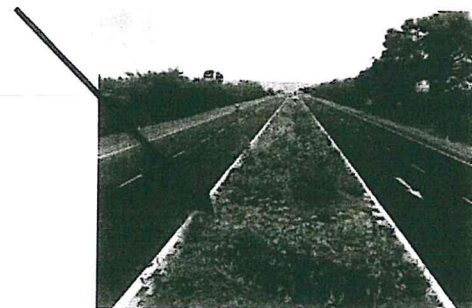


5-Number Summary

Opening Question

The center divider of a highway or road is called a *median*. In the picture at the right, this is the floral area that the arrow is pointing at.

Median



How else could you describe the word *median*?

The median is the middle.

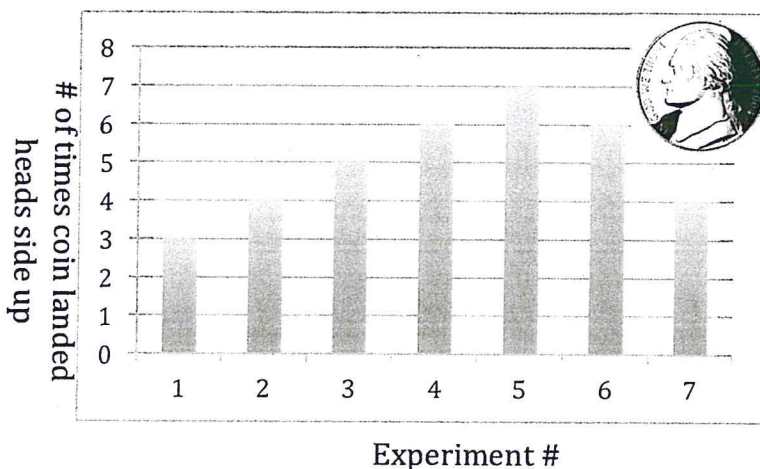
Revisiting Traci's Experiment

Previously, we found out that the average or *mean* number of times Traci's coin landed up heads was 5 out of 10 flips.

Is there perhaps a better number that we could use to describe the approximate number of heads she got?

a) Let's list the number of heads for each experiment in sequential order.

3, 4, 4, 5, 6, 6, 7



Circle the number that is in the middle of the 7 numbers.

b) The middle number is 5. This number also represents a *measure of central tendency*, known as the *median*.

c) In my own words, the *median* of a data set is the number that is precisely in the middle of the data set, when it is ordered from least to greatest.

1) a) Write down the 11 numbers that the students in the front of the class are holding. (Do not record the numbers until instructed by your teacher to do so.)

62, 66, 67, 68, 68, 69, 71, 72, 74, 75, 75

Q1 median Q3
Q2

b) Prediction: I think the **median** is 69 because it is the number in the middle.

c) Actual *median*: 69

d) Write the word **median** under the median number.

2) Explain how to find the **median** if there are an odd number of numbers in the data set:

you find the number that separates the data into 2 equal sets.

3) The median is also known as **Quartile 2 (Q2)**. **Quartile 2** is exactly half way between all of the numbers in the set of data.

a) Q2: 69

b) Write Q2 under the appropriate number.

4) To find **Quartile 1 (Q1)**, we find the median of the first half of the set of data, not inclusive of Q2. Find Q1.

a) Q1: 67

b) Write Q1 under the appropriate number.

5) a) To find **Quartile 3 (Q3)**, we find the median of the second half of the set of data, not inclusive of Q2. Find Q3.

b) Q3: 74

c) Write Q3 under the appropriate number.

6) Are there any *outliers* for this set of data, or a number or numbers that do not fit the trend of the majority of the data set? No

7) a) What is the **maximum value** of the data? 75

b) What is the **minimum value** of the data? 62

Q1 (lower quartile)
Q3 (upper quartile)
median
maximum
minimum

8) a) The **range** of the data set is the difference between the smallest (*minimum value*) and greatest (*maximum value*) number in the data set.

