Lesson 32

MAKE BOX PLOTS AND STEM PLOTS 6.SP.B.4

INTRODUCTION

Real-World Connection

Tanya researches and records the prices of school lunches in 11 different school districts. She then wants to display the data graphically in order to show the distribution of the data best. What type of display should she choose? Let's practice the skills in the Guided Instruction and Independent Practice and help Tanya decide how to display her data at the end of the lesson!

$2.32	$2.70	$2.55	$2.40	$2.00	$2.45
$2.50	$2.65	$2.25	$2.75	$2.25	

What I Am Going to Learn

- How to display numerical data in plots on a number line in the form of a box plot

What I May Already Know 5.MD.B.2

- I know how to make a line plot to display a data set of measurements.

Vocabulary in Action

A box plot is a graph that shows the distribution of values in a data set by dividing the set into quarters. A box plot shows a summary of the data set.

- Box plots also are called "box-and-whisker plots." The lines are the "whiskers."

The data can be divided into four equal parts called quartiles.

- The middle value, or median, divides the data into upper and lower halves.

- The lower quartile, Q1, divides the lower half into two quarters.

- The upper quartile, Q3, divides the upper half into two quarters.

The box plot also shows the **minimum** and **maximum** data values.

● The minimum is the smallest number in the data set.

● The maximum is the largest number in the data set.

EXAMPLE

This list shows a set of data values in order from least to greatest. Draw a box plot for the data.
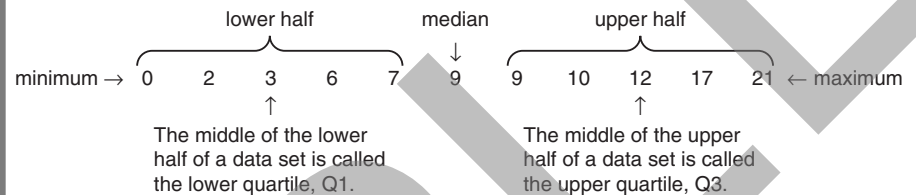
Step One Plot the minimum, lower quartile, median, upper quartile, and maximum values above a number line.

Step Two Draw a box with its ends at the quartile values and a line at the median.

Step Three Draw lines from the box to the minimum and maximum data points.
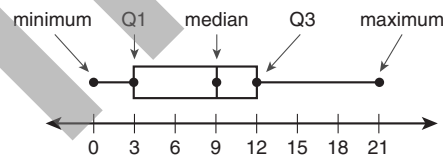
EXAMPLE

A **stem-and-leaf plot** displays data in order by place value. Stem-and-leaf plots make it easy to organize data with many different values. For example, the table shows the bowling scores for a team's season.

155, 206, 162, 193, 173, 164, 201, 210, 155, 171, 174, 195, 177, 160, 199

The stem-and-leaf plot shows the tens place value as the stem, and the ones place value as the leaf.

Notice that there were no scores in the 180s. The stem-and-leaf plot also makes it easy to see that most scores were in the 170s.

Stem	Leaf
15	5 5
16	0 2 4
17	1 3 4 7
18	
19	3 5 9
20	1 6
21	0

Key: 15 | 5 = 155

▶ **TURN AND TALK**

What are the five points you need in order to draw any box plot?

GUIDED INSTRUCTION

1. The data set shows the number of students absent from school on 20 different days. Make a box plot of the data in the table.

4	7	3	0	1	6	9	5	3	2
4	2	1	4	5	0	7	3	2	6

Step One List all of the data values in order from least to greatest.

0, 0, 1, 1, [   ], 2, 3, 3, [   ], 4, 4, 5, [   ], 6, 7, 7, 9

Step Two Find the median, or middle number, of the data set. There is an even number of data values, so find the mean of the two middle numbers for the median.
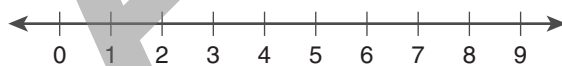
$$\frac{3 + 4}{2} = \boxed{}$$

Step Three Find the lower and upper quartiles. Find the average of the two middle numbers in each half to find the lower quartile and upper quartile.
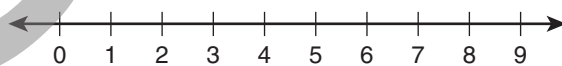
$$\frac{2 + 2}{2} = \boxed{} \qquad\qquad \frac{5 + 6}{2} = \boxed{}$$

Step Four Draw a number line from the minimum number to the maximum number.

[   ] (minimum) to [   ] (maximum)

Step Five On your own, plot the five points for the five values (minimum, lower quartile, median, upper quartile, maximum) above the number line.

