Day 61 Guided Practice

Outliers at Lunch

The table below lists what's on the menu for lunch in a school cafeteria, along with the calories for each item. Follow along with your teacher to fill out the five-number summary for the data. Then, calculate any outliers for the data.

Lunchtime Calories

Menu item	Calories
Veggie sub with oil, vinegar, Italian spices and cheese	258
Whole-grain ham sub with veggies	310
Pasta with marinara sauce	290
Vegetarian salad, light dressing	42
Whole-grain turkey sub with veggies	290
Cheeseburger	515
Salad with chicken, cheese and light dressing	237

1. List the numbers from the table in order from least to greatest:

   42   237   258   (290)   290   310   515

2. Fill out the five-number summary for the data.

Minimum (min)	42
Lower quartile (Q_1)	237
Median (M or Q_2)	290
Upper quartile (Q_3)	310
Maximum	515

3. Determine the interquartile range.

   $IQR = Q_3 - Q_1 =$ __310__ $-$ __237__ $=$ __73__

4. Multiply the interquartile range by 1.5.

   $IQR \cdot 1.5 =$ __73__ $\cdot 1.5 =$ (109.5)   **IQR RULE**

5. **Subtract** the answer from problem 4 from the lower quartile.

   $Q_1 -$ 109.5 ＊ 127.5

   Any number(s) from the five-number summary that is **less than** this answer is an **outlier.**

   Outlier: __42__

6. **Add** the answer from problem 4 to the upper quartile.

$Q_3 +$ **109.5** $=$ **419.5**

Any number(s) from the five-number summary that is <u>**greater than**</u> this answer is an <u>**outlier**</u>.

Outlier: **515**

7. What are your outliers, if any?

    42 (vegetarian salad) and 515 (cheeseburger)

Day 61 Practice

Find the Outliers

For each problem, the data set to fill out the five-number summary. Then, calculate any outliers. Use a calculator. Show your work. Use the Day 61 Guided Practice: Outliers at Lunch worksheet to help you if needed.

1. Data set:

   11, 15, 32, 33, (33) 35, 38, 40, 42, 45, 45, 47, 48, 55, 56, 65, 67, 123

   43.5

   a. Fill out the five-number summary:

Minimum (min)	11
Lower quartile (Q_1)	33
Median (M or Q_2)	43.5
Upper quartile (Q_3)	55
Maximum	123

   b. What's the interquartile range?

   $IQR = Q_3 - Q_1 =$ __55__ − __33__ = __22__

   c. Multiply the interquartile range by 1.5.

   $IQR \cdot 1.5 =$ __22__ • 1.5 = __33✳__

   d. **Subtract** this answer from the **lower quartile.**

   $Q_1 -$ __33✳__ = __0__

   e. **Add** the answer from part c to the **upper quartile.**

   $Q_3 +$ __33✳__ = __88__

   f. What are your outliers, if any? __123__

2. Data set:

   63, 95, 97, (100,) 101, 105, 108, 110, 110, 112, (115,) 117, 119, 120

   a. Fill out the five-number summary:

Minimum (min)	63
Lower quartile (Q_1)	100
Median (M or Q_2)	109
Upper quartile (Q_3)	115
Maximum	120

b. What's the interquartile range?

$$IQR = Q_3 - Q_1 = \underline{115} - \underline{100} = \underline{15}$$

c. Multiply the interquartile range by 1.5.

$$IQR \cdot 1.5 = \underline{15} \cdot 1.5 = \underline{22.5}$$

d. **Subtract** this answer from the **lower quartile.**

$$Q_1 - \underline{22.5} = \underline{77.5} \qquad *\boxed{IQR * 1.5}$$

e. **Add** the answer from (problem 4) to the **upper quartile.**

$$Q_3 + \underline{22.5} = \underline{137.5}$$

f. What are your outliers, if any? $\underline{63 \, 0}$

3. Data set:

16, 19, 24, 25, 25, 83, 33, 34, 34, 37, 37, 40, 42, 46, 49, 73

a. Fill out the five-number summary:

Minimum (min)	16
Lower quartile (Q₁)	25
Median (M or Q₂)	34
Upper quartile (Q₃)	41
Maximum	73

b. What's the interquartile range?

$$IQR = Q_3 - Q_1 = \underline{41} - \underline{25} = \underline{16}$$

c. Multiply the interquartile range by 1.5.

$$IQR \cdot 1.5 = \underline{16} \cdot 1.5 = \underline{24}$$

d. **Subtract** this answer from the **lower quartile.**

$$Q_1 - \underline{24} = \underline{1} \qquad {}^{25}$$

e. **Add** the answer from problem 4 to the **upper quartile.**

$$Q_3 + \underline{24} = \underline{65}$$

f. What are your outliers, if any? $\underline{73}$

`continued`

North Carolina Introduction to High School Math, Version 2.0

Day 62 Guided Practice

Grades

Below are 9 test grades from Jack's language arts class. Follow along with your teacher to fill out the five-number summary for the data. Then, calculate any outliers for the data.

