Lesson Two
Shark Statistics: Data Collection and Analysis (5th Grade)

Acknowledgement:

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Overview of the Lesson

Name of Lesson	Shark Statistics
Optional Activities	We prepared multiple materials for various students' backgrounds. **Please consider your students' background knowledge and adjust accordingly.**
Summary of STEM Concepts	The **Mean** is the simple arithmetic average. The mean is found by adding up all the numbers in a data set and dividing by the number of numbers. The **Median** is the middle of a sorted list of data. It separates the lower half of the data from the upper half of the data. The median is found by arranging the data from least to greatest and finding the middle number. The **Range** is the difference between the smallest and the largest numbers in the data set.
Performance Based Learning Objectives	By the end of this section, the students will be able to: 1. Read/memorize/define the grade-level terms in their own language. 2. Describe/explain the steps for calculating mean, median, and the range.
Materials Needed	Printing materials were listed in Section 2 **Materials are varied. Customize as you need.**

NGSS / MAFS /CS Standards:

Standard	Description
MA.5.DP.1.1	Collect and represent numerical data, including fractional and decimal values, using tables, line graphs, or line plots.
MA.5.DP.1.2	Interpret numerical data, with whole-number values, represented with tables or line plots by determining the mean, mode, median, or range.

ENGAGE (Time: X minutes)

How will you invite students into the lesson, access prior knowledge, and excite them?

Goal	What will you say/do	Expected student responses/actions
Introduce the scenario of being a shark	Today, you will be a shark scientist who works for OCEARCH, a	

scientist. Let the students use measurements to sense the size and weight of a shark. Place the students into small groups or conduct the activity with the whole class. Adjust as you need.	non-profit organization conducting research on sharks. Your team just met Breton, a white shark that is 13 feet and 3 inches long and 1437 lbs. Optional: News of Breton First, use the tape measure to measure students' heights and record the numbers in the table. Then, calculate and compare the length of Breton and the height of students. Optional: Mark Breton's length on the floor and let the students jump multiple times to measure the length. Optional: Use the weighing scale to measure students' weights, record the numbers in the table, and add all numbers together. Then, compare the weight of Breton and the weights of students.	Students collaboratively contribute to measuring and recording results.

EXPLORE (Time: X minutes)

How will you organize student activities and thinking as they explore the STEM concepts in this lesson?

Goal	What will you say/do	Expected student responses/actions
Explore the shark tracker app from Ocearch. Read and interpret the data collected by researchers.	Place students into groups of 2-3 with 1 iPad. Go to the Ocearch Shark Tracker App or Ocearch Tracker Website. Use the filter in the tracker toolbar to search for the shark: Breton. • Track Breton's activity by month and count how many times Breton was seen in the recent month.	Students might need help with iPad passwords, internet connection, app login, and app navigation.

	• When did Breton show up often? AM or PM?	
	Place students into groups of 2-3 with 1 iPad. Go to the Ocearch Shark Tracker App or Ocearch Tracker Website. Use the worksheet to record and graph data. The instructions are included in the worksheet.	Provide pencils and colored pencils to students so they can complete the worksheet.

EXPLAIN (Time: X minutes)

How will you help students make sense of the experiences they had in the exploration?

Goal	What will you say/do	Expected student responses/actions
Students share their results with the whole class.	Students will show their graphs and share their findings and rationales based on the data. Review the concept of mean, range, and median. Review the process of calculating mean, range, and median. Identify the range and median weight of female/male white sharks together with students. Then, let the students identify the range and median length of female/male white sharks. Calculate the mean weight of female/male white sharks together with students. Then, let the students calculate the mean length of female/male white sharks.	Students will explain their findings and participate in the discussion. Students might need papers for calculation.
Further discussion about the tracker app and graphs.	Check the selected shark's travel log and discuss the following questions.	

	• When is Mary Lee's first and latest data? And When is Luna's first and latest data? Why is Luna's data different from Mary Lee's? What might happen to Luna's tag? What might happen to Luna? • Check Luna's track map. What does the yellow dot on the track path mean? Why the track path is over the land? Does the track map show how sharks are moving? Why or Why not?	

ELABORATE (Time: X minutes)

How will you connect this experience with other ideas or real-world applications?

Goal	What will you say/do	Expected student responses/actions
Read the data in multiple charts and tables. Interpret the information from the data.	Go to the Florida Museum shark attacks data webpage. Discuss the following questions: • Which county in Florida has the highest number of confirmed unprovoked shark attacks? • How many fatal attacks have happened in this county since 2012? • When do the shark attacks most commonly occur? There are only about a dozen shark species have been involved in attacks on humans. But there are more than 530 species of sharks in oceans. The top three most dangerous species of sharks are (1) great white shark, (2) tiger shark, and (3) bull shark. (Also called the big three)	Students participate in the discussion.

