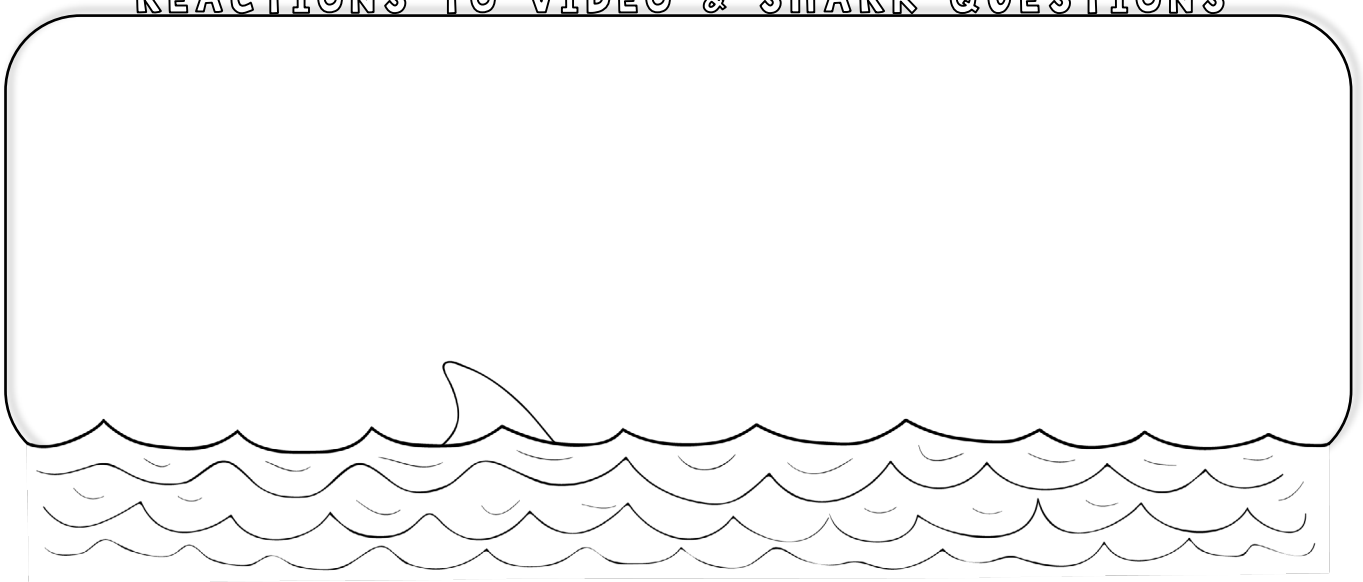
Name _____ Class _____ Date_____

GRAPHING GREAT WHITES

Watch the video Great White Shark Caught, Tagged, Released For Science at https://bit.ly/340AtTj. What thoughts, reactions, observations and questions do you have after watching this video clip? What general questions do you have about Great White Sharks? Write them here:

REACTIONS TO VIDEO & SHARK QUESTIONS



Ocearch is a scientific data collection organization that tracks the movement of Great White and other shark and marine species around the globe. The sharks that are tracked were captured, tagged, and released back into the ocean. When the dorsal fin of these tagged sharks comes to the surface of the ocean, they 'PING' a satellite orbiting Earth. The satellite then sends the shark's location information to the Ocearch database.

Knowing the locations of the tagged sharks helps scientists to track the animals' migration through the oceans, to understand the surfacing habits of the sharks in various stages of life, and to re-capture the sharks for short (15 minute) intervals for hands-on experimentation by the world's best marine scientists.

You will use the real shark tracking data from the Ocearch website to learn about experimental variables, how to create different types of graphs, and data analysis. You will be creating a Graphing Great Whites booklet that contains 2 data tables, a world map, and 5 different graphs. Keep track of the tasks you complete by checking the boxes below as you finish each one:

- ☐ TASK 1: DATA TABLE
- ☐ TASK 2: BAR GRAPH 1
- ☐ TASK 3: BAR GRAPH 2
- ☐ TASK 4: SCATTERPLOT
- ☐ TASK 5: PIE CHART
- ☐ TASK 6: LINE GRAPH
- ☐ TASK 7: COVER PAGE

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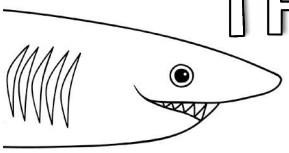


THE GREAT WHITE SHARK IS SOME-FIN ELSE!