Jack's test grades

75, 40, 91, 96, 80, 68, 81, 93, 85

1. List the numbers from the table in order from least to greatest:

    40   68   75   80   (81)   85   91   93   96

2. Fill out the five-number summary for the data.

Minimum (min)	40
Lower quartile (Q_1)	71.5
Median (M or Q_2)	81
Upper quartile (Q_3)	92
Maximum	96

3. Determine the interquartile range.

    $IQR = Q_3 - Q_1 =$ 92 $-$ 71.5 $=$ 20.5

4. Multiply the interquartile range by 1.5.

    $IQR \cdot 1.5 =$ 20.5 $\cdot 1.5 =$ 30.75

5. **Subtract** the answer from problem 4 from the lower quartile.

    $Q_1 -$ 30.75 $=$ 40.75

    Any number(s) from the five-number summary that is **less than** this answer is an **outlier**.

    Outlier: 40

6. **Add** the answer from problem 4 to the upper quartile.

$Q_3 + $ **30.75** $=$ **122.75**

Any number(s) from the five-number summary that is **greater than** this answer is an **outlier**.

Outlier: **NONE**

7. What are your outliers, if any? **40**

8. What is the mean of the data set? **78.8**

9. What is the mean of the data set without the outlier? **83.6**

8. What do you notice about the means in problems 8 and 9? **9 IS HIGHER THAN 8**

10. What is the median of the data set? **81**

11. What is the ~~mean~~ of the data set without the outlier? **83** → **83.6**
    ↳ median ———→

12. Can we take out the outlier and report that mean as the measure of center? Explain.

    NO BECAUSE IT CHANGES

13. Which more accurately represents the measure of center for the data set: mean or median? Explain.

    MEDIAN - NOT AS AFFECTED BY THE OUTLIER

8-2a Measures of Variation

Low(15)

$$12 \quad 18 \quad 23 \quad \boxed{(23)} \quad 25 \quad 30 \quad 42$$

1.) What is the range of the data given below?

25, 42, 23, 12, 30, 18, 23   ← 30

2.) The interquartile range is the _upper 3̶ quartile_ minus the _lower quartile_, whereas, the range is the _max_ minus the _min_.

Medium(70)

2.) Given the ordered data set, identify the lower quartile, median, and upper quartile. Then give the overall range and the interquartile range of the data set. SHOW YOUR WORK!!!!

28   38

25, 28, 28, 32, 44, 58, 88, 125

lower quartile: _28_   median: _38_

upper quartile: _73_   Range: _100_

45

Interquartile range: _3̶0̶0̶_

3.) Identify any outliers in the data given for problem 2. SHOW YOUR WORK regardless of whether an outlier does or does not exist.

$$Q_1 - (45*1.5) \qquad\qquad Q_3 + (45*1.5)$$
$$28 - 67.5 = -39.5 \qquad 73 + 67.5 = 140.5$$

$\boxed{\text{NO OUTLIERS}}$

High(15)

Bubba found the lower quartile, median, and upper quartile of a data set. He then went on to find the outlier. Did he make any mistakes? If so, what was the mistake? What would be correct?
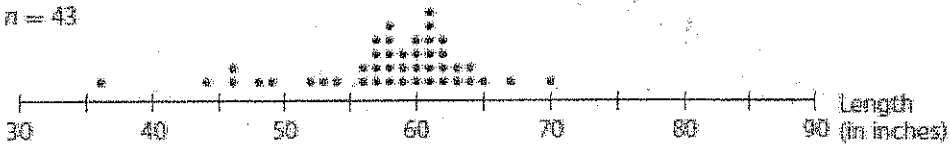
2, 5, 5, 10, 12, 16, 20, 45

Lower quartile = 5   Upper quartile = 18

Median = 11

1.) The outlier can be found from the range 18 − 5 = 13
2.) Subtract 13 from 5 and add it to 18
3.) Based on step 2, the minimum limit is -8 and the maximum limit is 31, therefore the outlier is 45

**②** Reproduced below is the dot plot of lengths of female bears from Lesson 1.

Female Bears
$n = 43$

a. Do there appear to be any outliers in the data?

b. The five-number summary for the lengths of female bears is:

minimum $= 36$, $Q_1 = 56.5$, median $= 59$, $Q_3 = 61.5$, maximum $= 70$.

    i. Use the steps above to identify any outliers on the high end.

    ii. Are there any outliers on the low end?

c. The box plot below (often referred to as a **modified box plot**) shows how the outliers in the distribution of the lengths of female bears may be indicated by a dot. The whiskers end at the last length that is not an outlier. What lengths of female bears are outliers?

Length of Female Bears (in inches)
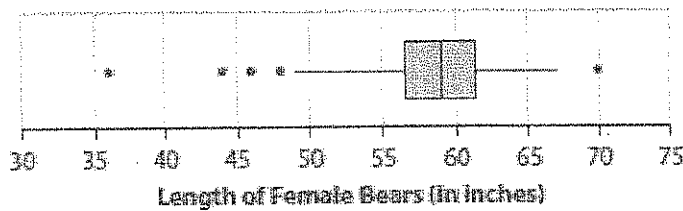
② Find the range and interquartile range of the following set of values.

$$1, 2, 3, 4, 5, 6, 70$$

a. Remove the outlier of 70. Find the range and interquartile range of the new set of values. Which changed more, the range or the interquartile range?

b. In general, is the range or interquartile range more resistant to outliers? In other words, which measure of spread tends to change less if an outlier is removed from a set of values? Explain your reasoning.

c. Why is the interquartile range more informative than the range as a measure of variability for many sets of data?