

## **The Five Magic Numbers**

**Objective:** Students will review the five numbers needed to construct a box and whisker plot. Students will also answer questions using a box and whisker plot they created.

**Background Knowledge:** Students need to know how to find median. They should also have some background knowledge of a box and whisker plot.

**Materials:** student handout, pencil

**Directions/Activity:** The first part of the worksheet is notes on box and whisker plots. You can read through this with the students and have them work on finding the five numbers needed to find a box and whisker plot. Later, students will construct their own box and whisker plot and answer questions off of their graph.

## “The Five Magic Numbers”

In a box and whisker plot there are “Five Magic Numbers”.

1 = **Lower Extreme** (the smallest number in the data)

2 = **Upper Extreme** (the largest number in the data)

3 = **Median** (the middle number in the data – this number cuts the data in half – 50% lower 50% higher)

4 = **Lower Quartile** (the median of the lower half – this number cuts the lower 50% in half)

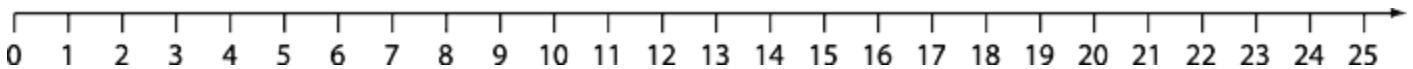
5 = **Upper Quartile** (the median of the upper half – this number cuts the upper 50% in half)

You need these “five magic numbers” to create a box and whisker plot.

- Circle the “five magic numbers” in the data below.

8 , 12 , 14 , 16 , 18 , 20 , 20 , 21 , 22 , 24 , 25

- Plot the “five magic numbers” on the number line below. Then draw the box and whisker plot using those numbers.



A box and whiskers plot divides data into four equal parts. The **median** splits the data in half. You have 50% of the data to the left of the median and 50% of the data to the right of the median.

- What percent of the data is less than 20?                      What fraction of the data is less than 20?
- What percent of the data is greater than 20?                      What fraction of the data is greater than 20?

The lower half of the data is to the left of the median. The **lower quartile** splits the lower 50% in half, making each part 25%.

- What is the lower quartile on the box and whisker plot above?
- What percent of the data is less than 14?
- What percent of the data is between 14 and 20?

The upper half of the data is to the right of the median. The **upper quartile** splits the upper 50% in half, making each part 25%.

- What is the upper quartile on the box and whisker plot above?
- What percent of the data is more than 22?
- What percent of the data is between 20 and 22?

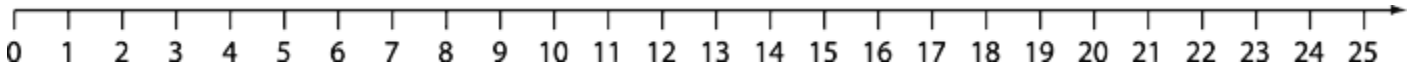
A box and whisker plot splits data into four equal parts, even though they may not look even. There is the same amount of numbers in each part, 25%. The box and whisker plot may not look even because of the way the data is distributed. This means that part 1 may have a bigger range than parts 2,3, or 4.

- If there are 12 numbers in a set of data, how many numbers are in each part of the box and whisker plot?

## “Box and Whisker Plot Activity Sheet”

1. Make a box and whisker plot of the data below.

2, 3, 3, 5, 6, 8, 10, 12, 13, 14, 14, 15, 18, 18, 21, 22, 23, 23, 24



2. What is the lower extreme?
3. What is the upper extreme?
4. What is the range of the data?
5. What is the lower quartile?
6. What is the upper quartile?
7. What is the interquartile range (this is the range of the quartiles, the size of the box)?
8. How many parts are there to a box and whisker plot?
9. What percent is each part of the box and whisker plot?
10. What percent of the data is below 6?
11. What percent of the data is above 14?
12. What percent of the data is represented by the box?
13. What fraction of the data is below the median?
14. What fraction of the data is above 6?
15. What fraction of the data is higher than 14?

## Answer Key to “The Five Magic Numbers”

In a box and whisker plot there are “Five Magic Numbers”.

