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Chapter 2 Test A - Multiple Choice

Section 2.1 (Visualizing Variation in Numerical Data)

1. [Objective: Understand the difference between how observations are recorded in dotplots, histograms, and stemplots.] How are individual observations recorded in a dotplot, a histogram, and a stemplot?

   a. A dotplot displays the actual values of observations. A histogram displays a dot for every observation. A stemplot uses bars to display intervals of observations.

   b. A dotplot displays a dot for every observation. A histogram uses bars to display intervals of observations. A stemplot displays the actual values of observations.

   c. A dotplot displays the actual values of observations. A histogram uses bars to display intervals of observations. A stemplot displays a dot for every observation.

   d. A dotplot uses bars to display intervals of observations. A histogram displays a dot for every observation. A stemplot displays the actual values of observations.

2. [Objective: Understand the difference between frequencies and relative frequencies.] What is the difference between a histogram and a relative frequency histogram?

   a. A histogram uses numbers to record how many observations are in a data set, and a relative histogram uses categories.

   b. A histogram uses categories to record how many observations are in a data set, and a relative histogram uses counts.

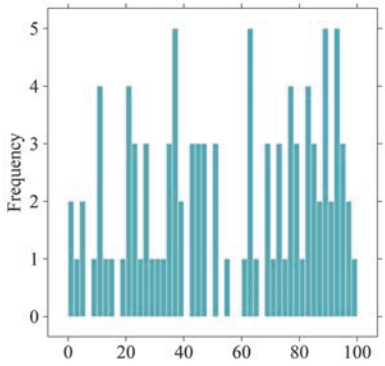
   c. A histogram uses counts to record how many observations are in a data set, and a relative histogram uses proportions.

   d. A histogram uses proportions to record how many observations are in a data set, and a relative histogram uses counts.

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3. [Objective: Determine significance of bin width in a histogram.] In the following histogram, what can you conclude about the bin width?



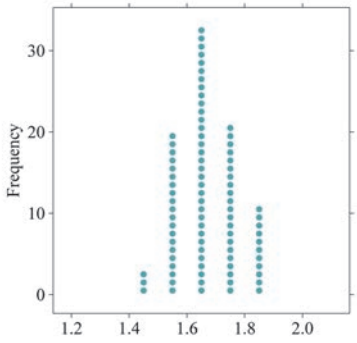
a. The bin width is too small. We are given too much detail.

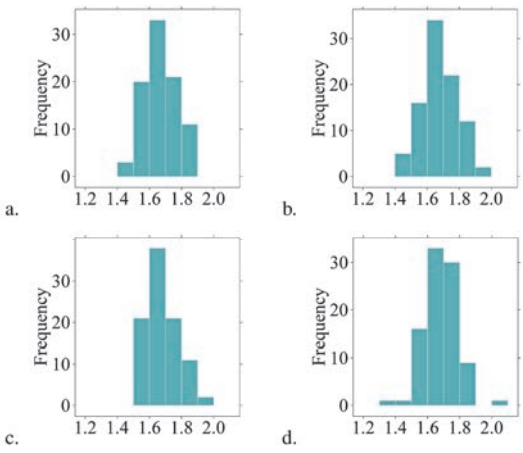
b. The bin width is too large. We are given too much detail.

c. The bin width is too small. We are hiding details of the distribution.

d. The bin width is too large. We are hiding details of the distribution.

4. [Objective: Understand that a distribution of a sample of data can be displayed multiple ways.] Which histogram represents the same data as the dotplot shown below?





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Section 2.2 (Summarizing Important Features of a Numerical Distribution)

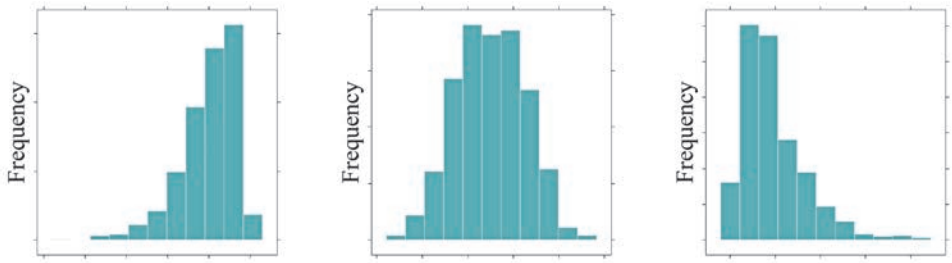
5. [Objective: Know what to pay attention to in distributions of numerical data.] When examining distributions of numerical data, what three components should you look for?

   a. Symmetry, center, and spread
   b. Symmetry, skewness, and spread
   c. Shape, symmetry, and spread
   d. Shape, center, and spread

6. [Objective: Understand modality in distributions.] Which of the following would likely show a bimodal distribution in a histogram?

   a. The heights of all students in a high school band.
   b. The ages of students who attend a 4-year university.
   c. The number of hours preschoolers plays outside.
   d. The final exam grades for an introductory statistics course.

For questions (7) - (9), match one of the histograms below with its appropriate description.



a. b. c.

7. [Objective: Recognize the shape of a distribution.] The distribution of scores on an easy test is displayed in histogram ___.

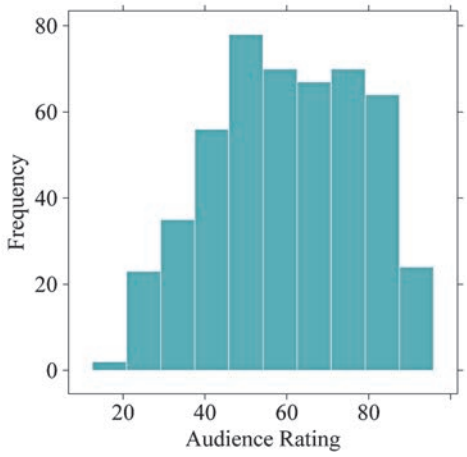
8. [Objective: Recognize the shape of a distribution.] The distribution of household income in a large city is displayed in histogram ___.

