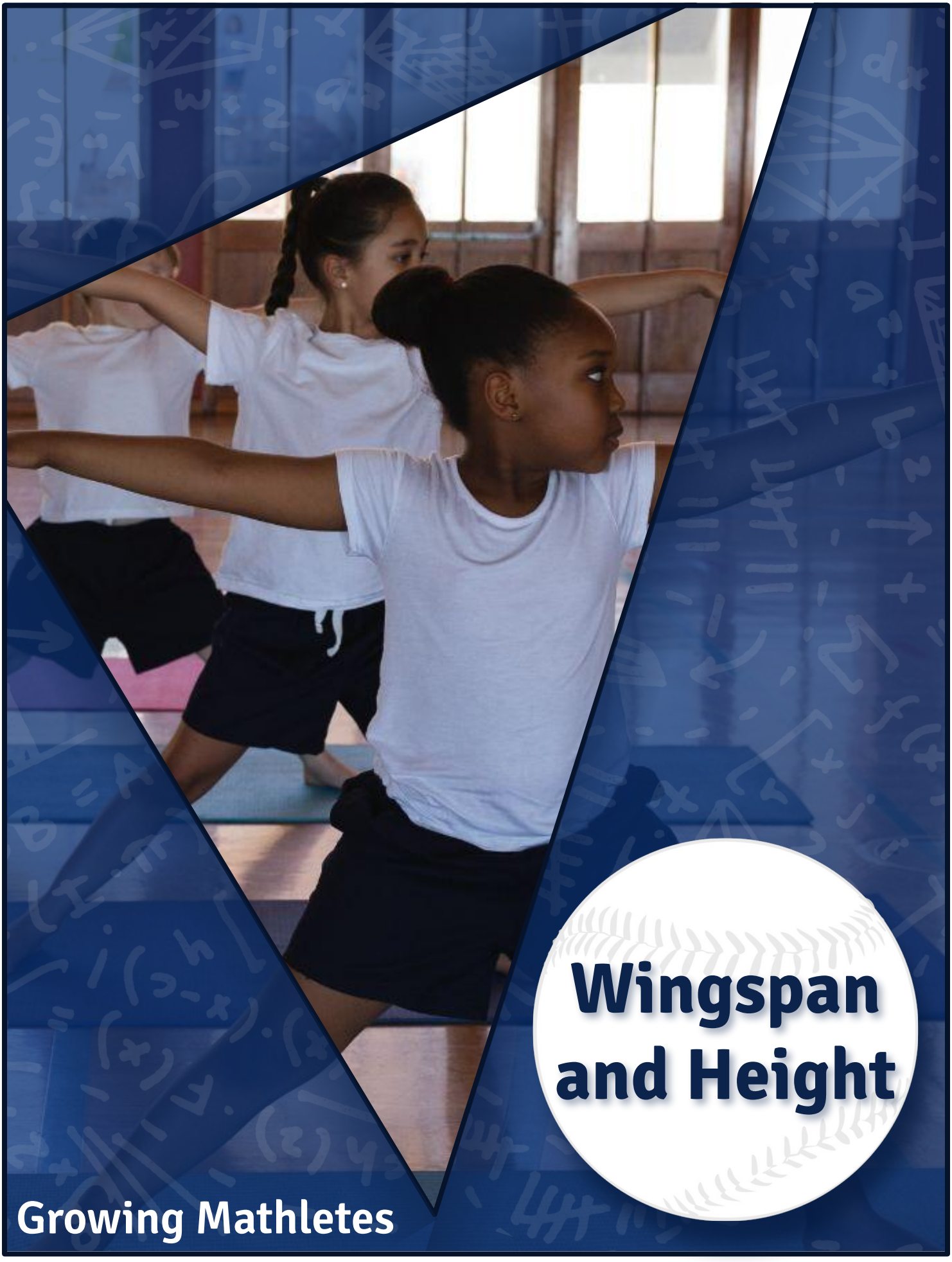


Wingspan and Height

Growing Mathletes

Wingspan and Height Lesson Overview

Key Ideas in This Session:

Youth use a measuring tape to measure their height and their wingspan in meters and centimeters. Youth record the measurements on a scatter plot and discuss patterns and relationships. Inspirational stories of players who have overcome physical challenges are used to inspire youth and support growth mindset.

