Inquiry Question

Is your arm span equivalent to your height or do you have the arms for basketball?

Name: _____ Date: _____

General Instructions

The average arm span or wingspan for adults is approximately equal to their height. The value that is often used is the ratio of arm span relative to height which is known as the APE index. After 15 years of age, the normal range of arm span/height or APE index is considered to be 1-1.05 but many people may fall outside of this range.

Interestingly, "the average ratio of arms to height in the NBA is an astounding 1.06" according to Sports Illustrated (https://vault.si.com/vault/2012/11/05/the-case-for-wingspan). We often think about the extraordinary height of basketball players but they often have incredibly long wingspans as well. Both being tall and having a long wing span are advantageous in this sport. Being tall puts you closer to the hoop for easier lay-ups and slam dunks on offense. It also helps playing defense to block shots. It is easy to see that wingspan would also help with these offensive and defensive moves.

Other sports, like swimming, may also have advantages with a long wingspan. Some sports, like weightlifting, may have advantages with a shorter wingspan considering there would be less distance to lift. How does your arm span compare with your height?

Hand size is also thought to be closely related to a person's height. According to https://www.medicalnewstoday.com/articles/average-hand-size, on average the adult male has a hand length of 19.3 cm and the adult female has a hand length of 17.3 cm and hand size generally increases with increased height. There have been numerous studies that have shown this positive correlation between height and hand size and they have shown that hand length can be used to predict height.

There are many basketball players that have massive hands. Check out: https://howtheyplay.com/team-sports/14-NBA-Players-With-the-Most-Impressive-Hand-Sizes. It would seem to be advantageous as it would make it easier to palm the ball. The average hand length of players in the NBA is an impressive 24.1 cm but it is good to keep in mind that they also tend to be very tall. Do they have proportionately large hands for their heights? Consider height to hand length ratios to investigate this.

Part 1:

Measure your height and wingspan:

- Take off your shoes and stand up straight.
- Ask your helper to measure your height in cm and record this in the Height column of Table 1
- Hold your arms straight out as shown in the picture.
- Ask your helper to measure the distance from the tip of the middle finger on one hand to the tip of the middle finger on the other hand in cm. Record this under Wingspan in Table 1.

Calculate the unit ratio of height to wingspan and record this in the table. Also record the APE index which is wingspan divided by height. Notice that this is the same number as in the unit ratio.

Measure your hand length from wrist to tip of the longest finger. Include this in the table. Calculate the unit ratio of height to hand length by dividing each by height and also include this in the table.

Repeat these measurements on your volunteers. Table 1 should include yourself and your family members. Keep in mind that this ratio may vary quite a bit for younger children.

Calculate the average APE index for your family.
Explain whether you and your family members are mathematically similar to each other.

Compare your family members' height to hand length ratios? Who has the longest hands for their height and who has the shortest hands for their height based on these ratios?

What are the average height to hand length unit ratios using the average adult male height of 175 cm and average male hand length of 19.3 cm and using average adult female height of 163 cm and 17.3 cm for average female hand length? How does yours and your family's ratios compare with the averages?

Do either Part 2 which includes researching NBA players to get these values <u>OR</u> Part 3 if you would prefer to look at a different sport than basketball.

Part 2:

Check out https://www.sportsfeelgoodstories.com/nba-players-height-wingspan-vertical/ and other sources as needed.

Choose a minimum of 5 NBA players and find their heights and wingspans. These will need to be converted to cm first and then include these values in Table 2. Calculate and record the unit ratio of their height to wingspan. Record their APE index.

Find the hand length of these players and calculate their height to hand length unit ratios by dividing both by height. Include these values in the table.

Calculate their average APE index.

Write a paragraph comparing yours and your family's average APE index to that found in the NBA. What is the average APE index of the NBA players that you chose?

How does yours and your family's height to hand length ratios compare to that of the NBA players that you chose? How do the NBA players' unit ratios of height to hand length compare with that of the average male? Do the NBA players have proportionately large hands for their height?

Is pro-basketball the sport for you?

Part 3:

Consider a sport of your choosing. If you are part of a sports team that would be a perfect source of volunteers or maybe you have friends that you weightlift with. With a minimum of 5 volunteers, record their heights and wingspans. Include these values in Table 2. Calculate and record the unit ratio of their height to wingspan. Record their APE index.

Measure their hand length from wrist to tip of the longest finger. Include this in the table. Calculate the unit ratio of height to hand length by dividing each by height and also include this in the table.

Calculate the average APE index for your volunteers for this sport.

Write a paragraph comparing yours and your family's average APE index to that found in your volunteers for this sport. How does the average APE index of your sports volunteers compare with that for the average adult? Keep in mind this is a very small sample size so you can't draw a big conclusion.

How does yours and your family's height to hand length ratios compare to that of the sport volunteers? How do the volunteer players' unit ratios of height to hand length compare with the averages? Do the sport volunteers have proportionately larger or smaller hands for their height?

Materials you'll need:

- measuring tape
- a helper to measure
- other volunteers to have their measurements taken
- the internet for research

Project submission:

Your project submission includes the

- Completed data tables with all calculations included
- Comparison of APE indices and comparison of height to hand length unit ratios

APE indices

Data Tables

Table 1: Height, Wingspan and Hand length of myself and my family members

person	Height (cm)	Wingspan (cm)	Unit ratio height : wingspan	APE index	Hand length (cm)	Unit ratio height : hand length
me						

Average family APE index:

Are the results for you and your family members mathematically similar?

(The average APE index - 5% and + 5% are the range of values we can use to determine mathematical similarity.)

5% of average APE index?

Average APE index -5%?

Average APE index + 5%?

Range?

Are you and your family members within this range so mathematically similar?

Compare your family members' height to hand length ratios. Who has the longest hands for their height and who has the shortest hands for their height based on these ratios?

What are the height to hand length unit ratios for the average adult male and average adult female?

How does your family's unit ratios compare with these averages?

Table 2: Height, Wingspan and Hand length of NBA players or players of another sport

person	Height (cm)	Wingspan (cm)	Unit ratio height : wingspan	APE index	Hand length (cm)	Unit ratio height : hand length

Average player APE index:

Comparison of APE indices:

Is your arm span approximately equal to your height?

Based on your arm span alone, are you well suited for pro-basketball or perhaps better suited for another sport?

Compare unit ratios of height to hand lengths.