9. [Objective: Recognize the shape of a distribution.] The distribution of female heights is displayed in histogram ____.

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10. [Objective: Understand how to find typical values from a histogram.] The following histogram represents audience movie ratings (on a scale of 1-100) of 489 movies. What is the *typical* movie rating given by audiences according to this distribution?



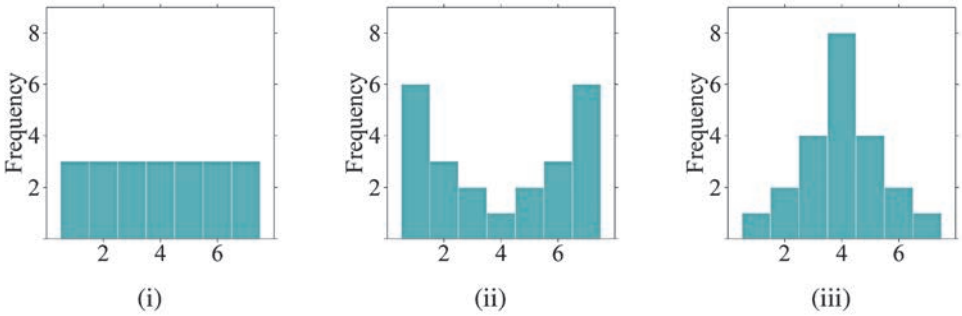
a. The typical value is about 40.

b. The typical value is about 50.

c. The typical value is about 60.

d. The typical value is about 70.

11. [Objective: Determine differences in variability.] Order the following histograms from least to most variability.



a. (i), (ii), (iii)

b. (ii), (i), (iii)

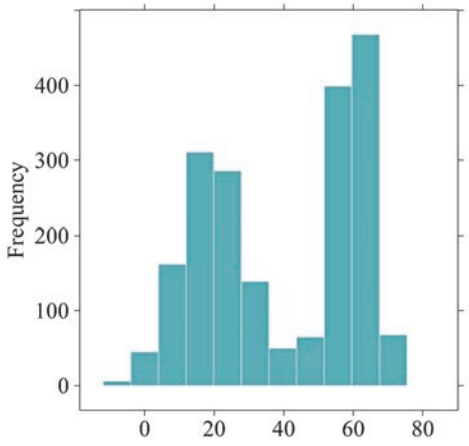
c. (ii), (iii), (i)

d. (iii), (i), (ii)

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12. [Objective: Interpreting typical values of bimodal distributions.] What is the typical value for the histogram shown below?



a. The typical value is 40 because it is the center of the distribution.

b. The typical value is 40 because it is the average of 20 and 60.

c. Since the data are bimodal, a typical value cannot be found.

d. Since the data are bimodal, there are two typical values - one is about 20 and the other is about 60.

Section 2.3 (Visualizing Variation in Categorical Variables)

13. [Objective: Understand differences between bar charts and histograms.] What is the difference between a bar chart and a histogram?

a. They can both be used to represent numerical data.

b. They can both be used to represent categorical data.

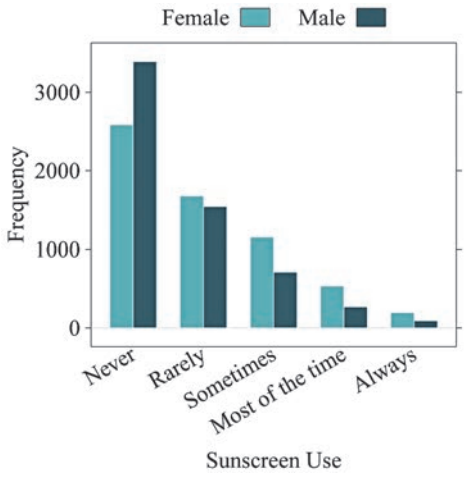
c. A bar chart represents numerical data and a histogram represents categorical data.

d. A bar chart represents categorical data and a histogram represents numerical data.

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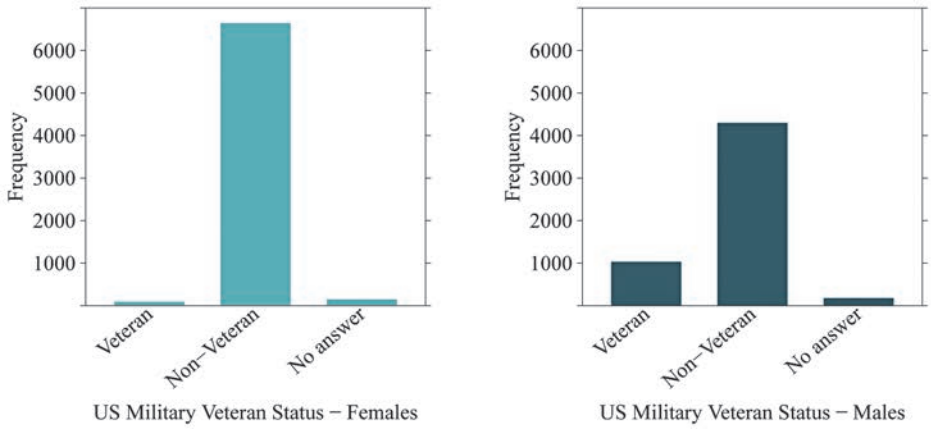
14. [Objective: Interpreting bar charts.] Which statement below is NOT supported by the following bar chart?



a. More females wear sunscreen than males.
b. Very few people, in general, always wear sunscreen.
c. More males wear sunscreen than females.
d. About 50% of males never wear sunscreen.