What is the range of the data set? 75 - 62 = 13

b) What does the value of the range mean in terms of the data set?

distance from the lowest to highest number

9) The **interquartile range (IQR)** is the difference between the first (Q1) and third (Q3) quartiles. (IQR = Q3 - Q1)

What is the interquartile range (IQR) of the data set? $74\frac{1}{2} - 67 = 7\frac{1}{2}$

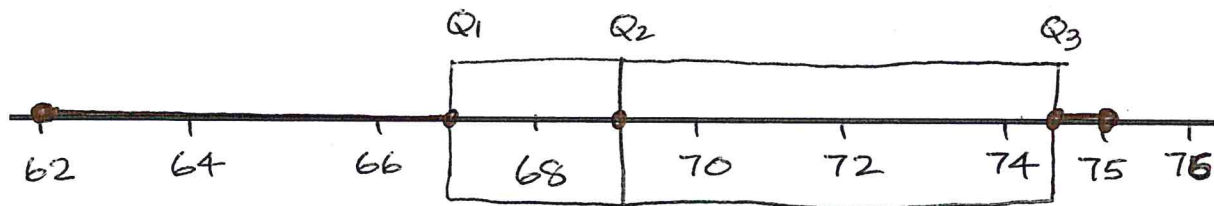
Creating a Box Plot

Using the data recorded above, your teacher is going to help you construct a **box plot**.

It is helpful to have a **5-Number Summary** complete before constructing a **box plot**. Record the values from the prior page into the table below.

5-Number Summary

Minimum Value	Lower Quartile (Q1)	Median (Q2)	Upper Quartile (Q3)	Maximum Value
62	67	69	$74\frac{1}{2}$	75



Reflection

10) a) What do you think would happen to the data set, and the **box** plot if we used data from a 3rd grade class? The box plot would move down or to the left on the number line, since 3rd graders are shorter.

b) What if you used data from the teachers and staff on campus?

The box plot would probably move up or to the right on the number line since teachers and staff are taller.

11) Find the **mean** of the data set. How does the **mean** compare to the **median**?

$$\begin{aligned}
 \text{mean} &= \frac{62 + 66 + 67 + 68 + 68 + 69 + 71 + 72 + 74 + 75 + 75}{11} \\
 &= \frac{767}{11} \\
 &= 69.\overline{72}
 \end{aligned}$$

The mean is slightly larger than the median.

What if there is an Even Number of Numbers in the Data Set?

11) a) Write down the 10 numbers of that the students in the front of the class are holding.
(Do not copy down the numbers until your teacher instructs you to do so.)

55, 60, 70, 62, 63, 58, 63, 57, 65, 67
→ 55, 57, 58, 60, 62, 63, 63, 65, 67, 70

b) Prediction: I think the **median** is 62.5 because it is the number that is between 62 and 63.

c) Why is finding the **median** for this data set not as easy? There are 2 numbers that share the middle.

To find the **median** for a data set with an even number of numbers, we take the **mean** of the two numbers closest to the middle.

For example, in the following data set, 2, 4, 6, 8, 10, 12 the **median** will be the **mean** of 6 and 8.

$$6 + 8 = 14 \text{ and } 14 \div 2 = 7 \quad \text{The } \mathbf{median} \text{ is } 7! \quad Q2 = 7$$

Q1 is the **median** of the lower half of the data, which would be **4**. $Q1 = 4$

Q3 is the **median** of the upper half of the data, which would be **10**. $Q3 = 10$

d) Actual **Median**: 62.5

e) Write the word *median* under the median number.

12) Explain how to find the *median* if there is an even number of numbers in the data set:

Find the mean of the 2 numbers that are in the middle.

13) a) Find Q2: 62.5
(Hint: You already found it!)

b) Write Q2 under the appropriate number.

14) a) Find Q1: 58

b) Write Q1 under the appropriate number.

15) a) Find Q3: 65

b) Write Q3 under the appropriate number.