Great White Sharks (GWS) are the largest predatory fish in the ocean. Find out more about these amazing marine predators by going to the Smithsonian Great White Shark profile at https://s.si.edu/2HNIFKq. Find and write the answers to the facts about the Great White Shark in the boxes below.

1. The ancestry of the GWS dates back more than _____.

2. The sense that the GWS has that we don't have is _____.

3. The scientific name of the GWS is _____

4. The four threats to GWS populations on Earth are: _____, _____, _____, and _____.

5. The _____ shape of the GWS is built for speed up to _____.

6. The GWS has _____ total teeth in up to _____ rows.

7. GW Sharks need to have enough brains to _____

8. A GWS could smell a single drop of blood floating in _____ drops of water.

9. Inside their ears, GW Sharks have an _____ that responds to gravity.

10. The GWS eyes are divided into two areas- one adapted for _____ and the other for _____ and _____; to protect its eyes when threatened, the GWS can _____.

11. Cells called Ampullae of Lorenzini in the GW Shark's snout can feel the _____ and _____ of electrical currents; this helps them to navigate through Earth's oceans.

12. The GW Shark's sense of touch occurs at the _____, which can perceive _____ in the water. They can detect the _____ and _____ made by prey from as far away as _____ meters.

13. Unlike typical fish, sharks do not produce _____; instead they invest their resources in fewer, larger eggs which are more likely to grow into _____.

14. GW Sharks gestate their pups for _____ before giving birth. Between _____ babies are born at a time.

15. GWS can live up to _____, maybe more.

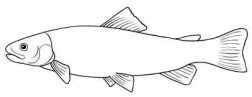
16. Interesting fact of your choice:

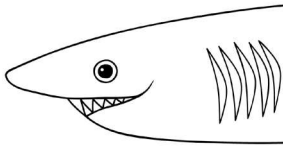
Name _____ Class _____ Date_____

DATA & TABLES

A collection of information.

Information organized in columns and rows.





- Collecting, organizing, and analyzing data is an integral part of doing science
- Data is a collection of information. There are two types of data: quantitative and qualitative
  - Quantitative data deals with quantity, or numbers, such as 12 oranges, 25 meters, 344 grams, or 100 degrees
  - Qualitative data deals with quality and is descriptive in nature such as blue-green in color, large in size, female in gender, or cold in temperature

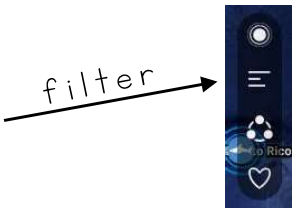
Put a square around the quantitative information and a circle around the qualitative information:

The male shark is of the species Great White and he is at a mature stage of life. He is 4 meters in length and 625 kilograms in weight. He was tagged off the coast of Madagascar, Africa. He has traveled a total of 12,800 meters since being tagged.

- A data table uses columns and rows to organize information about variables
  - A variable is a characteristic, number, or quantity that may change over time or in different circumstances.

TASK 1: DATA TABLE

1. Go to the Ocearch global shark tracker at www.ocearch.org
2. The map shows all of the recent pings of tagged animals.
3. Click the Filter button (three white lines) and choose the White Shark under the Species drop-down menu.



4. Click the blue Track button. Zoom out using the +/- buttons.
5. Click on one of the blue pings. On the right, you can view the name, photos, and data about this shark. You can X out of the pop-up to choose a different shark by clicking Close Track.
6. Choose at least 10 Great White sharks from the map and record their data on your Great White Data Table.

   You will need to convert pounds into kilograms (metric system) by multiplying by 0.454 or by using the converter at https://bit.ly/37XjsrP. Most of the sharks' lengths are given in both feet/inches and in meters (metric system). However, if you need to convert feet/inches to meters, you can use https://bit.ly/2TdGm5D.
7. Additionally, mark each shark's approximate Latest Ping location on the World Map. Write the shark's name and date of Latest Ping (at top of pop-up box).
8. You may optionally choose 2 additional sharks.