Section 2.4 (Summarizing Categorical Distributions)

15. [Objective: Determine the variability of categorical data from a bar chart.] The bar charts below depict the veteran statuses of Americans, separated by gender. Which bar chart has more variability in veteran status? Why?



a. The female bar chart shows more variability because many of the observations fall into one category ("Non-Veteran").
b. The female bar chart shows more variability because there are more observations in the different categories than there are for males.
c. The male bar chart shows more variability because many of the observations fall into one category ("Non-Veteran").
d. The male bar chart shows more variability because there are more observations in the different categories than there are for females.

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16. [Objective: Understand the term *mode* when describing categorical variables.] What does it mean to find the *mode* of a bar chart?

    a. You cannot find a mode for categorical data. Modes are only used with numerical data.

    b. The mode can be found by finding the bar, or category, with the most observations.

    c. The mode can be found by adding up the total number of categories.

    d. The mode can be found by adding up the total number of observations and dividing by the number of categories.

Section 2.5 (Interpreting Graphs)

Use the following information to answer questions (17) - (18):

A large state university conducted a survey among their students and received 300 responses. The survey asked the students to provide the following information:

* Age
* Year in School (Freshman, Sophomore, Junior, Senior)
* Gender
* GPA

17. [Objective: Determine appropriate graph based on variable type.] What type of graph would you use to describe the variable Age?

    a. A histogram because Age is a numerical variable.

    b. A histogram because Age is a categorical variable.

    c. A bar chart because Age is a numerical variable.

    d. A bar chart because Age is a categorical variable.

18. [Objective: Determine appropriate graph based on variable type.] What type of graph would you use to describe the variables Gender and Year in School?

    a. A side-by-side histogram should be used since these are two numerical variables.

    b. A side-by-side histogram should be used since these are two categorical variables.

    c. A side-by-side bar chart should be used since these are two numerical variables.

    d. A side-by-side bar chart should be used since these are two categorical variables.

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A word cloud was created using the first chapter of Lewis Carroll's Alice's Adventures in Wonderland. (Note that filler words such as "the," "a/an," and "and" were excluded from the plot.)
Use the word cloud to answer questions (19) - (20).



19. [Objective: Interpreting word clouds.] According to the word cloud, what is the most common word in the first chapter of Alice's Adventures in Wonderland? Why?

    a. The most common word is "alice" because it is the largest in size.

    b. The most common word is "alice" because she is a main character in the story.

    c. The most common word is "marked" because it appears at the top of the cloud.

    d. The most common word is "garden" because it appears in the middle of the cloud.

20. [Objective: Pitfalls of using word clouds.] What information is NOT explicitly portrayed in the word cloud?

    a. The words that occur most frequently in the chapter.

    b. The specific word that occurs most often.

    c. The number of times each word occurs.

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Chapter 2 Test A - Answer Key

1. B
2. C
3. A
4. A
5. D
6. A
7. A
8. C
9. B
10. C
11. D
12. D
13. D
14. C
15. D
16. B
17. A
18. D
19. A
20. C

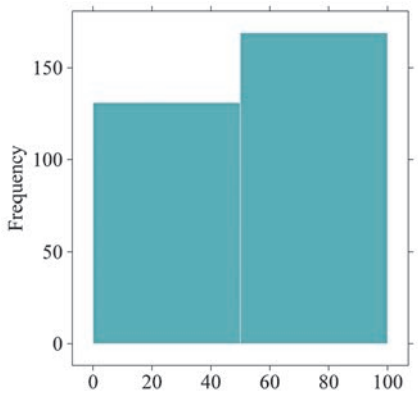
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Chapter 2 Test B - Multiple Choice

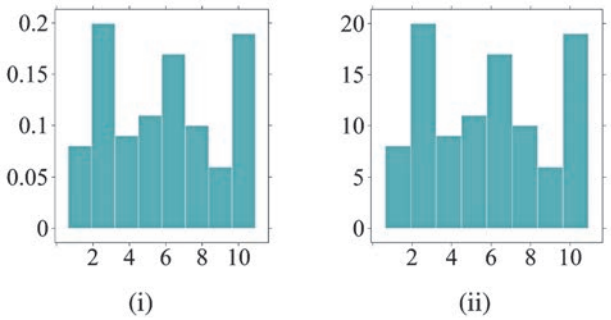
Section 2.1 (Visualizing Variation in Numerical Data)

1. [Objective: Determine significance of bin width in a histogram.] In the following histogram, what can you conclude about the bin width?



   a. The bin width is too small. We are given too much detail.
   b. The bin width is too large. We are given too much detail.
   c. The bin width is too small. We are hiding details of the distribution.
   d. The bin width is too large. We are hiding details of the distribution.

2. [Objective: Understand the difference between frequencies and relative frequencies in a histogram.] The two histograms below display the exact same data. How do the plots differ?



   a. Histogram (i) uses frequencies to simply count the number of observations at a given value. Histogram (ii) uses relative frequencies to show the proportion of observations at a given value.
   b. Histogram (i) uses relative frequencies to show the proportion of observations at a given value. Histogram (ii) uses frequencies to simply count the number of observations at a given value.
   c. Histograms (i) and (ii) are exactly the same; there are no differences between the plots.
   d. Histograms (i) and (ii) do not display the same data because the values listed on the *y*-axis do not match.

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3. [Objective: Understand the difference between how observations are recorded in dotplots and stemplots.] How are individual observations recorded in a dotplot versus a stemplot?

