



# What's Your Wingspan?

<p><b>THE BASICS</b></p>  <p>Grade Level: 1-12</p>  <p>Estimated Time: 45 min.</p>	<p><b>THE TOOLBOX</b></p> <ul style="list-style-type: none"> <li>• Tape measure</li> <li>• Paper &amp; pencil</li> <li>• Large chalkboard or dry-erase board and chalk or markers</li> </ul>	<p><b>EDUCATION STANDARDS</b></p>	<p><b>Data Analysis and Probability Math Standard:</b></p> <p>Learning to formulate questions that can be answered by collecting, organizing, and displaying data in graphs and charts.</p>
		<p><b>SAFETY CONCERNS</b></p>	<p>Students should not loop the tape measure around their necks. If students remove their shoes, be sure they don't step on sharp objects or slip on a wet floor.</p>
		<p><b>FOR KIDS WITH DISABILITIES</b></p>	<p>Visually-impaired students may need a Braille measuring tape. Mobility-impaired students may need to measure shorter portions of their body and add them together.</p>



**Educational Objective:**

To learn measuring skills and problem-solving. To learn how to gather and analyze data.

**What to Do:**

- Gather the materials.
- Duplicate the activity sheet.

**Questions to Ask Students As They Do This Activity:**

- How can you solve the problem of measuring someone who is taller or wider than the tape?
- After the students have finished measuring each other, have them share their results while one of the students records the data on the chalkboard or other large surface. Ask them if they see any patterns in the information they have gathered.
- What conclusions, if any, can be drawn from the data collected?
- Can you make generalizations based on a small amount of data?

**Why It Happens:**

No matter what their age, most people have a wingspan that is the same length or almost the same length (within 2 inches) as their height. There are, however, some people whose wingspans are 3 – 5 inches (or even more) longer than their height.

There are many different ways of looking at the data, and each will give you slightly different information about it. If you have a large enough group—roughly 10 or more—to analyze, you will usually find that the greatest number of participants have wingspans equal to their heights. The category into which most people fall is called the **mode**. Measurements that differ by one or two inches are also very common. In fact, if you count together in one category all the people whose wingspans differ from their height by zero, one, and two inches, you will probably account to most of the people in your sample.

Another way to look at the results is to make a line with “0” as the midpoint and hash marks for +1, 2, 3...8 to the right and –1, 2, 3...8 to the left and make a mark for each person at the appropriate difference: wingspan-height. You would probably find that about half of the people in the sample would be to the left of “0” and half would be to the right. (See Activity Sheet, Part C.) This is called finding the **median**. Depending on your particular sample, the median may well be some number other than “0” such as +1 or –2.

If you added all the plus and minus entries together (adding algebraically so the pluses and minuses cancel out) and divided them by the total entries, you would get the **mean**. The mean is usually what we think of as the **average**.

**Calculating:** In finding the mean in Part C, students will be calculating with negative and positive numbers. They may need to be reminded that they should think of numbers on a continuous line with 0 in the middle:

-5    -4    -3    -2    -1    0    +1    +2    +3    +4    +5

When adding a positive and negative number, the answer will be between the value of the two numbers they are adding on the number line. For example:

$$\begin{array}{r} +4 \\ + \quad -3 \\ \hline +1 \end{array}$$

When two positive numbers are added together they make a greater positive number, and when two negative numbers are added together they make a greater negative number. For example:

$$\begin{array}{r} +3 \\ + \quad +5 \\ \hline +8 \end{array} \qquad \begin{array}{r} -3 \\ + \quad -5 \\ \hline -8 \end{array}$$

One way to add a long list of positive and negative numbers is to first add all the positive numbers together, and all the negative numbers together, then add the positive and negative totals together.

When dividing a positive number, such as the number of people in the data sample, into a negative number such as might result by adding up the data, the answer (quotient) will always be negative. Of course if the total for the data is positive, the division answer will be positive.

