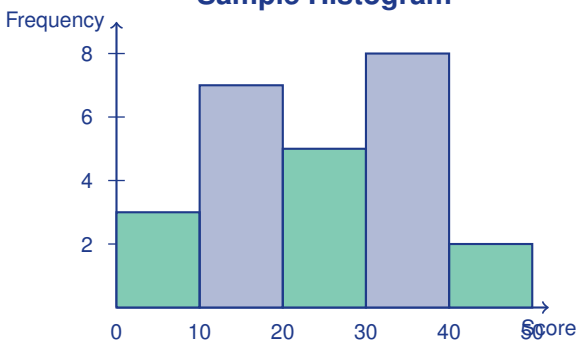
Histograms and Stem-and-Leaf Plots

Name: _____	Date: _____	Score: _____ / 18

A **histogram** uses touching bars to show how often data falls within equal-width intervals called *bins*—and unlike a regular bar graph, the bars touch because the data is continuous, picking up right where the previous bar left off. A **stem-and-leaf plot** organizes every data value into rows so you can see the shape of the distribution *and* keep all the original numbers visible. Both displays help you spot patterns, clusters, gaps, and outliers at a glance. Learning to read and build these graphs is essential for describing data and making smart comparisons!

Sample Histogram



Key Concepts & Quick Review

Histogram:

- Bars touch (no gaps) because the data is continuous.
- Each bar covers one interval (e.g., 0–9, 10–19, . . .).
- The height of each bar shows the **frequency** (count) of data in that interval.

Stem-and-Leaf Plot:

- The **stem** is the leading digit(s); the **leaf** is the last digit.
- Leaves are listed in order from least to greatest.
- A key tells you what the digits represent (e.g., $3 \mid 5 = 35$).

Examples

① A histogram shows: 0–9 (3 students), 10–19 (7 students), 20–29 (5 students). How many students scored below 20?

Think It Through: The question asks how many students scored *below* 20, which means we need the bars for 0–9 and 10–19. Read the heights: the first bar is 3 students and the second bar is 7 students. Add them up: $3 + 7 = 10$. So 10 students scored below 20.

Answer: 10 *students*

② Make a stem-and-leaf plot for: 23, 25, 31, 34, 34, 38, 42, 47.

Think It Through: In a stem-and-leaf plot the *tens* digit is the stem and the *ones* digit is the leaf. Group the data by tens:

Stem | Leaf
2 | 3 5
3 | 1 4 4 8
4 | 2 7

Key: $2 \mid 3 = 23$. Notice that leaves in each row go from smallest to largest—that makes reading the data much easier.

Answer: *See plot above*

Practice Problems

Use the information given to answer each question.

1. A histogram has interval 0–9 with frequency 4, interval 10–19 with frequency 8, and interval 20–29 with frequency 6. How many data values are shown? _____
2. In problem 1, which interval has the greatest frequency? _____
3. In problem 1, how many data values are less than 20? _____
4. A histogram has frequencies 3, 7, 10, and 5 for the intervals 50–59, 60–69, 70–79, and 80–89. How many data values are shown? _____
5. Using the histogram in problem 4, how many scores are at least 70? _____
6. Using the histogram in problem 4, what fraction of the scores are in the 60–69 interval? _____
7. A stem-and-leaf plot has the row $1 \mid 2\ 5\ 8$. List the data values in that row. _____
8. A stem-and-leaf plot has the row $3 \mid 0\ 0\ 4\ 7$. Find the median of those values. _____
9. A stem-and-leaf plot has rows $2 \mid 1\ 6$, $3 \mid 3\ 9$, and $4 \mid 5$. Find the range. _____
10. How many data values are shown in the stem-and-leaf plot from problem 9? _____
11. Make a stem-and-leaf plot for the data set $45, 48, 52, 55, 55, 61, 63$. _____
12. Make a stem-and-leaf plot for the data set $12, 15, 18, 22, 24, 30$. _____
13. A histogram uses equal-width bins from 0 to 24, and each bin has width 5. How many bars are needed? _____
14. A stem-and-leaf plot has the row $5 \mid 0\ 3\ 3\ 7\ 9$. Find the mode of those values. _____
15. Can you find the exact median from a histogram alone? Explain why or why not. _____

Study Tips

- Histogram bars **touch** (unlike bar graphs for categorical data). No gaps means the intervals are continuous.