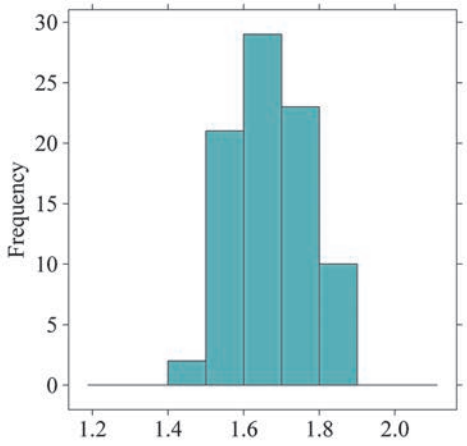
   a. A dotplot displays the actual values of observations. A stemplot uses bars to display intervals of observations.

   b. A dotplot displays the actual values of observations. A stemplot displays a dot for every observation.

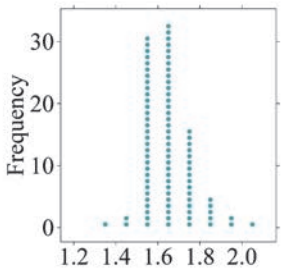
   c. A dotplot displays a dot for every observation. A stemplot displays the actual values of observations.

   d. A dotplot displays a dot for every observation. A stemplot uses bars to display intervals of observations.

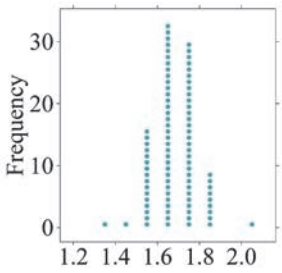
4. [Objective: Understand that a distribution of a sample of data can be displayed multiple ways.] Which dotplot represents the same data as the histogram shown below?



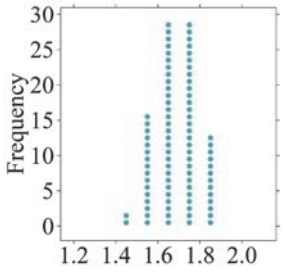
a.



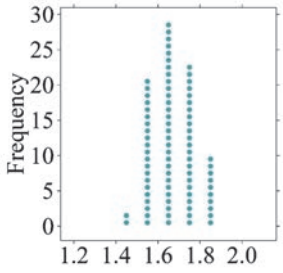
b.



c.



d.



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Section 2.2 (Summarizing Important Features of a Numerical Distribution)

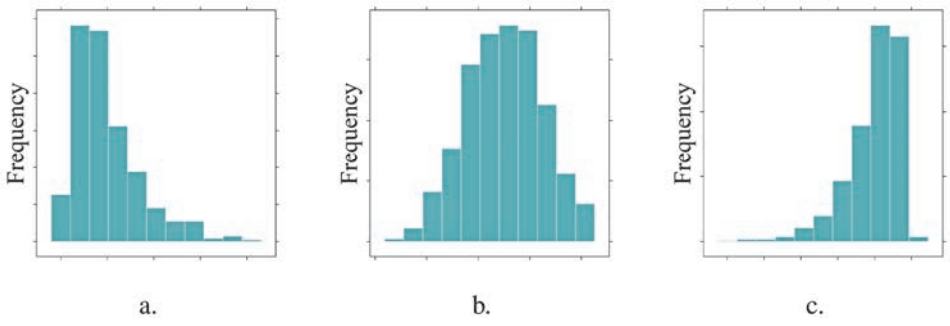
5. [Objective: Know what to pay attention to in distributions of numerical data.] When examining distributions of numerical data, what three components should you look for?

   a. Shape, center, and spread
   b. Shape, symmetry, and spread
   c. Symmetry, skewness, and spread
   d. Symmetry, center, and spread

6. [Objective: Understand modality in distributions.] Which of the following would likely show a bimodal distribution in a histogram?

   a. The midterm exam scores for an introduction to Spanish course.
   b. The ages of students who attend a local high school.
   c. The number of hours a college student spends on homework per night.
   d. The price of college tuition, including both public and private schools.

For questions (7) - (9), match one of the histograms below with its appropriate description.



a. b. c.

7. [Objective: Recognize the shape of a distribution.]
   The distribution of test scores for a group of students who received a 15-minute study session prior to taking a test is displayed in histogram ___.

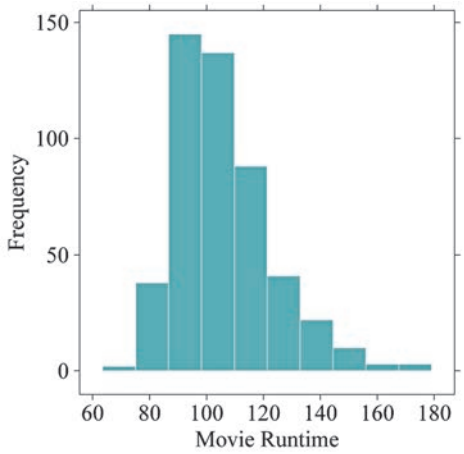
8. [Objective: Recognize the shape of a distribution.]
   The distribution of male heights is displayed in histogram ___.

9. [Objective: Recognize the shape of a distribution.]
   The distribution of the number of "friends" users of a popular social media site has is displayed in histogram ___.

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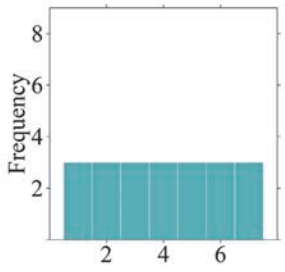
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10. [Objective: Understand how to find typical values from a histogram.] The following histogram represents the movie runtimes (length of a movie in minutes) of 489 movies. What is the *typical* movie runtime according to this distribution?