Step Six On your own, draw a box around the quartile values. Draw a vertical line in the box at the median. Draw horizontal lines to connect the minimum value to the lower quartile and the maximum value to the upper quartile.
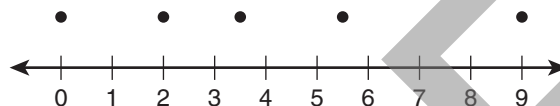
Step Seven Write a title for the completed box plot.
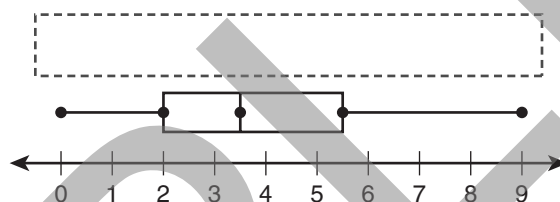
2. The following are the monthly average high temperatures (°F) for Dallas, TX: 57°, 67°, 69°, 77°, 84°, 92°, 96°, 96°, 89°, 79°, 67°, and 58°. Create a stem-and-leaf plot to display the data.
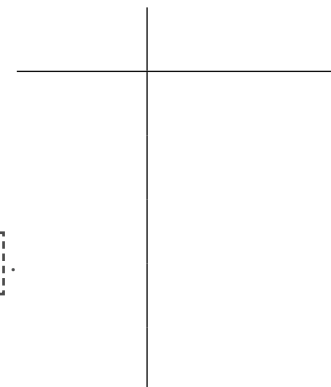
   What is the highest and lowest average high temperature for Dallas?

   Step One Determine the place values for the stem and leaf.

   The _____ and _____ place values are shown in the data.

   The place value of the stem will be _____ .

   The place value of the leaves will be _____ .

   Step Two Write each stem in the range of values. Do not skip numbers.

   Step Three Write the leaves in numerical order for each stem. Write each leaf, even if they occur more than once.

   Step Four Include a key to explain how to translate the stems and leaves into numbers.

   Step Five What is the highest and lowest average high temperature for Dallas? _____ and _____

How Am I Doing?

What questions do you have?

_____

_____

_____

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_____

How do you find the median when there are an even number of data

points in the data set?

_____

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Explain in your own words how to find the upper quartile and lower quartile.

_____

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◀ THINK ABOUT IT

Work with a partner to come up with surveys to collect data. Ask classmates about their favorite foods, sports, pets, subjects, etc. Create dot plots to display the data. Discuss the data as a class. Specifically, discuss if this data is a good representation of the entire school. Explain why or why not.

Color in the traffic signal that shows how you are doing with the skill.

I am stuck.

I almost have it.

I understand the skill.

INDEPENDENT PRACTICE

Answer the questions.

1. The data values shown are the number of passengers on different days of the Washington Avenue bus route.

230	240	300	367	330	280	370
295	320	225	370	210	345	350

Draw lines to partition the number line. Make a box plot of the data.

<————————————————————————————————→

2. Tasha will make a box plot of the data. Which statement describes a box plot that accurately represents the data?

4	24	13	10	11	12
18	21	7	9	13	20

Ⓐ The number line extends from 2 to 20.

Ⓑ Points are plotted at 9.5, 12.5, and 19.

Ⓒ The box starts at 9 and ends at 19.

Ⓓ Points are plotted at 4 and 20.

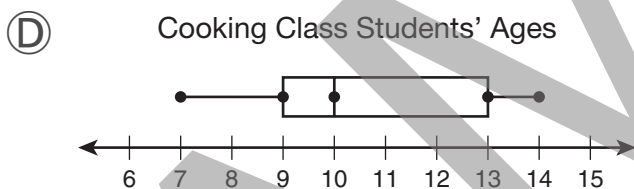3. Which number is not represented in the stem-and-leaf plot?

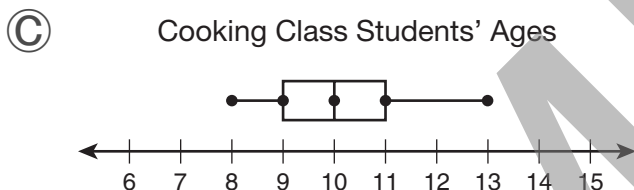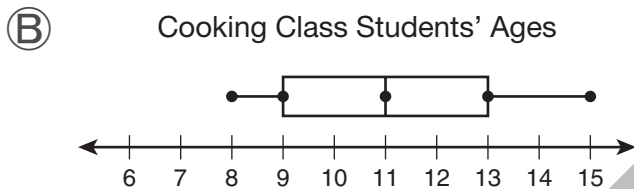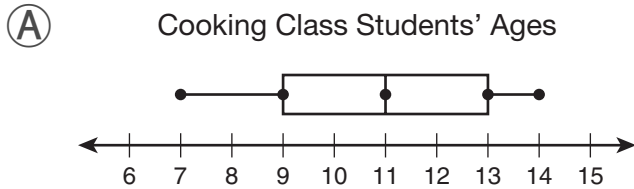| Stem	Leaf
1	2 5 6 8 8 9
2	1 2 3 5 7 7 9
3	0 2 4 5 8
4	0 2 3

Ⓐ 19   Ⓒ 36

Ⓑ 27   Ⓓ 40

4. The data values show the ages of students in a cooking class.

| 9 | 14 | 9 | 8 | 9 | 10 | 11 | 13 | 7 | 13 | 14 |

Which box plot matches the data?