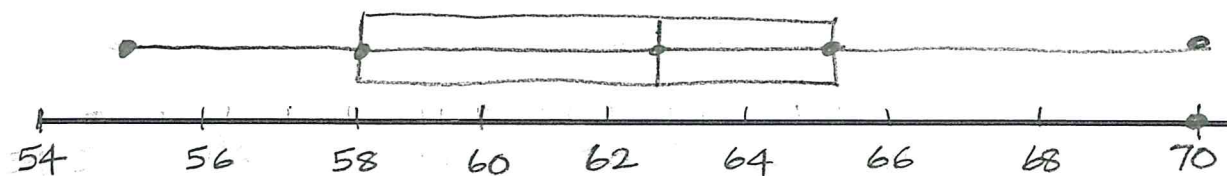
16) Are there any *outliers* for this set of data, or a number or numbers that do not fit the trend of the majority of the data set? Explain. No

17) Find the **range** for the data set: 70 - 55 = 15

18) Find the **interquartile range** (IQR): $65 - 58 = 7$

19) Find the **minimum value** 55 ; **maximum value** 70

20) Construct a **boxplot** for the data using your **5-Number Summary**.



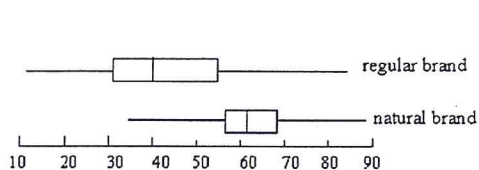
21) Find the **mean** of the data set. How does this compare to the **median**?

$$\text{mean} = \frac{55 + 57 + 58 + 60 + 62 + 63 + 65 + 67 + 70}{10} = \frac{620}{10} = 62$$

Mean is less than the median.

22) Looking at the **boxplot** above, is the data skewed to the right? To the left? Or is it symmetric? What does this mean in terms of the data?

The data is slightly skewed to the ~~left~~ ^{right}. This means that there is greater variability in the lower half of the data.



Data skewed to the ~~left~~ ^{right}.

Data skewed to the ~~right~~ ^{left}.

Reflection

23) What do you think the name **quartile** has to do with the way numbers are grouped?

It is divided into 4 groups.

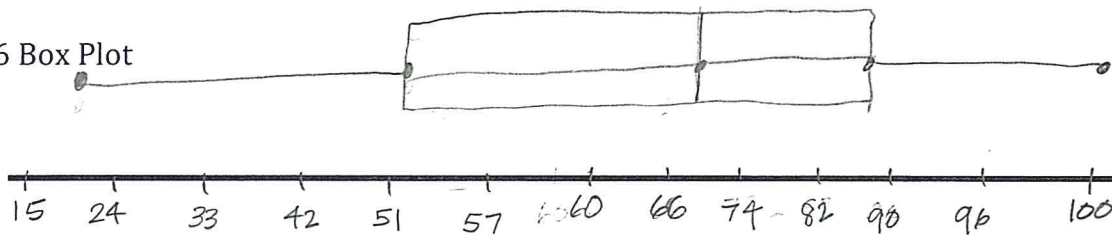
24) Why do you think it is important to put the numbers in sequential order when finding a 5-number summary? We are looking at the range of data on a number line so the data must be in numerical order.

25) If one of the **whiskers** of the **boxplot** is longer than the other, does that mean that there is more data on that part of the plot? No, it means the range is greater (or variability). It still represents 25% of the data.

Practice: Find the 5-Number Summary for each of the data sets below, as well as the mean, range, and IQR. Use this information to make a box plot. 6, 8, 9, 9, 10, 12, 13, 13, 17, 25

26) 18 27 34 52 54 59 61 <u>68</u> 78 82 85 87 91 93 100	27) 8, 25, 17, 6, 9, 13, 9, 13, 12, 10
Mean (review) = $\frac{989}{15} \approx 66$	Mean (review) = $\frac{122}{10} \approx 12$
Median = 68	Median = 11
Q1 = 52	Q1 = 9
Q3 = 87	Q3 = 13
IQR = $87 - 52 = 35$	IQR = $13 - 9 = 4$
Range = $100 - 18 = 82$	Range = $25 - 6 = 19$
Maximum Value = 100	Maximum Value = 25
Minimum Value = 18	Minimum Value = 6
MAD Value = $\frac{48 + 39 + 32 + 14 + 12 + 7 + 5 + 2 + 12 + 16 + 19 + 21 + 25 + 27 + 34}{15} = \frac{316}{15} \approx 21$	MAD Value = $\frac{6 + 4 + 3 + 3 + 2 + 6 + 1 + 1 + 5 + 13}{10} = \frac{65}{10} = 6.5$

#26 Box Plot



#27 Box Plot