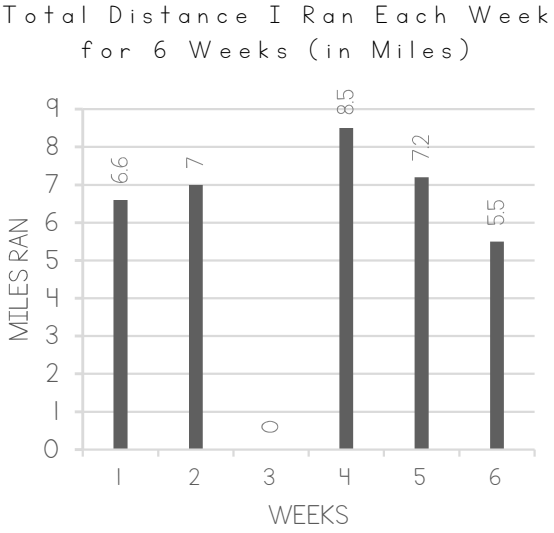
Name _____ Class _____ Date_____

BAR GRAPHS

- Bar graphs display data on X and Y axes

- Good for comparing quantitative data of experimental tests or how one variable affects another
- It is important to graph the correct variable on each axis:
  - The X axis should contain the independent variable, meaning that it stands alone and does not change due to the other variable
  - The Y axis should contain the dependent (or responding) variable, meaning that it may change with respect to the other variable

- As an example, if a bar graph was created to display the total distance that you ran each week over the course of 6 weeks, it may look something like this:



- The scale of a bar graph does not always need to start at 0. You want to maximize the space on the Y axis so that the difference between the bars is obvious

- It is important to put axis labels on a bar graph
  - *What is the label for the X axis? For the Y axis?*

- An outlier is a data point that seems abnormal compared to the rest of the data in a set
  - *What week would you consider to be an outlier in the graphed set of data?*

- The title of a bar graph should be descriptive

TASK 2: BAR GRAPH 1

1. Create a bar graph of the weights of the sharks from your Great White Data Table. Use the metric unit (kilograms). Color the female sharks' bars with one color and the male sharks' bars with another color. Make a small KEY to show the colors. Use graph paper to keep your graph neat. Make a 'rough draft' first.

2. When you've had your graph checked by the teacher, create and tape the 'good copy' onto a blank graph page.

3. Be sure to give your bar graph a title and axis labels.

4. Label or write the name of this type of graph in the gray box at the top left of the booklet page.

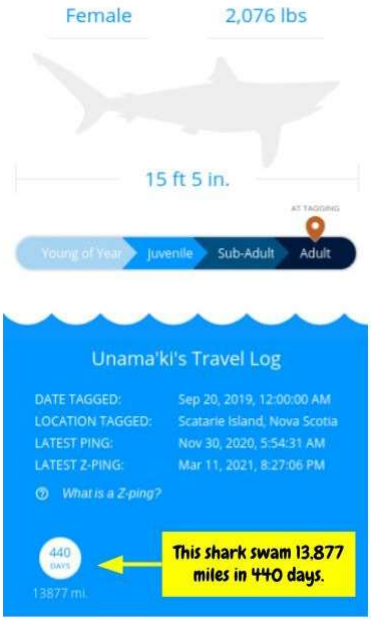
5. In the bottom box, write a summary of what this type of graph is used for and a short analysis of what your graph's data shows about the sharks.

Name _____ Class _____ Date_____

BAR GRAPHS (CONTINUED)

TASK 3: BAR GRAPH 2

1. Add data to the Great White Swim Speed Data Table. You will need to go back to Ocearch.org and use the filters to sort for each gender and age listed in the table. You will collect data on how far (in miles) a shark of that gender/age swam in a certain number of days. For example, the shark below swam 13,877 miles in 440 days. Divide 13,877 by 440 and you get 31.5 miles per day.



2. Create a bar graph of the different aged sharks' swim speeds (miles per day) from your Great White Shark Swim Speed Data Table. Color the female sharks' bars with one color and the male sharks' bars with another color. Make a small KEY to show the colors. Use graph paper to keep your graph neat. Make a 'rough draft' first.

