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## The 5 Number Summary

After understanding the central tendency of a data set, it is important to understand how the rest of the data set is **distributed**. We can do this by looking at numbers that divide the data set into quarters – known as the **quartiles**.

**Exercise #1:** Shown below are the scores 16 students received on a math quiz.

52, 60, 66, 66, 68, 72, 72, 73, 74, 75, 80, 82, 84, 91, 92, 98

(a) What is the median of this data set?

$$\frac{16+1}{2} = 8.5$$

med = Avg of 8<sup>th</sup> & 9<sup>th</sup> obs

$$\text{med} = \boxed{73.5}$$

(b) Find the **range** of the data set (defined as the difference between the largest data value and the smallest data value).

$$98 - 52 = \boxed{46}$$

(c) What is the median of the lower half of this data set (known as the **first quartile**,  $Q_1$ )?

$$Q_1 = \frac{66+68}{2} = \boxed{67}$$

(d) What is the median of the upper half of this data set (known as the **third quartile**,  $Q_3$ )?

$$Q_3 = \frac{82+84}{2} = \boxed{83}$$

**Exercise #2:** What would be an appropriate name, in terms of quartiles, for the median? Explain.

$Q_2$

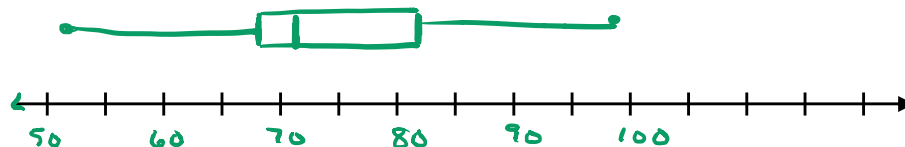
The first and third quartiles are sometimes known as the lower and upper quartiles, respectively. The quartiles, the median, and the lowest and highest values in a data set comprise what is known as the **five number summary** and can be graphically represented on a **box-and-whisker plot**.

**Exercise #3:** Construct a box plot using the data above. Identify the outlier boundaries.

$$IQR = 16$$

No outliers

$$1.5(16) = 24$$



**Exercise #4:** The ages of the 15 employees of the Cool Curry House are given below.

16, 17, 17, 18, 19, 22, 25, 26, 29, 33, 33, 37, 40, 42, 44

(a) Determine the median and quartile values for this data set.

$$Q_2 = 26$$

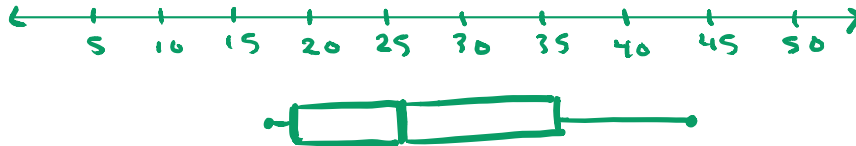
$$Q_1 = 18$$

$$IQR = 19$$

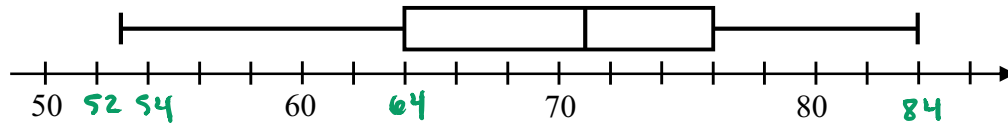
$$Q_3 = 37$$

$$1.5(19) = 28.5$$

(b) Create a box plot for the data. Identify the outlier boundaries.



**Exercise #5:** Twenty of Mr. Greco's physics students recently took a quiz. The results of this quiz are shown in the following box-and-whiskers diagram. Assume that all scores are whole numbers.



(a) What was the median score on Mr. Greco's math quiz?

$$Q_2 = 71$$

(b) What was the range of the scores on Mr. Greco's math quiz?

$$R = 84 - 53 = 31$$

(c) What score was greater than or equal to 75% of all other scores on this quiz?

$Q_3$

any score  $\geq 76$

(d) Mr. Greco regularly sets the passing grade on his quizzes to be the score of the lower quartile. What is the passing grade on this quiz?

$$Q_1 = 64$$

**Exercise #6:** Which of the following box-and-whiskers diagram shows a data set with the greatest median?