- In a stem-and-leaf plot, always write leaves in **ascending order** and include a **key** so the reader knows what the digits mean.
- You **cannot** read individual data values from a histogram, only frequencies per interval. A stem-and-leaf plot preserves every value.

Word Problems

16. A teacher records quiz scores: 72, 75, 78, 80, 82, 85, 88, 90, 93, 95. Create a stem-and-leaf plot and find the median.

_____

17. A histogram of students' reading times (in minutes) shows: 0–14: 3 students, 15–29: 8, 30–44: 12, 45–59: 5. How many students read for at least $30\ min$?

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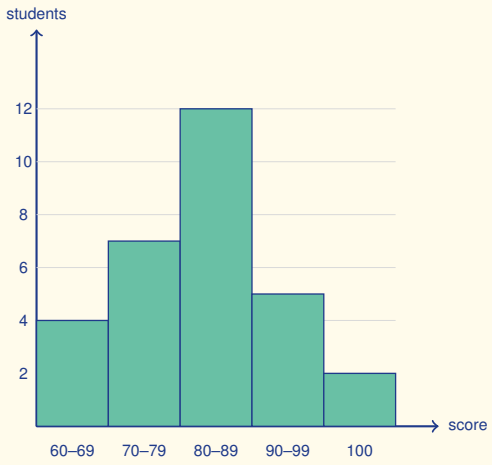
18. Use this histogram (test scores for one class) to find: (a) the total number of students, (b) the modal interval (the bar with the most students), (c) how many students scored *at least* 80.



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Answer Keys

1) 18
2) 10–19
3) 12
4) 25
5) 15
6) $\frac{7}{25}$
7) 12, 15, 18
8) 32
9) 24
10) 5
11) $4|5,8;\ 5|2,5,5;\ 6|1,3$
12) $1|2,5,8;\ 2|2,4;\ 3|0$
13) 5
14) 53
15) no; only estimate
16) Stem-and-leaf: $7|2,5,8;\ 8|0,2,5,8;\ 9|0,3,5$; median 83.5
17) 17 students
18) (a) 30 students; (b) 80–89; (c) 19 students

Step-by-Step Explanations

Strategy: For Surface Area of Cylinders, combine the two circular bases with the rectangle that wraps around the side. The final surface-area answer should include both bases and the curved side.

Practice 1: Find the total surface area of a cylinder with radius $4\ cm$ and height $6\ cm$. **Answer:** 251.2
For the first sample, add the two circular bases and the rectangular curved surface area.

Practice 15: Find the total surface area of a cylinder with radius $9\ m$ and height $5\ m$. **Answer:** 791.28
Late in the set, add the two circular bases and the rectangular curved surface area.

Word-problem notes:

16. Answer: $301.44\ cm^2$
Since the mug is open on top, there is only *one* circular base instead of two. Base area: $3.14 \times 4^2 = 50.24\ \ cm^2$. Lateral area (the curved side): $2 \times 3.14 \times 4 \times 10 = 251.2\ \ cm^2$. Add them together: $50.24 + 251.2 = 301.44\ cm^2$. Remember, if the top were closed you would add another 50.24!

17. Answer: $169.56\ cm^2$
A label wraps around the curved side of the can, so we need the lateral area only. The diameter is $6\ cm$, giving $r = 3\ cm$. Plug into the formula: $LA = 2\pi rh = 2 \times 3.14 \times 3 \times 9 = 169.56\ \ cm^2$. That is exactly how much paper one label requires.

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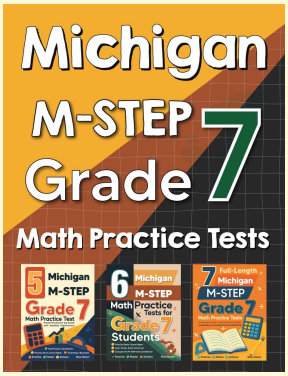

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