3. When you've had your graph checked by the teacher, create and tape the 'good copy' onto a blank graph page.

4. Be sure to give your bar graph a title and axis labels.

5. Label or write the name of this type of graph in the gray box at the top left of the booklet page.

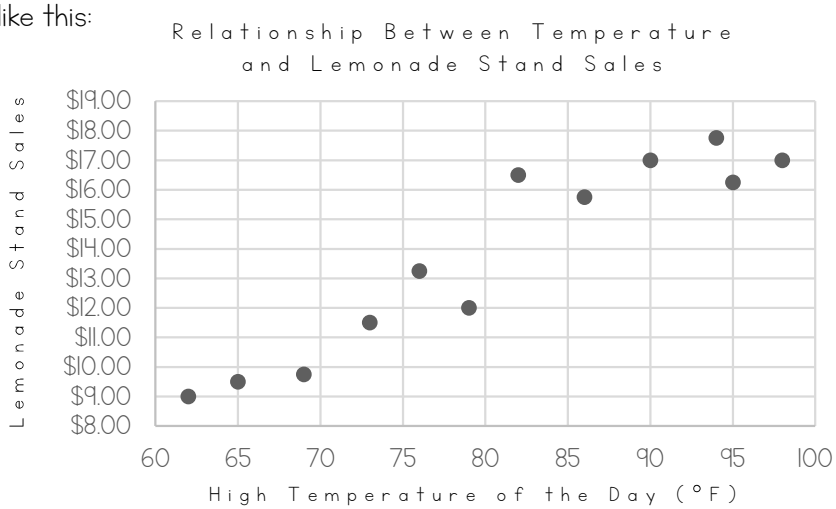
6. In the bottom box, write a summary of what this type of graph is used for and a short analysis of what your graph's data shows about the sharks.

Name _____ Class _____ Date_____

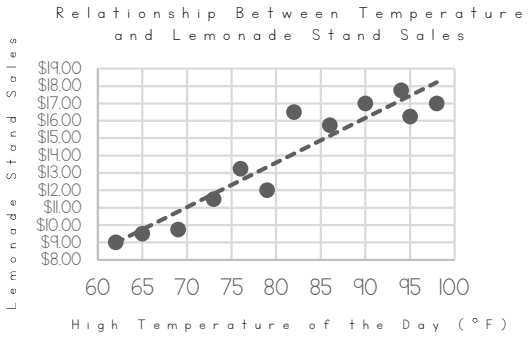
SCATTERPLOTS

- This is also called an X-Y plot

- Good for comparing the relationship between two sets of quantitative data
- Use dots as points and DO NOT connect the dots!
- As an example, if a scatterplot was created to display lemonade stand sales and the temperature of the day, it may look something like this:



- The scales of a scatterplot's axes should accommodate the best range of numbers to showcase the data
  - *What would this graph look like if the ranges on the X and Y axis began at '0'?*
- A trendline or 'best fit line' can be added to a scatterplot to show the general trend on the graph
  - To create a 'best fit line', use a ruler to estimate a straight line that cuts equally close to the data points (see example to the right)
  - *Why doesn't the trendline go through the intersection of the X and Y axes?*



- The title of a scatterplot should be descriptive

TASK 4: SCATTERPLOT

1. Create a scatterplot of the lengths and weights of the sharks from your Great White Data Table. Use the metric units (meters and kilograms). Put length on the X axis and weight on the Y axis. Draw a best fit line (trendline). Color the female sharks' points with one color and the male sharks' points with another color. Make a small KEY to show the colors, and then draw *two* different trendlines. Use graph paper to keep your graph neat. Make a 'rough draft' first.