1 = **Lower Extreme** (the smallest number in the data)

2 = **Upper Extreme** (the largest number in the data)

3 = **Median** (the middle number in the data – this number cuts the data in half – 50% lower 50% higher)

4 = **Lower Quartile** (the median of the lower half – this number cuts the lower 50% in half)

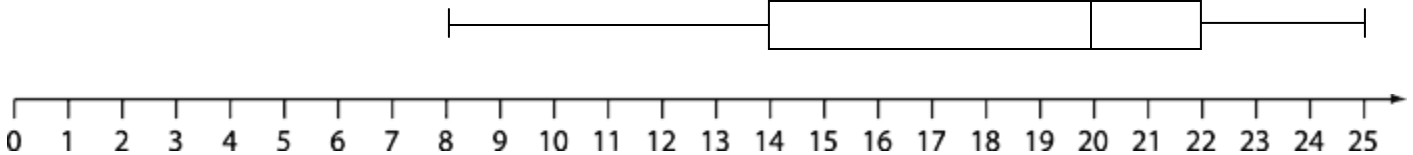
5 = **Upper Quartile** (the median of the upper half – this number cuts the upper 50% in half)

You need these “five magic numbers” to create a box and whisker plot.

- Circle the “five magic numbers” in the data below.

**8** , 12 , **14** , 16 , 18 , **20** , 20 , 21 , **22** , 24 , **25**

- Plot the “five magic numbers” on the number line below. Then draw the box and whisker plot using those numbers.



A box and whiskers plot divides data into four equal parts. The **median** splits the data in half. You have 50% of the data to the left of the median and 50% of the data to the right of the median.

- What percent of the data is less than 20? **50%**    What fraction of the data is less than 20?  $\frac{1}{2}$
- What percent of the data is greater than 20? **50%**    What fraction of the data is greater than 20?  $\frac{1}{2}$

The lower half of the data is to the left of the median. The **lower quartile** splits the lower 50% in half, making each part 25%.

- What is the lower quartile on the box and whisker plot above? **14**
- What percent of the data is less than 14? **25%**
- What percent of the data is between 14 and 20? **25%**

The upper half of the data is to the right of the median. The **upper quartile** splits the upper 50% in half, making each part 25%.

- What is the upper quartile on the box and whisker plot above? **22**
- What percent of the data is more than 22? **25%**
- What percent of the data is between 20 and 22? **25%**

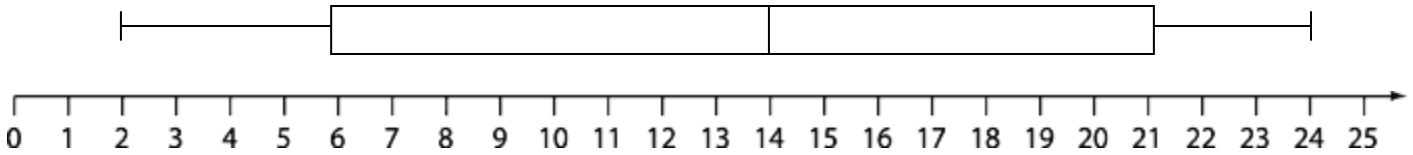
A box and whisker plot splits data into four equal parts, even though they may not look even. There is the same amount of numbers in each part, 25%. The box and whisker plot may not look even because of the way the data is distributed. This means that part 1 may have a bigger range than parts 2,3, or 4.

If there are 12 numbers in a set of data, how many numbers are in each part of the box and whisker plot? **3**

## Answer Key to “Box and Whisker Plot Activity Sheet”

1. Make a box and whisker plot of the data below.

2, 3, 3, 5, 6, 8, 10, 12, 13, 14, 14, 15, 18, 18, 21, 22, 23, 23, 24



2. What is the lower extreme? **2**
3. What is the upper extreme? **24**
4. What is the range of the data? **22**
5. What is the lower quartile? **6**
6. What is the upper quartile? **21**
7. What is the interquartile range (this is the range of the quartiles, the size of the box)? **15**
8. How many parts are there to a box and whisker plot? **4**
9. What percent is each part of the box and whisker plot? **25%**
10. What percent of the data is below 6? **25%**
11. What percent of the data is above 14? **50%**
12. What percent of the data is represented by the box? **50%**
13. What fraction of the data is below the median?  $\frac{1}{2}$
14. What fraction of the data is above 6?  $\frac{3}{4}$
15. What fraction of the data is higher than 14?  $\frac{1}{4}$