Student Worksheet: Statistical Measures

Introduction

In this activity you will compare the length of missions for four space shuttles over a seven-year period. You will determine statistical measures of central tendency, including mean, median, and mode. You will also create a box-and-whiskers plot. You will draw the upper and lower quartiles and show the upper and lower end points of the data on your graph. These skills will be important during the mission.

Vocabulary

box-and-whiskers plot: a method of displaying data that helps in interpreting how data is distributed on an interval scale. A box-and-whiskers plot shows the shape of the distribution, its central value, and the variability. It especially helps show whether a distribution is skewed or whether there are unusual observations in the dataset (outliers).

central tendency: how much the values of a distribution cluster, usually measured by mean, median, or mode.

lower quartile: the median of the lower part of the data.

mean: the arithmetic average; the sum of all the scores divided by the number of the scores.

median: the middle of a set of data. Half the scores are above the median; half are below. To find the median:

- If the number of data is odd, the median is in the center.
- If the number of data is even, the median is the average of the two center scores.

mode: the number or score that appears most often in a set of data.

quartile: a division or group of data that separates the data into equal parts.

upper quartile: the median of the upper part of data.

Materials

- Data Analysis worksheet
- Pencil
- Ruler

Procedure

1. Be sure you understand all of the vocabulary.
2. Look at the Atlantis data example. Use this example to guide you as you create a box-and-whiskers plot for the other three shuttles' data.
3. Analyze the mean, median, mode, and box-and-whisker plot for each shuttle to answer the questions.

Box-and-Whiskers Plotting and Statistical Analysis Activity

The following table contains data from space shuttle missions flown from 1996-2003.

STS	Space Shuttle Name	Duration of Mission (days)
80	Columbia	17
81	Atlantis	10
82	Discovery	9
83	Columbia	3
84	Atlantis	9
85	Discovery	11
86	Atlantis	10
87	Columbia	15
88	Endeavor	8
89	Endeavor	11
90	Columbia	15
91	Discovery	9
92	Discovery	12
93	Columbia	4
94	Columbia	15
95	Discovery	8
96	Discovery	9
97	Endeavor	10
98	Atlantis	12
99	Endeavor	11
100	Endeavor	11
101	Atlantis	9
102	Discovery	12
103	Discovery	7
104	Atlantis	12
105	Discovery	11
106	Atlantis	11
107	Columbia	15
108	Endeavor	10
109	Columbia	10
110	Atlantis	10
111	Endeavor	13
112	Atlantis	10
113	Endeavor	13

Tasks

- Construct box-and-whiskers plots for each of the space shuttles and the durations of its missions.
- Identify the mean, median, and mode for each of the four sets of data.
- An example has been done using the Atlantis data. Use this example as a model to construct a box and whiskers plot and identify the mean, median, and mode (central tendencies) for the other shuttles.

Example: Atlantis

The following numbers represent the duration of the missions carried on by the Atlantis:

10, 9, 10, 12, 9, 12, 11, 10, 10

Step 1: Calculate the Mean

Mean = (10+9+10+12+9+12+11+10+10)/9

Mean = 10.33

Step 2: Calculate the Median

There are nine numbers in the set of data. The median is the one in the middle when they are written in ascending numerical order:

9, 9, 10, 10, **10**, 10, 11, 12, 12

Median = 10

Step 3: Calculate the Mode

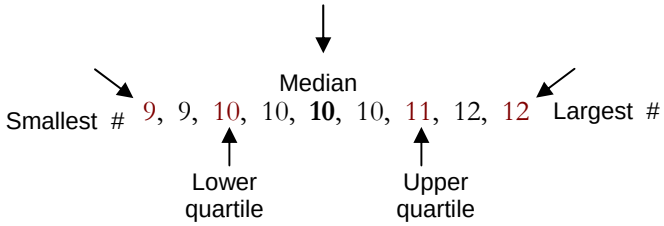
List how many times each number is repeated:

Number	Repetitions
9	Two
10	Four
11	One
12	Two

Mode = 10

Step 4: Draw the Box-and-whiskers Plot

a) Find the lower quartile, the median, the upper quartile, the smallest value, and the largest value.

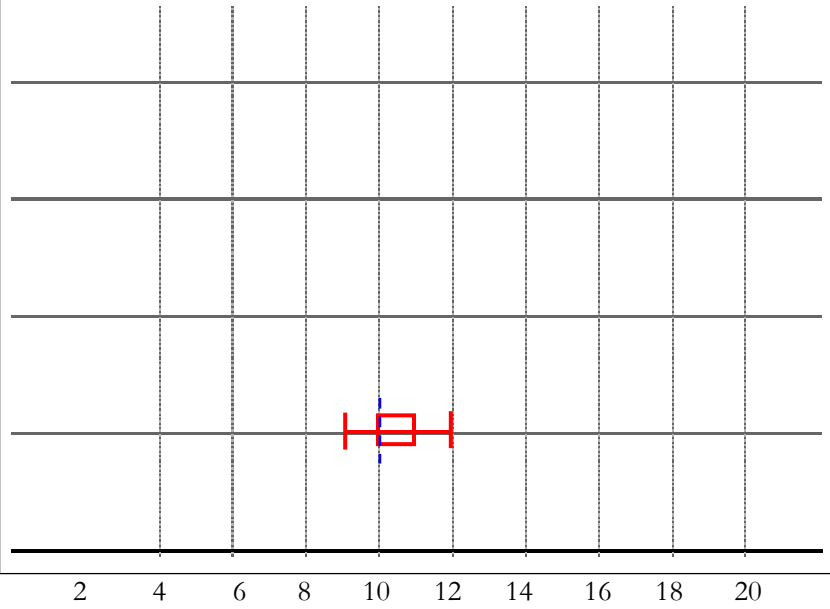


b) Graph those values in the worksheet. Draw a box between the two quartiles.

Data Analysis Worksheet

In the following worksheet construct box-and-whiskers plots and identify the mean, median, and mode for each of the shuttles.

Label	Box-and-whiskers Plot	Mean	Median	Mode
Discovery				
Endeavor				
Columbia				
Atlantis		**10.33**	**10**	**10**



Analysis Questions

Use your box-and-whiskers plots to answer the following questions:

1. Which shuttle flew the longest mission?

2. Which shuttle flew the shortest mission?

3. Which shuttle's duration had the smallest range? Explain.

4. Which shuttle had a median of 11 days?