2. When you've had your graph checked by the teacher, create and tape the 'good copy' onto a blank graph page.

3. Be sure to give your scatterplot a title and axis labels.

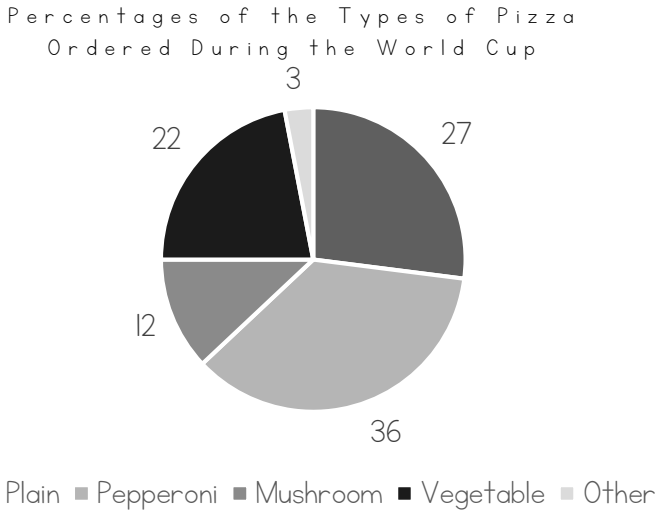
4. Label or write the name of this type of graph in the gray box at the top left of the booklet page.

5. In the bottom box, write a summary of what this type of graph is used for and a short analysis of what your graph's data shows about the sharks.

Name _____ Class _____ Date_____

PIE CHARTS

- This is also called a pie graph
- Good for showing percentages of a whole or percentages at a set point in time
- Pie charts do NOT show changes over time
- The sections of a pie chart should each be a different color or filled in with different patterns
- As an example, if a pie chart was created to display the percentages of the types of pizza that were ordered from Shark Bite Pizzeria during the World Cup, it may look something like this:



- If the pie chart shows percentages, they must add up to 100
- The actual percentages or parts can optionally be written by the pie slices
- The title of a pie chart should be descriptive

TASK 5: PIE CHART

1. Collect some new data from Ocearch to use to create a pie chart:
   Go back to the Ocearch global shark tracker at www.ocearch.org. Click the Filter button (three white lines) and choose the White Shark under the Species drop-down menu. Select **Adult** under Stage of Life and **Female** under Sex/Gender. Click the blue Track button. Zoom out using the +/- buttons if necessary to see all of the pings on the map.
2. Count the number of Adult Female Great Whites that show up as pings (blue dots) on the map. Record this number on the Gender and Stage of Life data table.
3. Now select **Adult** and **Male** and click Track. Count the number of Adult Male Great Whites. Record the number.
4. Do the same for **Sub-Adult Females**, **Sub-Adult Males, Juvenile Females**, and **Juvenile Males**. Record all numbers.
5. Calculate the total number of sharks that you counted. Then calculate the *fraction* of total and the *percentage* of total for each category of shark (row) on the data table. Decide on a color for each category of shark.
6. Create a pie chart using the percentage data. Make a 'rough draft' first.
7. When you've had your graph checked by the teacher, draw the 'good copy' onto a blank graph page.
8. Be sure to give your pie chart a title and a colored key.
9. Label or write the name of this type of graph in the gray box at the top left of the booklet page.
10. In the bottom box, write a summary of what this type of graph is used for and a short analysis of what your graph's data shows about the sharks.

Name _____ Class _____ Date_____

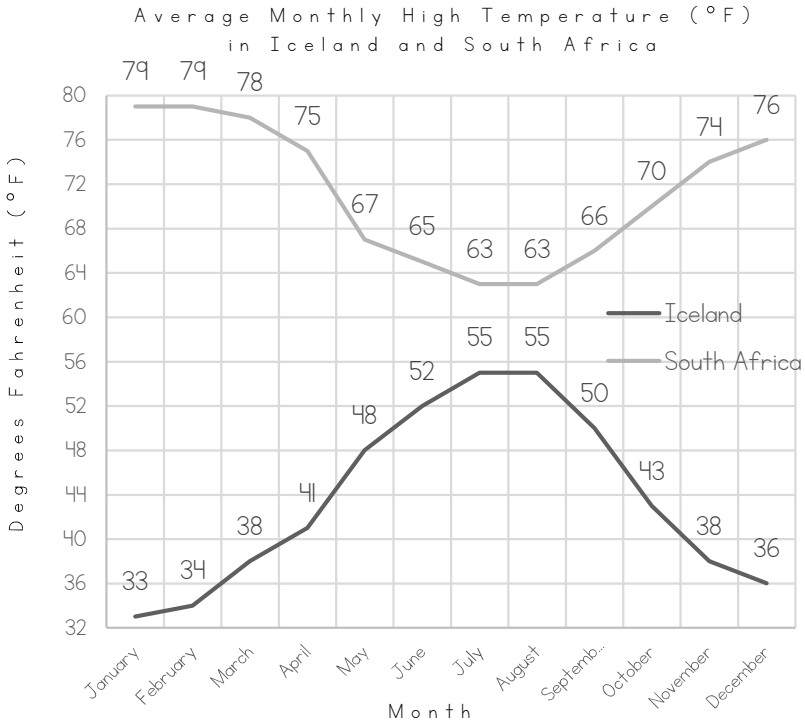
LINE GRAPHS

- Good for tracking changes over time
- Use dots as points and you CAN connect the dots!