Driving Questions:

1. What relationships do you notice between your height and your wingspan?
2. What strategies can you use to overcome challenges?

Math Standards:

4.MD.A.1 Know relative sizes of measurement units within one system including km, m and cm. Within one system of measurement, express measurements in a larger unit with a smaller unit.
5.MD.A.1 Convert among different sizes standard measurement units within a given measurement system (e.g., convert cm to meters).
6.SP.5.C Calculate range and measures of center, as well as describe any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered.
8.SP.1 Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association.

Activity	Time	Description
Activity 1	40 minutes	Youth are introduced to the concept of wingspan through a video about a famous basketball player. Youth measure their height and their wingspan in meters and centimeters and plot the measurements on a group scatterplot.
Activity 2	20 minutes	Youth learn about an inspirational baseball player - Jim Abbott - who overcame significant physical challenges. Youth reflect on challenges they have faced and strategies they have used to persist.

Materials

- 2-meter measuring tapes (8-12)
- Masking tape
- Blank scatter plot (poster or projection)
- Dot stickers
- Blank poster paper (1 per small group)
- **Worksheet 1**

Growth Mindset Connection

The power of effort and persistence.

Set-Up

For **Activity 1**, set up several measuring stations around the room (1 per group). Set up the blank scatter plot graph on a whiteboard or on chart paper for the whole group scatter plot. See the diagrams on the following page for set up details.

For **Activity 2**, prepare chart paper, markers and post-it notes for each group.

