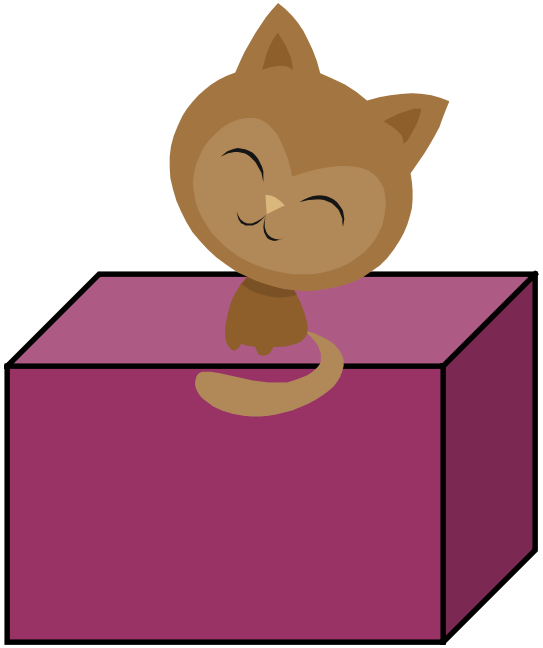
Notes Unit 8: Interquartile Range, Box Plots, and Outliers



I. Box Plot
A. What is it?

- Also called a ‘Box and Whiskers’ plot
  - A 5-numbered summary of data:
    - Lower extreme
    - Lower quartile
    - Median
    - Upper quartile
    - Upper extreme
  - To draw a Box Plot, we need to find all 5 of these numbers

B. Steps to Creating a Box Plot

1. Order the numbers smallest to largest

2. Find the 5 numbers- median, lower and upper extremes, lower and upper quartiles

3 Draw the box plot- draw a number line, draw and label the parts

C. Examples

Example 1:

12, 13, 5, 8, 9, 20, 16, 14, 14, 6, 9, 12, 12

Step 1: Order the numbers from smallest to largest

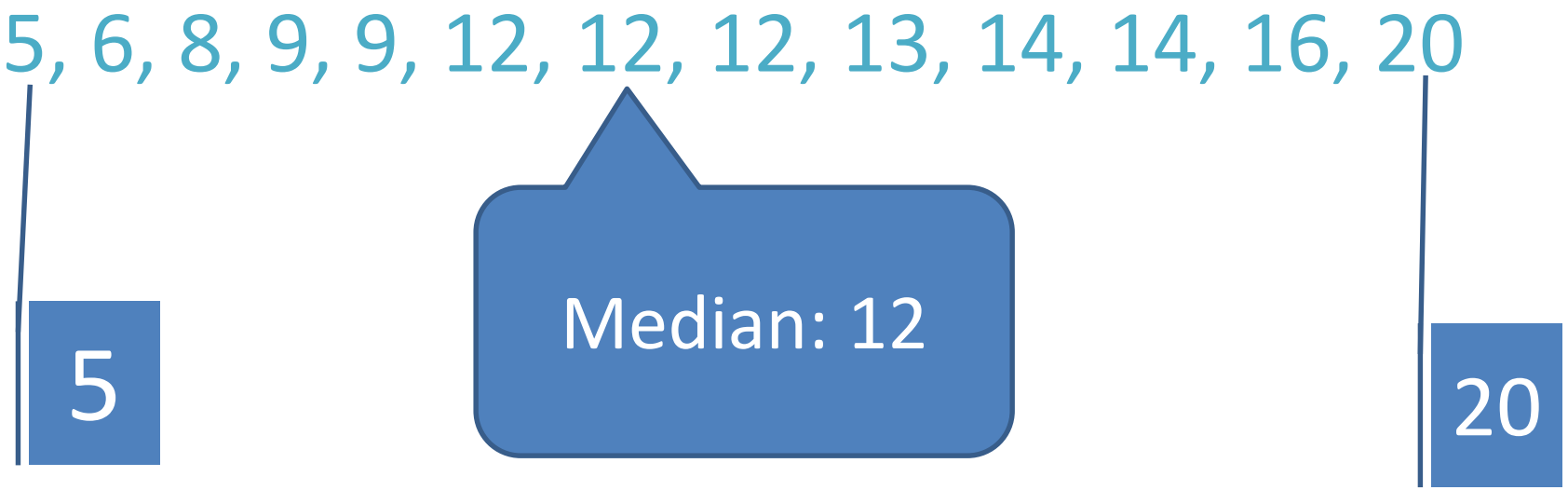
5, 6, 8, 9, 9, 12, 12, 12, 13, 14, 14, 16, 20