EVALUATE (Time: X minutes)

How will you assess the extent to which learning goals are met during/by the end of the lesson?

Goal	What will you say/do	Expected student responses/actions
The students can record, read, and interpret a set of data.	By completing the measure activity and worksheet.	Complete the data collection and recording activity.
The students can describe the process of calculating and identifying the mean, median, and range in a data set.	By completing the worksheet.	Complete the worksheet.
Open-end Discussion	What are the challenges of using data in real life?	Participant in the discussion about interpreting data in the Shark Track App.

Section 2: Worksheets Index

Worksheet #1: Measure Recording Table

Please write down the measure results in the table below, and make sure you clarify the unit (e.g., kg/lb; feet/cm).

	Student Name	Height	Weight
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			

Optional:

Please identify the median and range of the height/weight, then calculate the mean value.

Worksheet#2: Record Data and Graphing Data

Part A:

1. Go to the Ocearch Shark Tracker App or Ocearch Tracker Website.
2. Use the filter in the toolbar, search Breton, and answer the questions:

   How many times has Breton been seen in the recent month?

   When did Breton show up often? AM or PM?

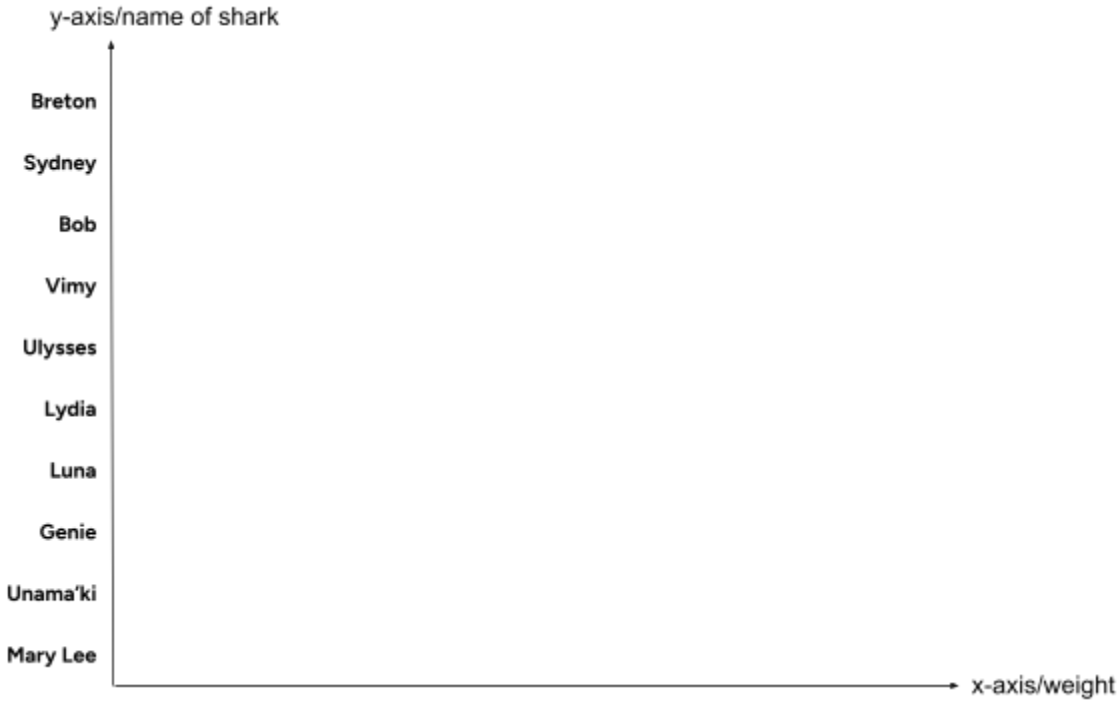
Part B:

1. Use the filter in the toolbar, search for each white shark on the table below, and then click "track" at the bottom.
2. Click the largest dot for the shark's most recent ping.
3. Click view more for the details of the shark, and complete the table.

