

Name _____

Investigation 1: Could You Be an Olympic Swimmer?

Worksheet 1.1 Height and Arm Span

Scenario

Do you know what type of bird has the largest wingspan?

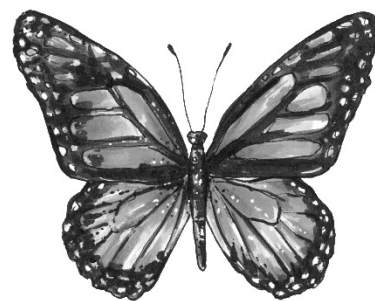
The “Wandering Albatross” has been declared as the *bird with the largest wingspan* among all living birds. Its wingspan, on average, is from 8.2 to 11.5 feet. Its length is from 3.51 to 4.43 feet. This wandering albatross breeds in several islands north of the Antarctic Circle and feeds off the coast of New Zealand. One albatross that was banded and followed by scientists was reported to have traveled around 3,700 miles in just 12 days.



An ornithologist is a scientist who studies every aspect of birds. One aspect an ornithologist uses to compare bird species is the ratio of a bird's wingspan to the length of its body. What is the ratio of the Albatross's wingspan to length?

Why do you think the Albatross has such a large wingspan when compared to its length?

While an ornithologist studies birds, a lepidopterist studies butterflies and moths. The wingspan of a Monarch butterfly is from $3\frac{1}{2}$ " to 4" and its length is from $1\frac{1}{4}$ " to $1\frac{3}{8}$ ". What is the ratio of Monarch butterfly's wingspan to length ratio?



How does a ninth grader's arm span to height ratio compare to that of the wingspan to length ratio of the Albatross and Monarch butterfly? Do the students follow a similar pattern, in which the wingspan is many times the length?

Do you know who is the most decorated Olympic swimmer?

Michael Phelps is the most decorated Olympian of all time, with a total of 28 medals (as of the 2016 Olympics). Phelps also holds the all-time record for Olympic gold medals with 23. At the 2016 Summer Olympics in Rio de Janeiro, he won five gold medals and one silver, more than any other competitor for the fourth Olympics in a row.

Statistical Question: _____

Analyze the Data

Using the class data, answer the following questions:

Visualizing the data with dot plots:

1. What does it mean if a person's arm span to height ratio is equal to 1? Less than 1? More than 1?
2. Construct a dot plot of the class ratios of arm span to height. Include Michael Phelps's ratio.
3. Describe the center, shape, and spread of the data.
4. Using the dot plot, what can you conclude about the ratio of arm span to height for the students in class?

Visualizing the data with box plots:

5. Construct a box plot of the class ratios of arm span to height. Include Michael Phelps's ratio in the class data. Use the same scale used for the dot plot.
6. What percent of the ratios are less than the lower quartile? What percent of the ratios are less than the upper quartile?

One definition of an outlier (very unusual data value): A data point is an outlier if it falls more than $1.5 \times (\text{IQR})$ above the upper quartile or more than $1.5 \times (\text{IQR})$ below the lower quartile. The interquartile range (IQR) is the difference between the upper quartile (Q3) and lower quartile (Q1).

7. Use the given definition of an outlier and determine if there are any outliers. Is Michael Phelps's ratio an outlier?
8. Using the box plot, what can you conclude about the ratio of arm span to height for the students in class?
9. Explain how the box plot and dot plot each helped in comparing the class data with Michael Phelps's ratio of 1.04.

Interpret the Results in the Context of the Original Question

10. Write a summary answering the statistical question. Your summary should include how your ratio compared to others in class and to Michael Phelps's ratio. Also, how did the class ratios compare to Michael Phelps's ratio?