## WEB SITES

- **Cool to Rule**  
<http://ericir.syr.edu/Virtual/Lessons/Mathematics/Measurement/MEA0015.html>  
(Grades 5-6)
- **The Tides of Change**  
[http://score.kings.k12.ca.us/lessons/Tides\\_of\\_Change\\_Lessons.html](http://score.kings.k12.ca.us/lessons/Tides_of_Change_Lessons.html) (Grades 7-12)

## SOFTWARE

- **Math Alive**  
BonusPoint, Inc., 1998  
(Grades 6-12)
- **Leapfrog Math: Intermediate 1-4**  
Meridian Creative Group  
(Grades 3-6)

## READING ROOM

- D'Amico, Joan and Karen E. Drummond. **The Math Chef: Over 60 Math Activities and Recipes for Kids.** Wiley, 1997. (Grades 3-8)
- Friedhoffer, Bob. **Magic Science: Math, Measurement, the Mind.** Educational Design, 1996. (Gr. 3-6)
- Pluckrose, Henry. **Size.** Children's Press, 1995. (Grades K-2)

## Career Connections

A person who analyzes data or numerical facts is called a statistician.

# WHAT'S YOUR WINGSPAN ACTIVITY SHEET PART A

Work with a partner. Take turns measuring your wingspans and heights.

1. Have your partner spread his/her arms out straight from the shoulders on each side of the body.
2. Using a tape measure, measure the distance in inches or centimeters (decide which you will use with your group) from the tip of the longest finger on one of your partner's hands to the tip of the longest finger on the other hand. This is your wingspan.
3. Write down your names and wingspans in the boxes below. Round your answers to the nearest inch (or centimeter).

Name	Wingspan	Height

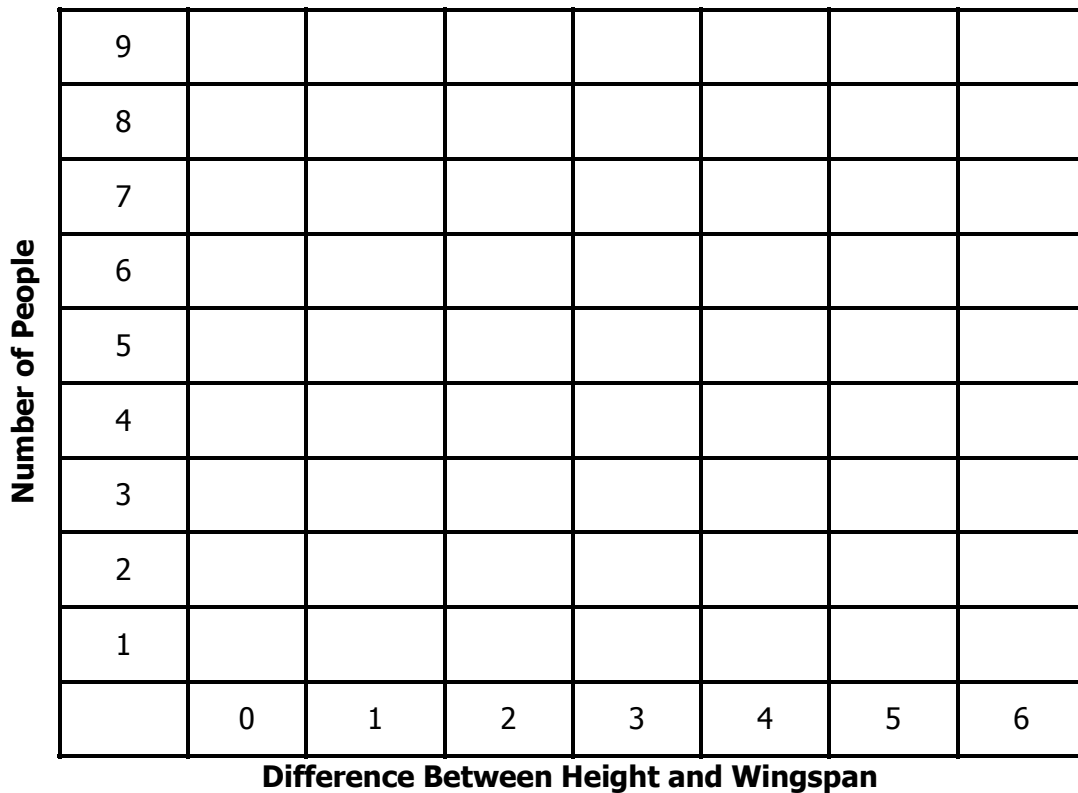
4. Measure your partner's height from the bottom of their heel to the top of their head. Don't measure their shoes. Your partner may want to remove their shoes before you measure their height. Write their height down in the correct box above. Round to the nearest inch (or centimeter).
5. Now, let your partner measure you.
6. Share the information, or **data**, that you collected with the others in your group.
7. Have someone record all the data on a big chart or a chalkboard for all to see.
8. How many people have the same wingspan and height measurement?
9. How many people have a wingspan measurement that is one inch different from their height measurement? Two inches?