Step 2 – Find the Median

5, 6, 8, 9, 9, 12, 12, 12, 13, 14, 14, 16, 20

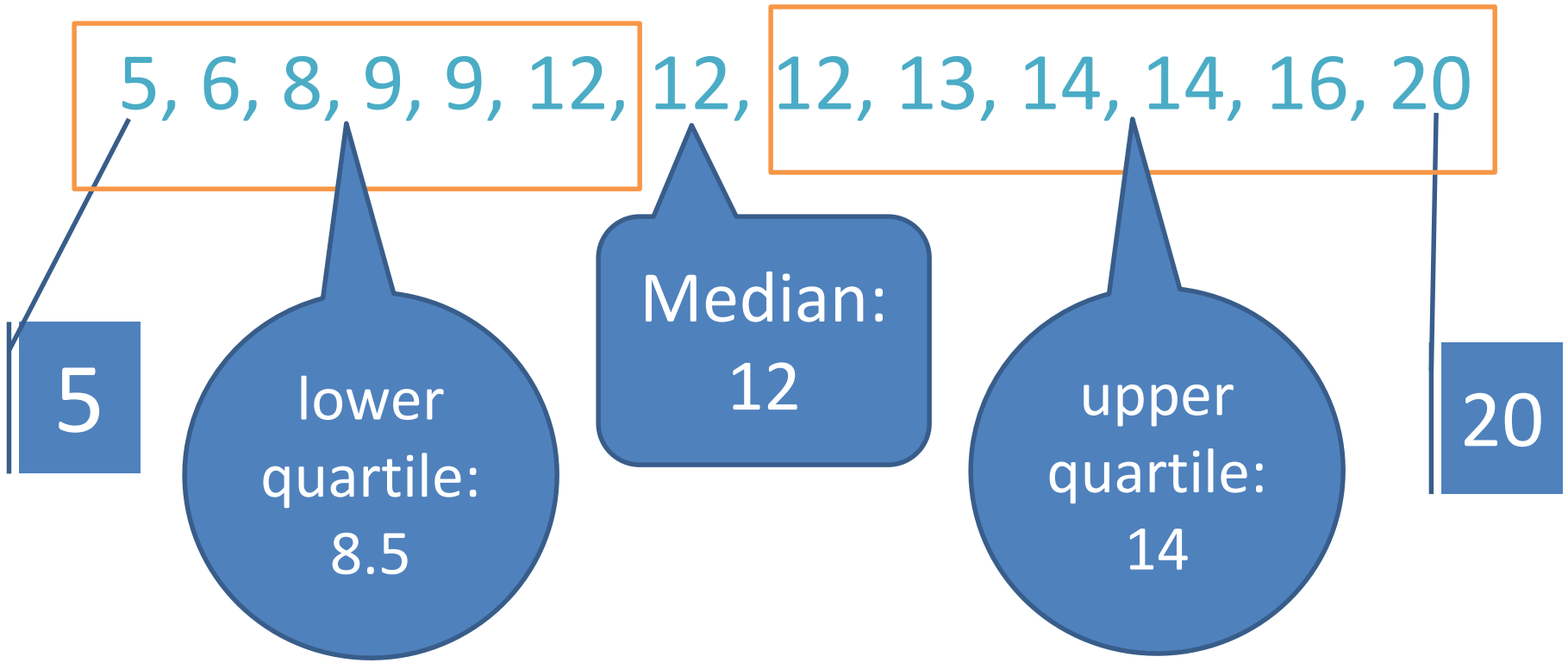
2. Find the **median**. The median is the middle number. If the data has two middle numbers, find the mean of the two numbers. What is the median?