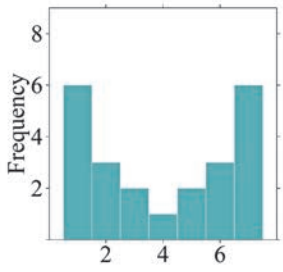


a. The typical value is about 90.
b. The typical value is about 100.
c. The typical value is about 120.
d. The typical value is about 130.

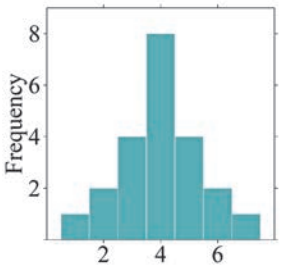
11. [Objective: Determine differences in variability.] Order the following histograms from most to least variability.



(i)



(ii)



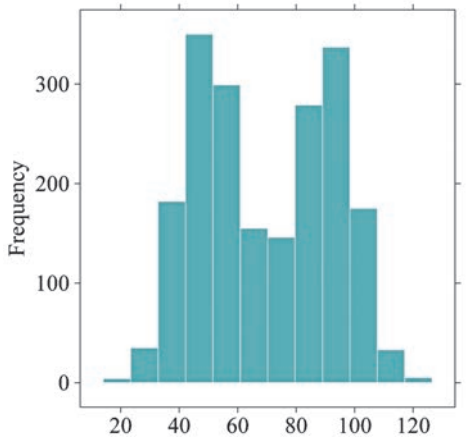
(iii)

a. (i), (ii), (iii)
b. (ii), (i), (iii)
c. (ii), (iii), (i)
d. (iii), (i), (ii)

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12. [Objective: Interpreting typical values of bimodal distributions.] What is the typical value for the histogram shown below?



a. The typical value is 70 because it is the average of 50 and 90.

b. The typical value is 70 because it is the center of the distribution.

c. Since the data are bimodal, a typical value cannot be found.

d. Since the data are bimodal, there are two typical values - one is about 50 and the other is about 90.

Section 2.3 (Visualizing Variation in Categorical Variables)

13. [Objective: Understand differences between bar charts and histograms.] What is the difference between a bar chart and a histogram?

a. A bar chart represents categorical data and a histogram represents numerical data.

b. A bar chart represents numerical data and a histogram represents categorical data.

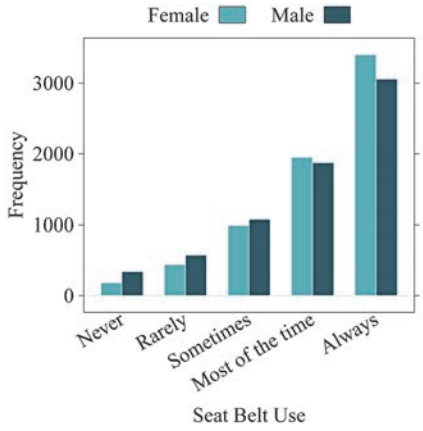
c. They can both be used to represent categorical data.

d. They can both be used to represent numerical data.

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14. [Objective: Interpreting bar charts.] Which statement below is NOT supported by the following bar chart?



a. In general, people always wear seat belts.

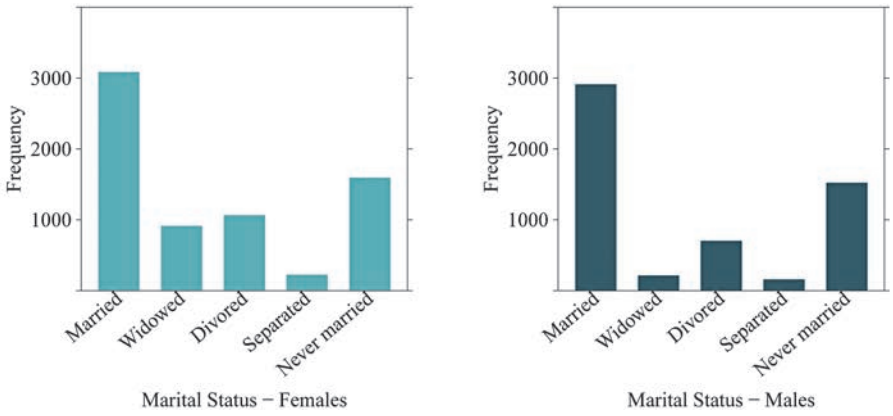
b. About 2000 people wear seat belts "sometimes."

c. More females wear seat belts compared to males.

d. More males wear seat belts compared to females.

Section 2.4 (Summarizing Categorical Distributions)

15. [Objective: Determine the variability of categorical data from a bar chart.] The bar charts below depict the marital statuses of Americans, separated by gender. Which bar chart shows more variability in marital status? Why?



a. The female bar chart shows more variability because many of the observations fall into one category ("Married").

b. The female bar chart shows more variability because there are more observations in the different categories than there are for males.

c. The male bar chart shows more variability because many of the observations fall into one category ("Married").

d. The male bar chart shows more variability because there are more observations in the different categories than there are for females.

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16. [Objective: Understand the term *mode* when describing categorical variables.] What does it mean to find the *mode* of a bar chart?

    a. The mode can be found by finding the bar, or category, with the most observations.

    b. You cannot find a mode for categorical data. Modes are only used with numerical data.

    c. The mode can be found by adding up the total number of observations and dividing by the number of categories.

    d. The mode can be found by adding up the total number of categories.