Activity 1 - Height and Wingspan Scatter Plots Set Up

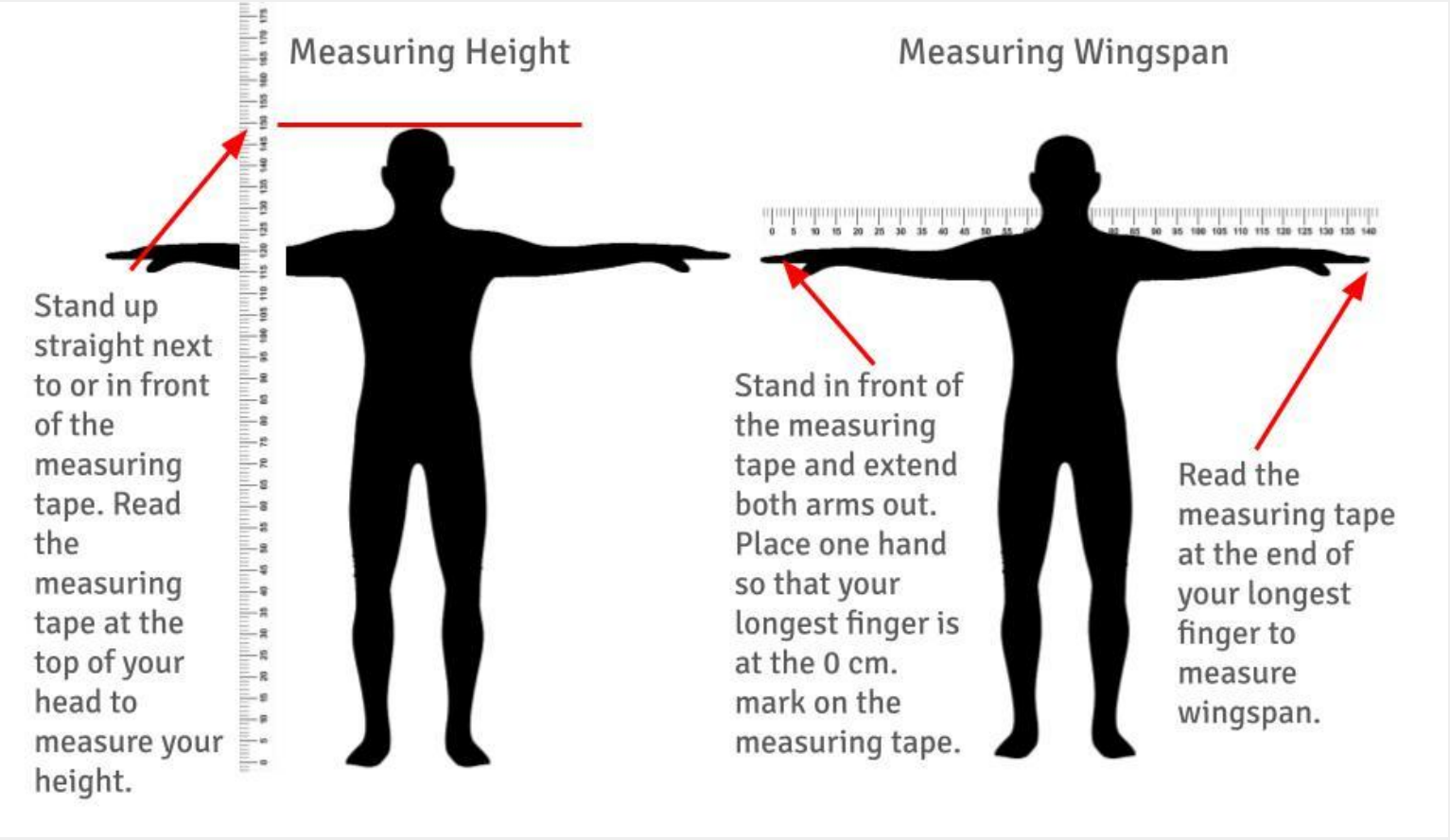
Set Up: Measuring Stations

Tell youth that they will work working in small groups to measure their height and their wingspan, in centimeters. Set up several "measuring stations" in different locations around the room - one for each small group. Place two measuring tapes at each station, one vertically (to measure height) and one horizontally (to measure wingspan) following the instructions below.

Set up to measure height: attach a 2 meter measuring tape to the wall with tape, starting with 0 cm on the floor and extending up to 200 cm. Make sure the measuring tape is pulled tight and straight for accurate measurements.

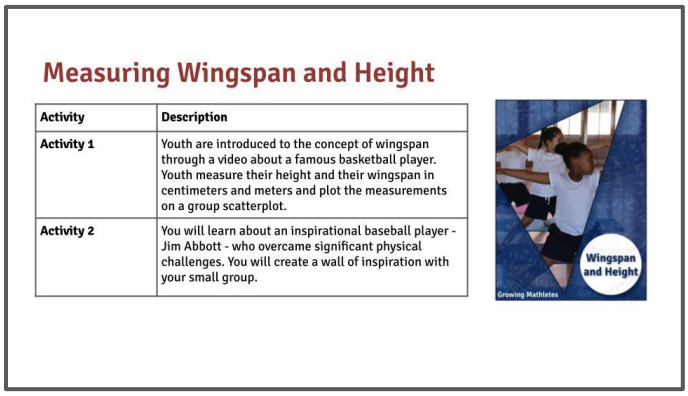
Set up to measure wingspan: attach a 2 meter measuring tape to the wall horizontally, so that the measuring tape is approximately at youths' shoulder height. Once again pull the measuring tape tight and ensure that it is placed parallel to the floor.

The diagrams below show how youth should stand to measure height and wingspan.



Wingspan and Height Introduction

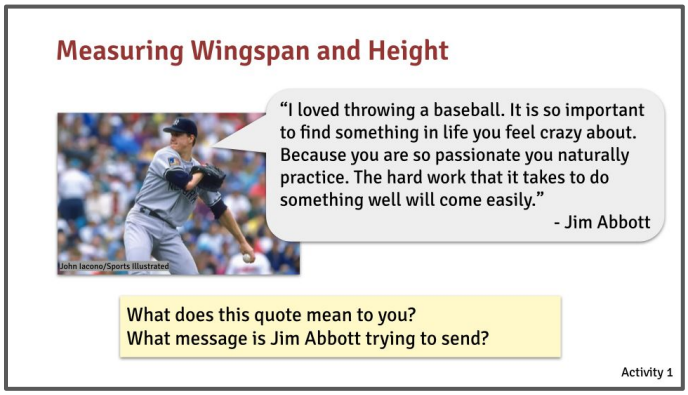
Start the session by providing youth with an overview of the key activities.



Wingspan and Height Youth Slides, Slide 1

Next, share and discuss this quote.