Step 2 – Find the Lower and Upper Extremes



2. Find the smallest and largest numbers

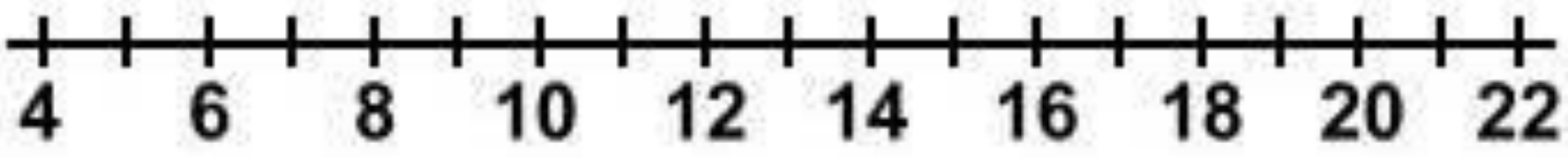
Step 2 – Upper & Lower Quartiles



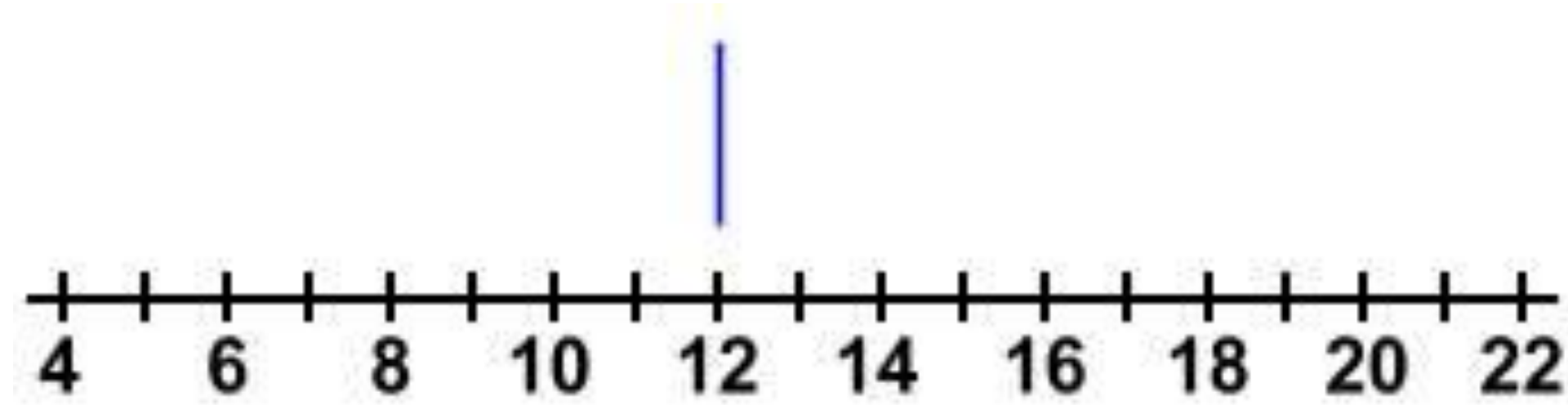
3. Find the **lower and upper medians or quartiles**. These are the middle numbers on each side of the median. What are they?

Step 3 – Draw the Box Plot

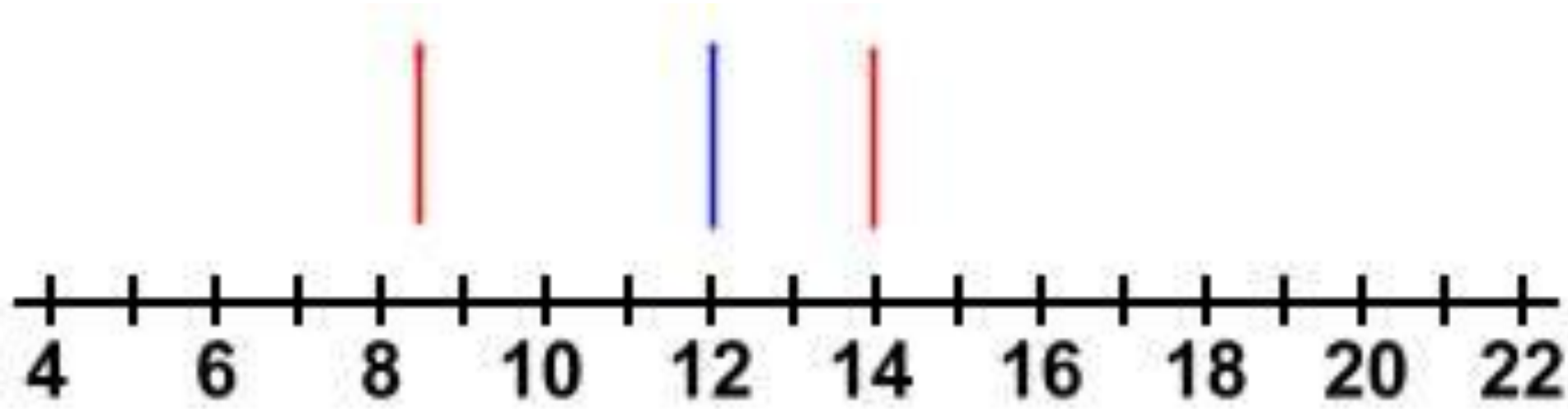
Now you are ready to construct the actual box & whisker plot. First you will need to draw an ordinary number line that extends far enough in both directions to include all the numbers in your data:



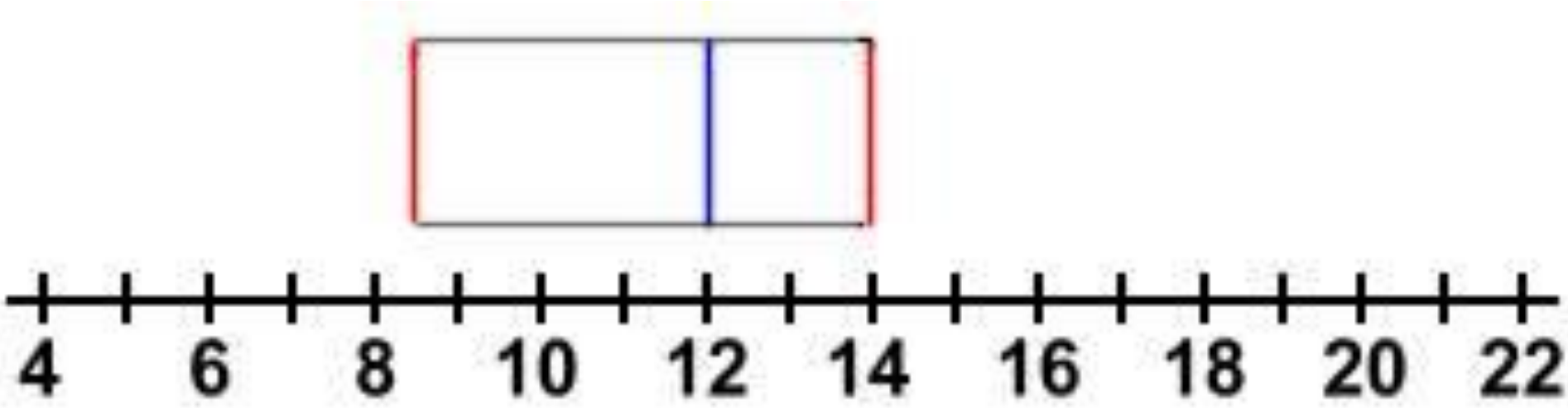
Locate the main **median 12** using a vertical line just above your number line:



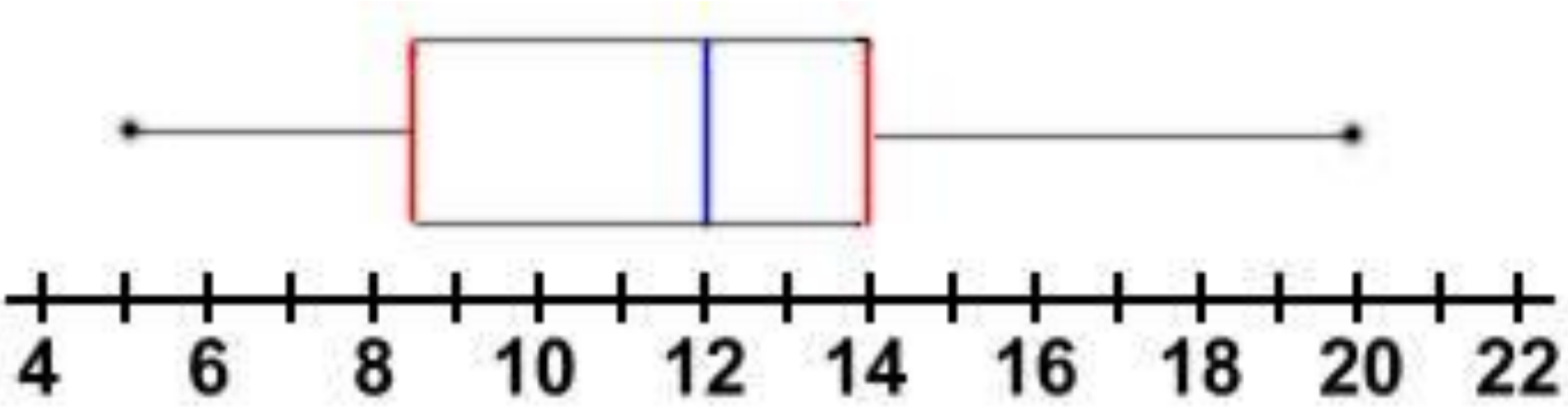
Locate the **lower median 8.5** and the **upper median 14** with similar vertical lines:



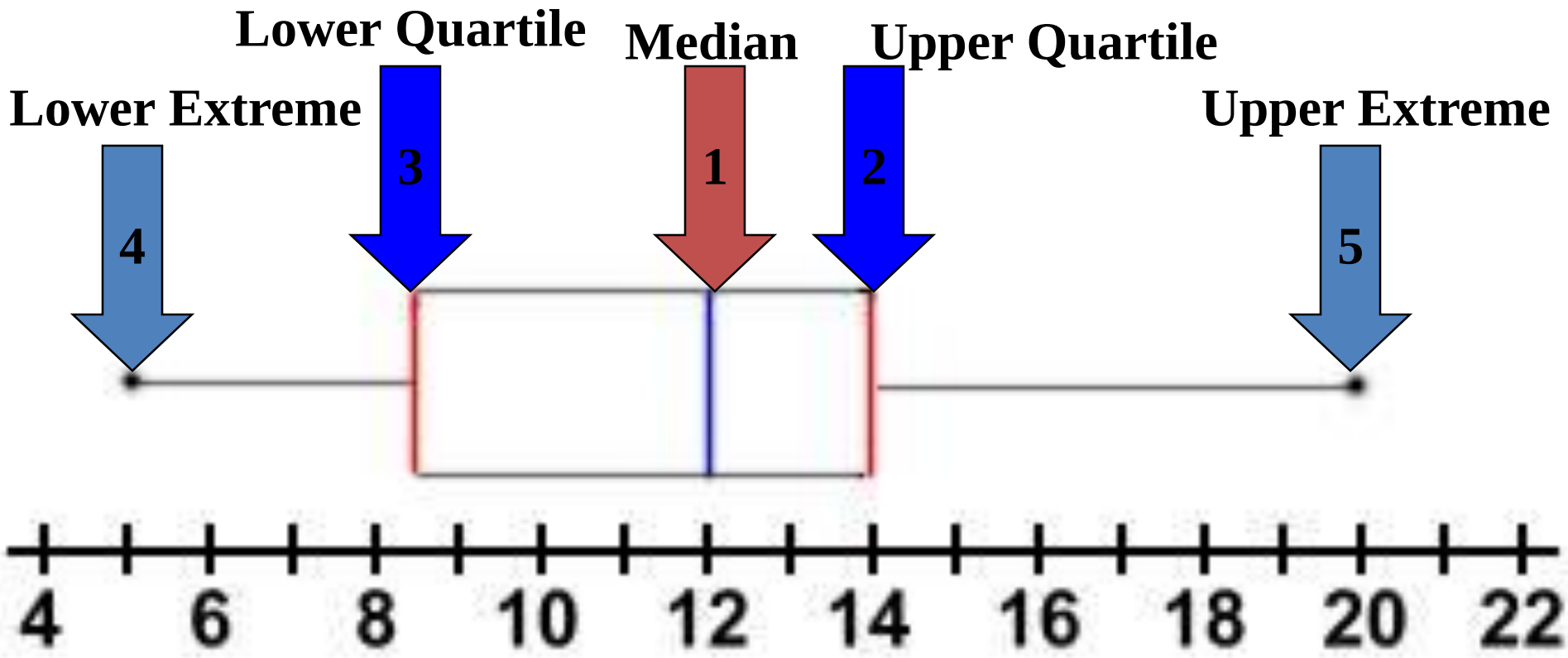
- Next, draw a box using the lower and upper median lines as endpoints:



Finally, the **whiskers** extend out to the data's smallest number **5** and largest number **20**:



Name the parts of a Box-and-Whisker Plot



II. Interquartile Range

The interquartile range is the difference between the upper quartile and the lower quartile.

$$14 - 8.5 = 5.5$$

III. Outlier
A. What is it?

- An outlier is a number in a data set that is very different from the rest of the numbers.
- It can have a MAJOR effect on the mean.

Totals of M&Ms:

19, 16, 17, 17, 19, 9

B. Finding Outliers

- Data: 10, 23, 6, 8, 9, 8

  Outlier 23

- Data: 78, 80, 82, 79, 105, 77

  Outlier 105

C. The Effect of Outliers

Ex 1: Ms. Gray is 25 years old. She took a class with students who were 55, 52, 59, 61, 63, and 58 years old. Find the mean and median with and without Ms. Gray's age.

Data with Ms. Gray's age:

mean ≈ 53.3 median = 58

Data without Ms. Gray's age:

mean = 58 median = 58.5

Ex 2: The Oswalds are shopping for gloves. They found 8 pairs of gloves with the following prices:

$17, $15, $3, $12, $13, $16, $19, $19

Data with the outlier:

mean = $14.25 median = $15.50

Data without the outlier:

mean = 15.85 median = 16