Section 2.5 (Interpreting Graphs)

Use the following information to answer questions (17) - (18):

A large state university conducted a survey among their students and received 400 responses. The survey asked the students to provide the following information:

* Age
* Year in School (Freshman, Sophomore, Junior, Senior)
* Major

17. [Objective: Determine appropriate graph based on variable type.] What type of graph would you use to describe the variable Major?

    a. A histogram because Major is a numerical variable.

    b. A histogram because Major is a categorical variable.

    c. A bar chart because Major is a numerical variable.

    d. A bar chart because Major is a categorical variable.

18. [Objective: Determine appropriate graph based on variable type.] What type of graph would you use to describe the variables Major and Year in School?

    a. A side-by-side bar chart should be used since these are two categorical variables.

    b. A side-by-side bar chart should be used since these are two numerical variables.

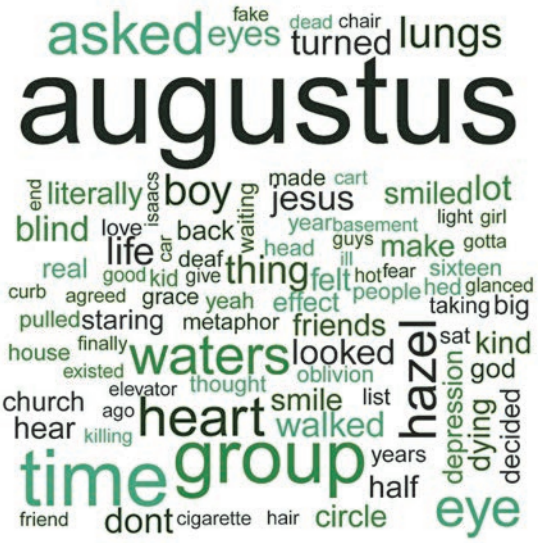
    c. A side-by-side histogram should be used since these are two categorical variables.

    d. A side-by-side histogram should be used since these are two numerical variables.

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A word cloud was created using the first chapter of John Green's The Fault in Our Stars. (Note that filler words such as "the," "a/an," and "and" were excluded from the plot.) Use the word cloud to answer questions (19) - (20).



19. [Objective: Interpreting word clouds.] According to the word cloud, which is the most common word in the first chapter of The Fault in Our Stars? Why?

    a. The most common word is "thing" because it appears in the middle of the cloud.
    b. The most common word is "augustus" because he is a main character in the story.
    c. The most common word is "hazel" because that is the narrator's name.
    d. The most common word is "augustus" because it is the largest in size.

20. [Objective: Pitfalls of using word clouds.] What information is NOT explicitly portrayed in the word cloud?

    a. The words that occur most frequently in the chapter.
    b. The number of times each word occurs.
    c. The specific word that occurs most often.

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Chapter 2 Test B - Answer Key

1. D
2. B
3. C
4. D
5. A
6. D
7. C
8. B
9. A
10. B
11. B
12. D
13. A
14. D
15. B
16. A
17. D
18. A
19. D
20. B

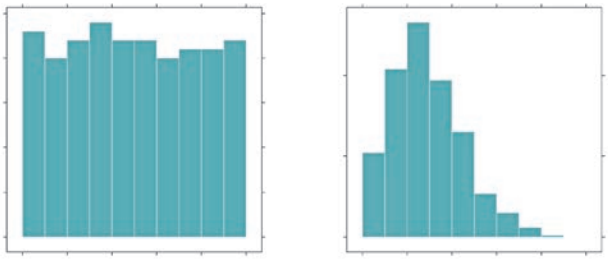
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Chapter 2 Test C - Short Answer

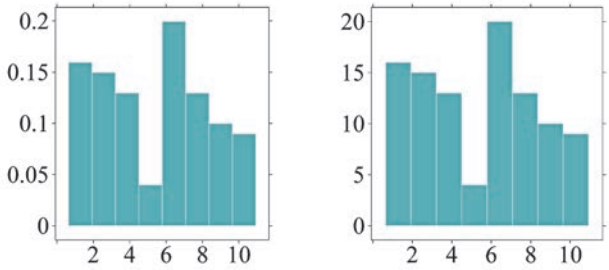
Section 2.1 (Visualizing Variation in Numerical Data)

1. [Objective: Know how to make graphs of distributions of numerical variables and interpret the graphs in context.] Below are two histograms. One corresponds to the ages at which a sample of people applied for marriage licenses; the other corresponds to the last digit of a sample of social security numbers. Which graph is which, and why?



(a) (b)

2. [Objective: Understand the difference between frequencies and relative frequencies in a histogram.] The two histograms below display the exact same data. How do the plots differ?



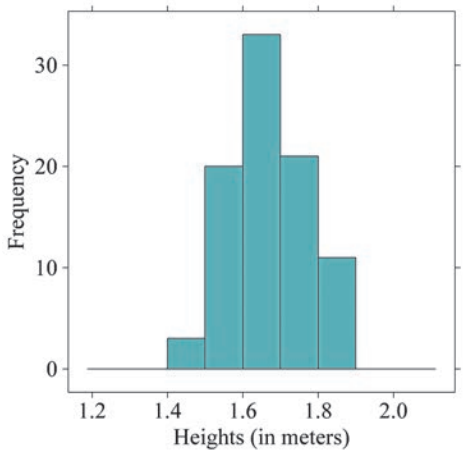
(a) (b)

3. [Objective: Understand differences and similarities between dotplots and histograms.] How is a dotplot similar to a histogram? How is it different?

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4. [Objective: Understand that a distribution of a sample of data can be displayed multiple ways.] If you were to create a dotplot to display the same data that is represented in the following histogram, how many dots would you draw to represent heights that fall between 1.5 meters and 1.6 meters?



Section 2.2 (Summarizing Important Features of a Numerical Distribution)

5. [Objective: Know what to pay attention to in distributions of numerical data.] When examining distributions of numerical data, what three components should you try to describe?