- Can graph multiple sets of data to compare and contrast trends

- It is important to graph the correct variable on each axis:
  - The X axis should contain the independent variable, meaning that it stands alone and does not change due to the other variable
  - The Y axis should contain the dependent (or responding) variable, meaning that it may change with respect to the other variable

- As an example, if a line graph was created to display the average high temperatures throughout the year in Iceland versus in South Africa, it may look something like this:



- The scales of a line graph's axes should accommodate the best range of numbers to showcase the data
  - *What do you notice about the scale on the Y axis?*

- The title of a line graph should be descriptive

TASK 6: LINE GRAPH

1. Create a two-line line graph using the given ping data on the next page. This data is the number of times an adult female pinged over the course of a year versus the number of times a juvenile female pinged over that same year. Put the months on the X axis and the number of pings on the Y axis. Make sure you use a scale that will accommodate **all** of the data. Pick a color for each shark and make a key. Use graph paper to keep your graph neat. Make a 'rough draft' first.

2. When you've had your graph checked by the teacher, create and tape the 'good copy' onto a blank graph page.

3. Be sure to give your line graph a title and axis labels.

4. Label or write the name of this type of graph in the gray box at the top left of the booklet page.

5. In the bottom box, write a summary of what this type of graph is used for and a short analysis of what your graph's data shows about the sharks.

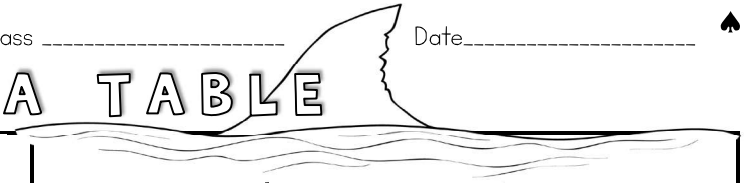
GREAT WHITE ANNUAL PING DATA (FOR LINE GRAPH)

This data compares how many times an adult female shark (Unama'ki) pinged each month over the course of a year versus how many times a juvenile female shark (Caper) pinged each month over the course of that same year.

	Unama'ki (Adult Female, 15 ft 5 in, 2076 pounds)	**Caper** (Juvenile Female, 8 ft 3 in, 348 pounds)
Month	**Times Pinged (surfaced)**	**Times Pinged (surfaced)**
October 2019	30	20
November 2019	5	12
December 2019	0	3
January 2020	2	7
February 2020	20	5
March 2020	12	4
April 2020	39	2
May 2020	51	0
June 2020	28	10
July 2020	33	0
August 2020	5	0
September 2020	0	0
October 2020	15	11

Name _____ Class _____ Date_____

GREAT WHITE DATA TABLE



Name	Gender	Stage of Life	Length (ft/in)	Length (m)	Weight (lbs)	Weight (kgs)	Tag Location

GREAT WHITE WORLD MAP

Name _____ Class _____ Date_____

GREAT WHITE SWIM SPEED DATA TABLE

Gender	Stage of Life	Shark Name	Weight in Pounds	Miles Swam	# of Days	Swim Speed (miles ÷ days)
Female	Adult	Unama'ki	2076 lbs	13,877 miles	440 days	31.5 miles per day
Male	Adult					
Female	Sub-Adult					
Male	Sub-Adult					
Female	Juvenile					
Male	Juvenile					

Name _____ Class _____ Date_____

GREAT WHITE GENDER & MATURITY DATA TABLE

Gender	Stage of Life	Number	Fraction of Total	Percentage of Total	Color for Pie Chart
Female	Adult				
Male	Adult				
Female	Sub-Adult				
Male	Sub-Adult				
Female	Juvenile				
Male	Juvenile				
Total					