# WHAT'S YOUR WINGSPAN ACTIVITY SHEET PART B (For Grades 3-6)

11. Follow steps 1-10 from Part A. Record your data from steps 1 to 5 on the following chart:

Name	Wingspan	Height	Difference

12. Share the group data you have developed with others by making a group graph that is large enough for everyone to see. Make the graph like the one below. Have each person add their own data by making an X in the column describing the difference in his or her wingspan and height.



13. What conclusions can you draw about your group's data?

14. Which column has the most X's? This is called the **mode**. How many modes does your group's chart have?

# WHAT'S YOUR WINGSPAN ACTIVITY SHEET PART C (For Grades 6-12)

15. Follow steps 1-10 in Part A. Record your data from steps 1 to 5 on the following chart. If your wingspan is less than your height, record the difference in column A next to the minus sign. If your wingspan is more than your height, record the difference in column C next to the plus sign. If there is no difference, record a zero in column B. There will be only one entry to the right of the double line for each person.

Name	Wingspan	Height	A Wingspan Less Than Height	B Wingspan Same As Height	C Wingspan More Than Height
			-		+
			-		+

16. Share the data you have developed with your group.

17. Make a Group Analysis chart like the sample below that is big enough for everyone to see.

Sample Group Analysis													
Number of People	6												
	5												
	4												
	3							X					
	2							X	X				
	1					X		X	X				X
	0	-6	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5
Difference in Wingspan and Height (inches or cm)													

18. Each person in the group records their minus, plus, or zero data on the Group Analysis chart by putting an X in the empty box closest to the bottom row above the appropriate number. The chart above shows you how your chart **might** look after a few entries.

19. Look at the graph of your group's data. What kinds of conclusions can you draw?
20. Which of your columns has the most entries? This is called the **mode**.
21. Draw a line connecting the top X in each column. What is the shape of the line? Your line **may** look something like a bell, high in the middle, and low at the ends. If it does, your data have formed what scientists and mathematicians call a **bell curve**. It is a very common shape for data such as these to make.
22. Half of the entries fall above, and half below, the point known as the **median**. Try to determine the median difference for your group's data.
23. The **mean** is found by adding up all the entries and dividing by the number of entries. Determine the mean. Don't forget that you will be calculating with negative numbers.

<b>Group Analysis Chart</b>													
<b>Number of People</b>	<b>6</b>												
	<b>5</b>												
	<b>4</b>												
	<b>3</b>												
	<b>2</b>												
	<b>1</b>												
	<b>0</b>	<b>-6</b>	<b>-5</b>	<b>-4</b>	<b>-3</b>	<b>-2</b>	<b>-1</b>	<b>0</b>	<b>+1</b>	<b>+2</b>	<b>+3</b>	<b>+4</b>	<b>+5</b>
<b>Difference in Wingspan and Height (inches or cm)</b>													