6. [Objective: Understand modality in distributions.] Describe a scenario in which a distribution could be bimodal. Explain your reasoning.

For questions (7) - (9), what would you expect the shape of the distribution described to look like? Explain your reasoning.

7. [Objective: Recognize the shape of a distribution.] The distribution of the household incomes in a large city.

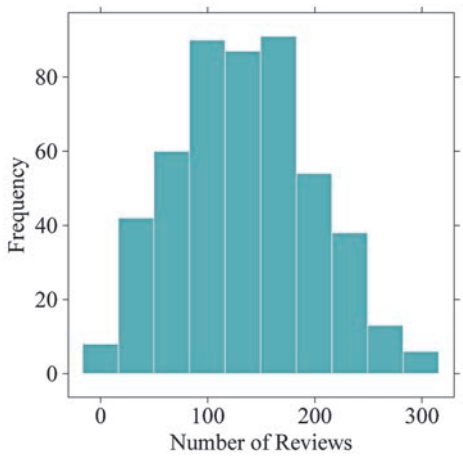
8. [Objective: Recognize the shape of a distribution.] The distribution of scores on an easy test.

9. [Objective: Recognize the shape of a distribution.] The distribution of the time (in minutes) it takes to drive to work using the same route each day.

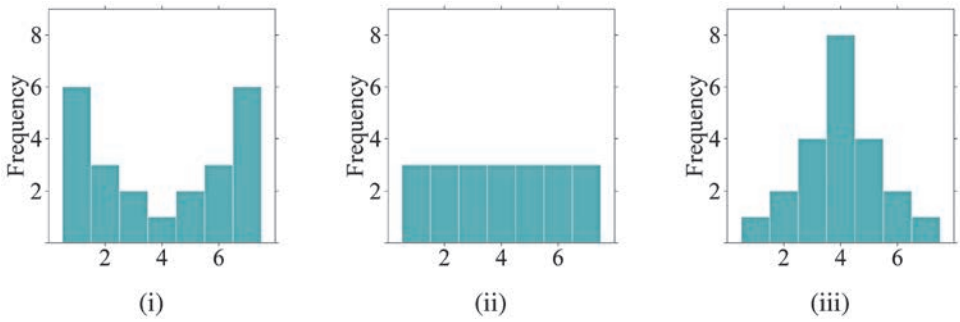
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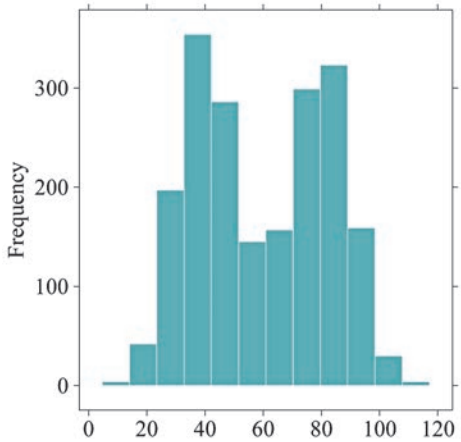
10. [Objective: Understand how to find typical values from a histogram.] The following histogram represents the number of reviews a movie received on a popular website. What is the *typical* number of reviews a movie is expected to receive, according to this distribution? Explain your reasoning.



11. [Objective: Determine differences in variability.] Order the following histograms from least to most variability. Explain your reasoning.



12. [Objective: Interpreting typical values of bimodal distributions.] How would you describe the typical value for this histogram? Explain your reasoning.



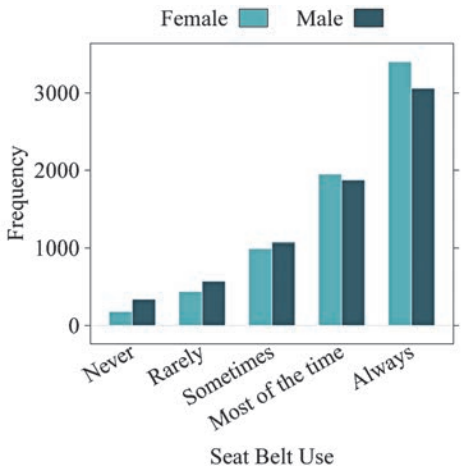
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Section 2.3 (Visualizing Variation in Categorical Variables)

13. [Objective: Understand differences between bar charts and histograms.] What is the difference between a bar chart and a histogram?

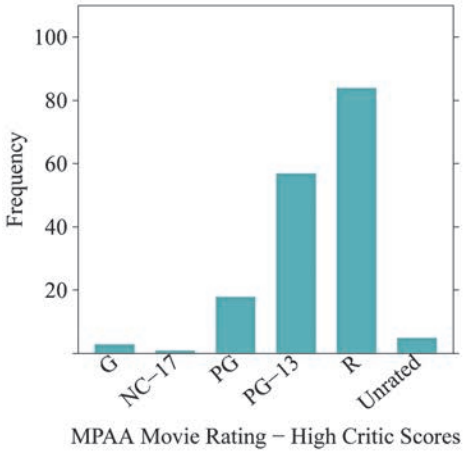
14. [Objective: Interpreting bar charts.] Using the following bar chart, what can you say about the difference in seat belt use for males versus females?