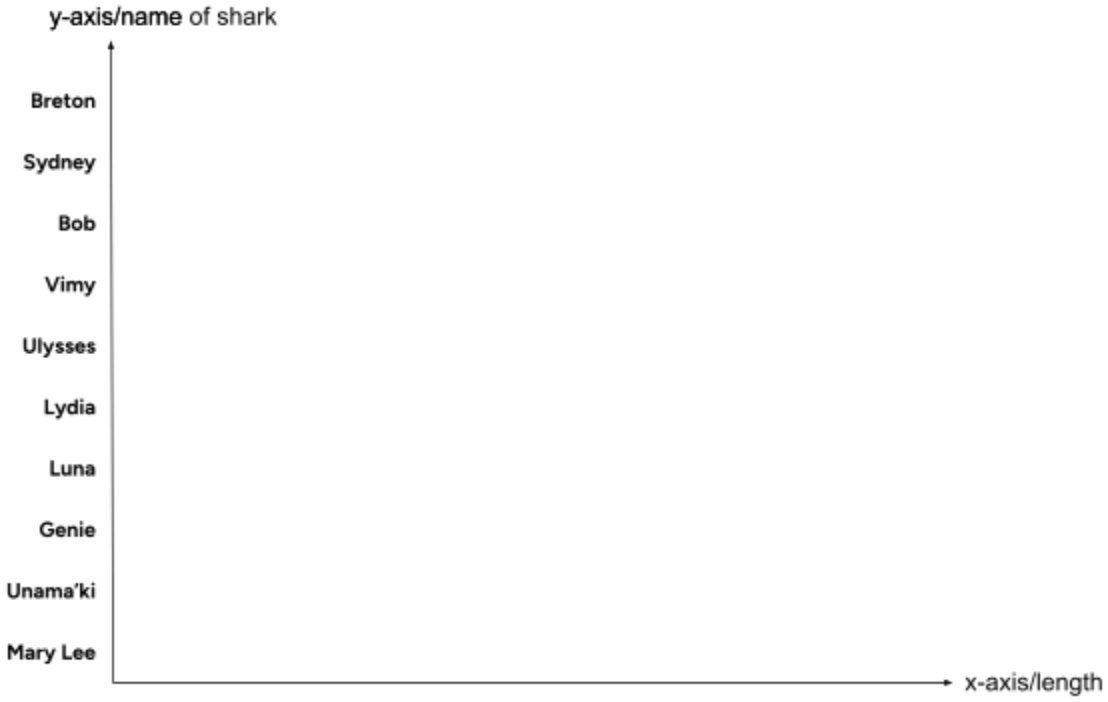
	Name	Gender	Length (ft)	Weight (lbs)
1	Breton			
2	Lydia			
3	Sydney			
4	Luna			
5	Bob			
6	Genie			
7	Vimy			
8	Unama'ki			
9	Ulysses			
10	Mary Lee			

Part C:
Please check the data in the table and complete the graphs of white sharks' weights and lengths. You may want to color-code your graphs based on gender.

Graph 1. ***(Write the title here)***



Graph 2. ***(Write the title here)***



Part D:
Check the data in the graphs, then answer the questions below.

1. **How many female and male white sharks were listed on the table?**

2. **Which gender of the white shark is longer? Please explain your rationale.**

3. **Which gender of white shark weighs less? Please explain your rationale.**

Record Data and Graphing Data - Answer Sheet

1. Go to the Ocearch Shark Tracker App or Ocearch Tracker Website.
2. Use the filter in the toolbar, search for each white shark on the table below, and then click “track” at the bottom.
3. Click the largest dot for the shark's most recent ping.
4. Click view more for the details of the shark, and complete the table.

	Name	Gender	Length (ft)	Weight (lbs)
1	Breton	Male	13ft 3 in	1437 lbs
2	Lydia	Female	14ft 6in	2072 lbs
3	Sydney	Male	12ft 2 in	1305 lbs
4	Luna	Female	15ft	1973 lbs
5	Bob	Male	13ft 4in	1308 lbs
6	Genie	Female	14ft 8in	2010 lbs
7	Vimy	Male	12ft 7in	1637 lbs
8	Unama’ki	Female	15ft 5in	2195 lbs
9	Ulysses	Male	12ft 4in	990 lbs
10	Mary Lee	Female	16ft	2639 lbs

Check the data in the graphs, then answer the questions below.

1. **How many female and male white sharks were listed on the table?**
   Five female white sharks and five male white sharks

2. **Which gender of the white shark is longer? Please explain your rationale.**
   Female white sharks are longer.
   Students could use the range/mean of the data to support the statement.

3. **Which gender of white shark weighs less? Please explain your rationale.**
   Male white sharks are lighter.
   Students could use the range/mean of the data to support the statement.

Section 3 Reference:

Ocearch Education (3-5 Grades) Math - Representing Data Graphically: https://www.ocearch.org/education/

Ocearch Tracker. https://www.ocearch.org/tracker/

Ocearch Shark Tracker App. https://www.ocearch.org/app/

USAToday. This 1,500 pound great white shark is making his annual return to North Carolina. https://www.usatoday.com/story/news/nation/2023/03/27/breton-great-white-shark-north-carolina/11552029002/

Florida Museum. International Shark Attack File (Florida). https://www.floridamuseum.ufl.edu/shark-attacks/maps/na/usa/florida/