"I loved throwing a baseball. It is so important to find something in life you feel crazy about. Because you are so passionate you naturally practice. The hard work that it takes to do something well will come easily."
- Jim Abbott



Wingspan and Height Youth Slides, Slide 2

Activity 1 - Height and Wingspan Scatter Plots (1 of 7)

Description:

Youth are introduced to the concept of wingspan through a video about a famous basketball player. Youth measure their height and their wingspan in centimeters and plot the measurements on a group scatterplot.

Math Ideas: Measuring in Metric Units

Youth will measure their height and their wingspan using **metric units** (centimeters). A key idea in this activity is **converting between measurement units in the same measurement system** - in this case, metric units of meter and centimeter. For example, youth can express a length of 150 centimeters as 1 meter and 50 cm or 1.5 meters. Similarly youth can express a length of 1.62 meters as 162 centimeters. Some youth may have experience with metric units, and for other youth, units such as inches and feet may be more familiar. Make sure to spend time discussing the relationship between centimeters and meters (100 cm equals 1 m) and how centimeters and meters compare to inches and feet (1 inch is roughly equivalent to 2.5 centimeters, and 1 meter is a little longer than 3 feet or 1 yard).

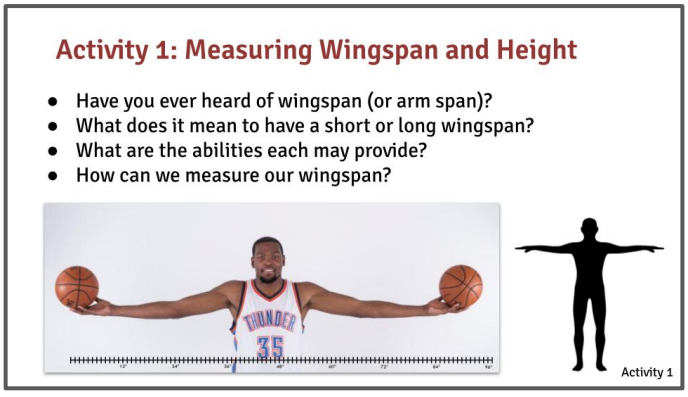
Math Ideas: Scatter Plots

In this activity, youth plot their height (in centimeters) and their wingspan (in centimeters) on a scatter plot. A **scatter plot** is a graph that shows the relationship between two sets of data. Each dot on a scatter plot represents the data from one youth. The horizontal axis, or x-axis of the scatter plot displays youths' height. The vertical axis, or y-axis of the scatter plot displays youths' wingspan. Youth use the number scale on the horizontal axis to find their height and the number scale on the vertical axis to locate their wingspan. Youth use these values to plot a point on the scatter plot to represent their data. Youth label the point using X and Y coordinates (X , Y). For example, a youth that is 150 cm tall with a wingspan of 145 cm can plot and label the point (150, 145) on the scatter plot. Once all youth have plotted their points, they can use the scatter plot to explore the relationship between height and wingspan. The positive linear trend of the points on the scatter plot shows a pattern - the taller the youth the longer the wingspan.

LAUNCH: Connecting to Prior Knowledge

Ask youth to share what they know about the concept of wingspan:

- Have you ever heard of wingspan (or arm span)?
- What does it mean to have a short or long wingspan?
- What are the abilities each may provide?
- How can we measure our wingspan?



Wingspan and Height Youth Slides, Slide 3

Activity 1 - Height and Wingspan Scatter Plots (2 of 7)

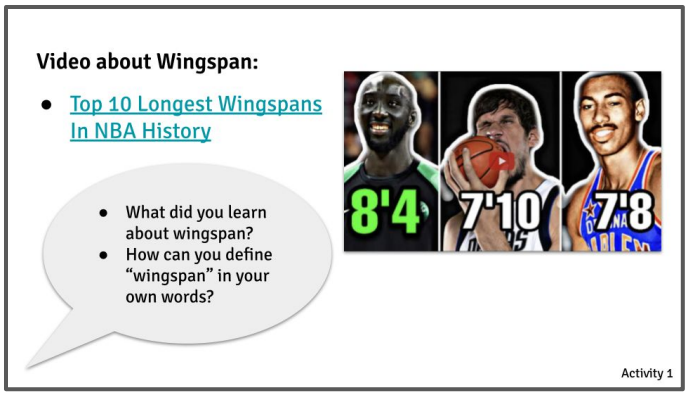
Demonstrate: Wingspan

Show the following video about the wingspan of a famous basketball player to introduce the concept of wingspan to youth.