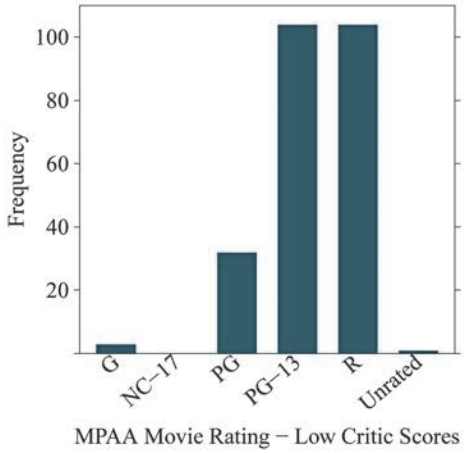


Section 2.4 (Summarizing Categorical Distributions)

15. [Objective: Understand the term *mode* when describing categorical variables.] What does it mean to find the *mode* of a bar chart?

16. [Objective: Determine the variability of categorical data from a bar chart.] The bar charts below depict the MPAA movie ratings of 489 movies, separated by high and low critic scores. Which bar chart shows more variability in MPAA movie ratings? Why?





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Section 2.5 (Interpreting Graphs)

Use the following information to answer questions (17) - (18):

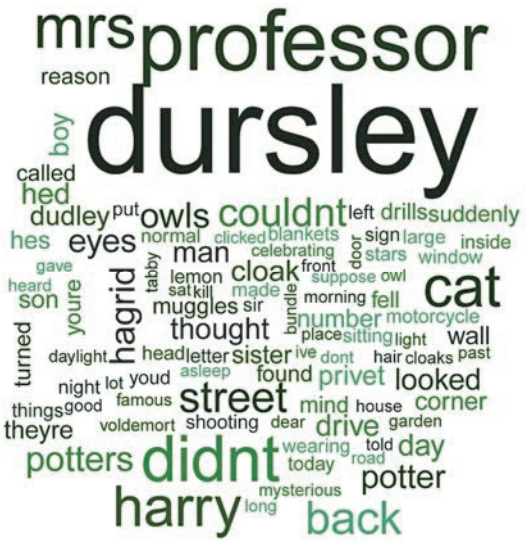
A large state university conducted a survey among their students and received 400 responses. The survey asked the students to provide the following information:

* Age
* Year in School (Freshman, Sophomore, Junior, Senior)
* Gender

17. [Objective: Determine appropriate graph based on variable type.] What type of graph would you use to describe the variable Year in School? Explain your reasoning.

18. [Objective: Determine appropriate graph based on variable type.] What type of graph would you use to describe the variables Gender and Year in School? Explain your reasoning.

A word cloud was created using the first chapter of J.K. Rowling's Harry Potter and the Sorcerer's Stone. (Note that filler words such as "the," "a/an," and "and" were excluded from the plot.) Use the word cloud to answer questions (19) - (20).



19. [Objective: Interpreting word clouds.] According to the word cloud, what is the most common word in the first chapter of Harry Potter and the Sorcerer's Stone? Why?

20. [Objective: Pitfalls of using word clouds.] The words "owls" and "eyes" appear to be similar in size. Does this mean that each of these words is used the same number of times in the first chapter of the book? Why or why not?

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Chapter 2 Test C - Answer Key

1. Histogram (a) displays the last digits of social security numbers because all of the values are mostly equally likely. Since the last digit of social security numbers are created randomly, we would expect any digit between 0 and 9 to show up just as often as another digit. Histogram (b) displays the ages at which a sample of people applied for a marriage license. Since most people get married in their early to mid-twenties, but there are also people who wait to get married until a later age, we would expect the distribution to be right-skewed.
2. Histogram (a) uses frequencies to simply count the number of observations at a given value. Histogram (b) uses relative frequencies to show the proportion of observations at a given value.
3. A dotplot and a histogram both show the overall shape of a distribution. They both can help determine a distribution's shape, center, and spread. They differ in terms of appearance in only one way. A dotplot displays a dot to represent each observation in the data, while a histogram uses bars to display intervals of observations.
4. About 20 dots should be drawn because there are about 20 people whose heights fall between 1.5 meters and 1.6 meters, as shown by the frequency value on the y-axis.
5. Shape, center, and spread of the data.
6. Answers may vary. Some examples include: (1) The price of college tuition, including both public and private schools (the different types of colleges would create two modes - private colleges would most likely have higher tuition costs compared to public schools). (2) The heights of all students at a high school (the different genders would create two modes - males are typically taller than females).
7. The distribution of incomes would most likely be right-skewed because most people earn middle-class salaries, but the very wealthy people are likely to earn incomes much higher than average.
8. The distribution of scores on an easy test would most likely be left-skewed because most test-takers will do well on the test, and a few will still do poorly.
9. The distribution of the time it takes to drive to work using the same route each day should be roughly symmetric because the time you leave your house is probably the same each day. The commute times will be very similar on a day-to-day basis.
10. The typical number of reviews a movie will receive is about 130. We know this because the distribution is centered around the value 130 on the x-axis.
11. Least to most variability: (iii), (ii), (i). Histogram (iii) has the least variability because it has more points that are close to the center of the distribution. Histogram (i) has the most variability because it has more points that are far away from the center of the distribution.
12. Since the data are bimodal, there are two typical values - one is about 40 and the other is about 80.
13. A bar chart represents a categorical variable and a histogram represents a numerical variable.

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14. Answers may vary. Some examples include: (1) In general, people always wear seat belts. (2) Females wear seat belts more than males. (3) About the same number of males and females report wearing seat belts "sometimes."

15. The mode can be found by finding the bar, or category, with the most observations. It will be the highest bar in the plot.

16. The "high critic scores" bar chart shows more variability because there are more observations in the different categories than there are for the "low critic scores."

17. A bar chart because Year in School is a categorical variable.

18. A side-by-side bar chart should be used since these are two categorical variables.

19. The most common word is "dursley" because it is the largest in size.

20. No. A word cloud can only tell us what words are the most common, but it cannot tell us exactly how many times a specific word appeared in the text.

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