Analyzing Univariate Data: Dot Plots & Histograms

Statistics Worksheet · Grade 9–12

Name: _____ Date: _____

Learning Objectives

- Create and interpret dot plots from a given data set, identifying shape, center, and spread
- Describe the distribution of data using appropriate vocabulary: symmetric, skewed, unimodal, outliers
- Read and analyze histograms by identifying shape, center, spread, and approximating extreme values

Problems

1. A statistics class recorded how many hours of sleep students got each night. The values ranged from 3 to 11 hours. List the whole-number values you would mark on the horizontal axis of a dot plot for this data set.

2. Use the sleep data below to complete the frequency table. Count how many students reported each number of hours of sleep.

Hours of Sleep	Tally	Frequency
3	I	1
4	II	2
5	IIII	4
6	IIII I	6
7	IIII II	7
8	IIII I	6
9	IIII	4
10	II	2
11	I	1

3. A dot plot of student sleep hours looks roughly symmetric. In one or two sentences, describe what it means for a dot plot to be roughly symmetric.

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4. For the sleep data dot plot, the spread of values is from 3 to 11 hours. Calculate the range of this data set.

$$\text{Range} = \text{Max} - \text{Min}$$

5. The U.S. Women's Soccer team's scores were recorded as (U.S. score minus opponent's score) for each game in 2012. The dot plot shows values from negative 2 to positive 5. What does a dot placed at negative 1 on this dot plot represent?

6. In the U.S. Women's Soccer data, values of 0 or negative numbers represent games where the team did not win. If the dot plot shows 2 dots at or below 0, and 18 dots above 0, what percentage of games did the U.S. Women's team win? Round to the nearest whole percent.

$$\text{Win \%} = \frac{\text{wins}}{\text{total games}} \times 100$$

7. A histogram shows monthly percent returns on common stocks. The distribution has one peak between 0% and 2.5%. Identify the shape of this distribution and name the appropriate term for a distribution with exactly one peak.

8. For the monthly stock returns histogram, the peak (highest bar) falls between 0% and 2.5%. Approximate the center of this distribution and explain why the peak is used to estimate center in a unimodal distribution.

9. The monthly stock returns histogram shows extreme bars (outliers) at the far left between negative 12.5% and negative 10%. Excluding these outliers, the smallest typical return visible on the histogram is negative 10%. The largest typical return is between 10% and 12.5%. Calculate the approximate range of typical monthly returns, excluding the outliers.

$$\text{Range} = \text{Largest typical} - \text{Smallest typical}$$

10. Below is a summary table comparing three data displays discussed in the lesson. Complete the missing cells by identifying the correct shape description, whether outliers were present, and the approximate center for each display.

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Data Display	Variable	Shape	Outliers?	Approx. Center
Dot Plot	Hours of sleep (3–11)		No	
Dot Plot	Soccer score differences	Skewed right (mostly positive)		
Histogram	Monthly stock returns (%)		Yes (far left)	

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Analyzing Univariate Data: Dot Plots & Histograms — Answer Key

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Answer Key

1. Answer: 3, 4, 5, 6, 7, 8, 9, 10, 11

- Identify the minimum value: 3 hours.
- Identify the maximum value: 11 hours.
- List every whole number from 3 to 11: 3, 4, 5, 6, 7, 8, 9, 10, 11.

2. Answer: See completed table

Hours of Sleep	Tally	Frequency
3	I	1
4	II	2
5	IIII	4
6	IIII I	6
7	IIII II	7
8	IIII I	6
9	IIII	4
10	II	2
11	I	1

- Count each tally mark to find the frequency for each hour value.
- Verify that the total of all frequencies equals the total number of students surveyed (33).

3. Answer: A roughly symmetric dot plot has dots that mirror each other on both sides of the center, so the left half and right half look approximately the same.

- Symmetric means the two halves of the distribution are mirror images of each other.
- Roughly symmetric allows for small differences — the overall shape is balanced around the center.

4. Answer: Range = 8 hours

- Identify the maximum value: 11 hours.
- Identify the minimum value: 3 hours.
- Subtract: 11 – 3 = 8 hours.

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5. Answer: A dot at –1 represents a game in which the U.S. team scored 1 fewer goal than the opponent, meaning the U.S. lost that game by 1 goal.

- The variable plotted is (U.S. score – Opponent score).
- A value of –1 means the difference was –1, so the opponent scored 1 more goal.
- Therefore, the dot at –1 represents a loss by 1 goal.

6. Answer: 90%

- Total games = 2 + 18 = 20.
- Wins = 18 (values above 0).
- Win % = (18 / 20) × 100 = 90%.

7. Answer: The distribution is unimodal (one peak) and skewed to the left.

- One peak means the distribution is unimodal.
- The tail extends to the left (toward negative values), so the distribution is left-skewed (negatively skewed).

8. Answer: Center is approximately 1.25% (midpoint of 0% and 2.5%); the peak shows where most data are concentrated, making it a reasonable estimate of center.

- The peak bar spans from 0% to 2.5%.
- Midpoint of 0 and 2.5 = (0 + 2.5) / 2 = 1.25%.
- In a unimodal distribution, the peak is where the most data cluster, approximating the center.

9. Answer: Range ≈ 20% to 22.5% (using –10% and 12.5% as endpoints: 12.5 – (–10) = 22.5%)

- Smallest typical return (ignoring outliers): approximately –10%.
- Largest typical return: approximately 12.5%.
- Range = 12.5 – (–10) = 12.5 + 10 = 22.5 percentage points.

10. Answer: See completed table

Data Display	Variable	Shape	Outliers?	Approx. Center
Dot Plot	Hours of sleep (3–11)	Roughly symmetric	No	7 hours
Dot Plot	Soccer score differences	Skewed right (mostly positive)	No	Around 1 to 2
Histogram	Monthly stock returns (%)	Unimodal, skewed left	Yes (far left)	0% to 2.5%

- Sleep dot plot: The distribution mirrors on both sides of 7 hours → roughly symmetric; center ≈ 7 hours.
- Soccer dot plot: Most values are positive (wins), tail on the left (losses) → skewed right; no outliers mentioned; center near 1–2.
- Stock returns histogram: One peak near 0–2.5%, tail extends left → unimodal and left-skewed; outliers exist between –12.5% and –10%; center ≈ 0% to 2.5%.

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