplot is most useful for displaying measurement data.
   **ANSWER:** 1) FOR DISPLAYING THE RELATIONSHIP BETWEEN TWO MEASUREMENT VARIABLES.

21. The following is an example of what type of data picture?

22. The following is an example of what type of data picture?
23. What characteristics do statistical pictures of measurement data allow us to examine?
   a. Trends or patterns in the data.
   b. Variability in the data.
   c. The overall shape of the data.
   d. All of the above.
   ANSWER: D

24. A(n) __________ is useful for displaying the relationship between two measurement variables.
   ANSWER: SCATTERPLOT

25. A(n) __________ is a good way to represent measurement data as it changes over time.
   ANSWER: LINE GRAPH

26. Name two of the five most common problems in plots, graphs and pictures.
   ANSWER: ANY TWO OF THE FOLLOWING: 1) ONE OR MORE AXES NOT LABELED; 2) NOT STARTING AT ZERO; 3) CHANGES IN LABELING ON ONE OR MORE AXES; 4) MISLEADING UNITS OF MEASUREMENT; OR 5) USING POOR INFORMATION.

27. What is wrong with the following histogram?

   ANSWER: THE HORIZONTAL AXIS HAS NO UNITS LABELED.
Narrative: Average hourly earnings

28. {Average hourly earnings narrative} The designers of this graph expressed all their data in terms of 1998 dollars. Explain why they did this, and whether or not you think this is a good idea.
   ANSWER: IT IS IMPORTANT TO USE FAIR AND COMPARABLE UNITS OF MEASUREMENT, AND CONVERTING ALL WAGES TO 1998 DOLLARS DOES THAT.

29. {Average hourly earnings narrative} Describe the scale used on the vertical axis and whether or not it is appropriate.
   ANSWER: THE SCALE STARTS AT $6 AND GOES BY INCREMENTS OF $3 WITH LOTS OF SPACE BETWEEN EACH ONE. THIS MAY EXAGGERATE THE DIFFERENCES FROM YEAR TO YEAR.

30. In what way(s) can a poorly done histogram be misleading?
    a. Changes in labeling on one or more axes.
    b. Not starting at zero as a way to exaggerate trends.
    c. Using poor information.
    d. All of the above.
   ANSWER: D

31. Suppose you have data on the number of accidents at a certain intersection for the following years: 1960, 1965, 1975, and 1990. What is the best way to display this information fairly?
    a. A bar graph with one bar for each year of data available; the bars are an equal distance apart.
    b. A line graph with the years from 1960 through 1990 marked off in equal increments and dots on the line graph representing the number of accidents for the years for which data are available. The dots are connected with lines.
    c. A pie chart with a slice for the percentage of accidents occurring in each of the four years for which data is available.
    d. Any of the above.
   ANSWER: B
32. If the scale on the vertical axis is in very large increments with very little space between each one, what does this do to the appearance of the data?
   a. It makes differences appear smaller than they really are.
   b. It makes differences appear larger than they really are.
   c. It does nothing to affect the appearance of the data.
   d. It makes the information easier to read and understand.
   **ANSWER: A**

33. A statistical picture isn’t worth much if the _______ can’t be trusted.
   **ANSWER: DATA (OR SOURCE, INFORMATION)**

34. Units of measurement are important. If a graph showed the number of crimes in each state for a given year, this would be misleading; the _______ should be reported instead.
   **ANSWER: CRIME RATE; NUMBER OF CRIMES PER CAPITA; NUMBER OF CRIMES PER 100,000 PEOPLE, ETC.**

35. Name 3 of the 10 questions you should ask when you look at a statistical picture, before trying to interpret it.

Narrative: Pick 3 lottery
The Kansas Pick 3 Lottery results through 3/15/97 are shown in the table below. In this game, three numbers are drawn each week, and numbers can be repeated (such as 2, 3, 3).

<table>
<thead>
<tr>
<th>Number drawn</th>
<th>Number of times drawn</th>
<th>Percentage of times drawn</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>485</td>
<td>10.0%</td>
</tr>
<tr>
<td>1</td>
<td>468</td>
<td>9.7%</td>
</tr>
<tr>
<td>2</td>
<td>513</td>
<td>10.6%</td>
</tr>
<tr>
<td>3</td>
<td>491</td>
<td>10.1%</td>
</tr>
<tr>
<td>4</td>
<td>484</td>
<td>10.0%</td>
</tr>
<tr>
<td>5</td>
<td>480</td>
<td>9.9%</td>
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<tr>
<td>6</td>
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<td>10.0%</td>
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<td>7</td>
<td>482</td>
<td>10.0%</td>
</tr>
<tr>
<td>8</td>
<td>475</td>
<td>9.8%</td>
</tr>
<tr>
<td>9</td>
<td>474</td>
<td>9.8%</td>
</tr>
</tbody>
</table>

36. {Pick 3 lottery narrative} Using the number of times each number was drawn, display the data in a bar graph that looks as though the number 1 was chosen much less often, and number 2 much more often, than the other numbers. (This will be a misleading graph.) Explain why the lottery chose to display their data in a similar way in their newsletter.

   **ANSWER: THE GRAPH SHOULD HAVE AN EXAGGERATED SCALE, SHOWING THE HEIGHT OF THE BAR FOR NUMBER 1 BEING VERY LOW, AND THE HEIGHT OF THE BAR FOR 2 BEING VERY HIGH, COMPARED TO THE OTHER BARS. REASON: TO GIVE THE APPEARANCE THAT THERE IS SOMETHING ‘INTERESTING’ GOING ON; THAT YOU SHOULD PLAY, AND PICK 2 BECAUSE IT’S ‘HOT’ OR PICK 1 BECAUSE IT’S ‘DUE TO COME UP.’ NEITHER OF THESE IS TRUE.**
37. {Pick 3 lottery narrative} Display the data in a bar graph that makes the point that each number is drawn about the same percentage of the time.

**ANSWER:** THE GRAPH SHOULD HAVE AN APPROPRIATE SCALE, SHOWING THE BARS FOR ALL NUMBERS TO BE ABOUT EQUAL IN HEIGHT. HEIGHTS REPRESENT THE PERCENTAGE OF TIMES EACH NUMBER WAS DRAWN.

38. Which of the following is not a characteristic of a good plot, graph, or picture of data?
   a. Financial data collected over time should be adjusted for inflation.
   b. Any breaks between years where data is missing should be closed in and not left as empty spaces.
   c. The labels should be clear and informative.
   d. All of the above are good characteristics of a good plot, graph, or picture of data.

**ANSWER:** B

39. Which of the following is not true about a plot, graph, or picture of data?
   a. Extraneous information should be excluded; the more extra information on a graph, the more confusing it can get.
   b. Many graphs are misleading; the public must look at them critically before trying to interpret their results.
   c. The scale on a graph doesn’t matter. Measurement data can be displayed using any scale as long as that scale is consistent.
   d. All of the above statements are true.

**ANSWER:** C

40. Which of the following would automatically mean a statistical picture is misleading?
   a. A histogram where the scale is very large.
   b. A pictogram where all money is converted to current U.S. dollar amounts.
   c. A line graph where the axes do not start at zero.
   d. None of the above.

**ANSWER:** D

Questions 3, 12:
Ohio Lottery
http://www.ohiolottery.com/

Question 13, 21, 29, 30:
Bureau of Labor Statistics
http://www.wa.gov/esd/lmea/occdata/oeswage/Page2067.htm

Question 22:

Question 28:
U.S. Census Bureau