Ⓐ   Cooking Class Students' Ages

```
    6   7   8   9  10  11  12  13  14  15
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Ⓑ   Cooking Class Students' Ages

```
    6   7   8   9  10  11  12  13  14  15
```

Ⓒ   Cooking Class Students' Ages

```
    6   7   8   9  10  11  12  13  14  15
```

Ⓓ   Cooking Class Students' Ages

```
    6   7   8   9  10  11  12  13  14  15
```

5. The stem-and-leaf plot represents the number of miles a truck driver traveled each day.

Stem	Leaf
7	90
8	02 20 50
9	00 09

Key: 1 | 25 = 125 mi

Which data set is represented by the stem-and-leaf plot?

Ⓐ 820, 790, 802, 900, 909, 850

Ⓑ 820, 709, 805, 900, 990, 820

Ⓒ 820, 790, 805, 900, 909, 820

Ⓓ 802, 790, 802, 900, 909, 850
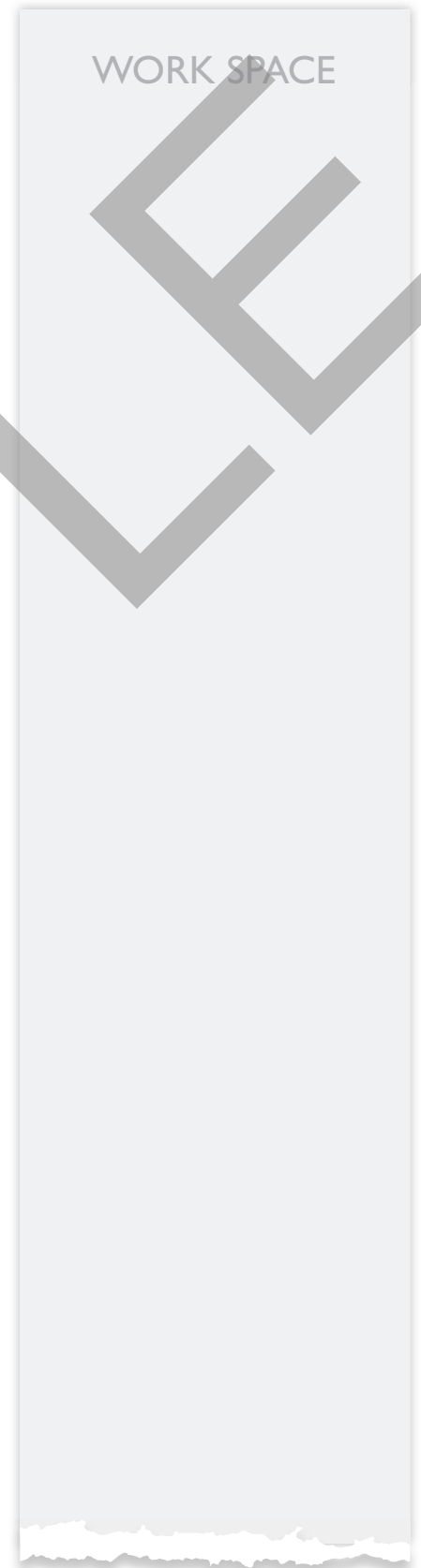
WORK SPACE

6. What would a set of data look like for a box plot that only has one "whisker"? Give an example.

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_____

7. Part A

Rebecca recorded the dollar amounts of her recent purchases. She made the stem-and-leaf plot for the data.

Stem	Leaf
1	6 7 7
2	1 4
3	0 1 5 7
4	2

Key: 1 | 6 = $16

How many purchases are represented in the stem-and-leaf plot?

_____

Part B

Rebecca wants to add up the amounts of all her purchases by finding the sum of the leaves and adding them to the sum of the stems and then multiplying the total by 10. Would this process work? Explain why or why not.

_____

_____

_____

_____

_____

_____

_____

EXIT TICKET

6.SP.B.4

Now that you have mastered box plots, let's solve the problem in the **Real-World Connection**. Tanya researches and records the prices of school lunches in **11** different school districts. She then wants to display the data graphically in order to best show the distribution of the data.

$2.32	$2.70	$2.55	$2.40	$2.00	$2.45
$2.50	$2.65	$2.25	$2.75	$2.25	

What type of display should Tanya use for this data? Draw a display for the data.

_____

_____

SAMPLE