VIDEO: Top 10 Longest Wingspans In NBA History [4:48]:
https://www.youtube.com/watch?v=g3RW6I_9jRA

After showing the video, **ask youth:**

- What did you learn about wingspan?
- How can you define "wingspan" in your own words?



Wingspan and Height Youth Slides, Slide 4

OPTIONAL: Watch a video about basketball players who do not have long wingspans.
NOTE: this video connects nicely to the Growth Mindset Principle effort and persistence because these players have had to work hard to find ways to compensate for their shorter wingspan.

Wingspan and Height Youth Slides, Slide 5

VIDEO: Hansel Emmanuel, teenage basketball player with one arm [watch to minute 3 or 4]
https://www.youtube.com/watch?v=sDSho9IK7n4

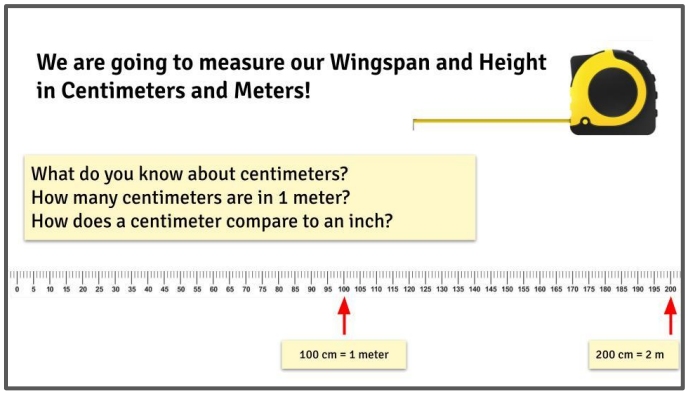
Ask youth to discuss:

- What did you learn about wingspans in the NBA?
- How did a growth mindset support these players' success?

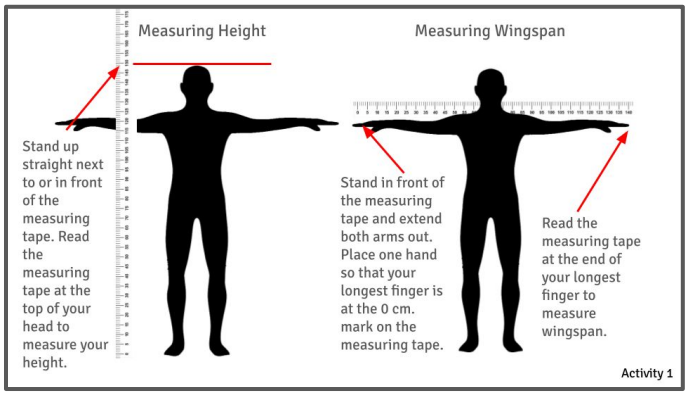
Activity 1 - Height and Wingspan Scatter Plots (3 of 7)

Demonstrate: How to Measure Height and Wingspan

Demonstrate how to use each of the measuring tapes accurately using a volunteer. Specifically, call youth's attention to the **meter** marking on the measuring tape, and the **centimeter** markings. Explain that each centimeter is divided into 10 smaller segments called **millimeters**. The longer tick marks that are evenly spaced between each centimeter mark show half-centimeter increments. Ask youth to use the measuring tape to confirm the number of centimeters in one meter (1 meter equals 100 centimeters).



Wingspan and Height Youth Slides, Slide 6



Wingspan and Height Youth Slides, Slide 7

To measure height: Remind youth to stand up straight right next to or in front of the measuring tape. Another youth in the group can place their hand above the youth's head to mark the spot on the measuring tape that corresponds to the youth's height. The youth being measured can step away from the measuring tape and the group can read the measurement.

To measure wingspan: Remind youth to stand directly in front of the horizontal measuring tape with both arms outstretched to the side, parallel to the floor. Youth should align the tip of their longest finger on one hand with the 0 mark on the measuring tape, and then measure to the tip of their longest finger on the other hand. Another youth in the group can help to mark the wingspan distance. The youth being measuring can step away from the measuring tape and the group can read and record the measurement.

Activity 1 - Height and Wingspan Scatter Plots (4 of 7)

Demonstrate: Converting Between Units in the Same Measurement System

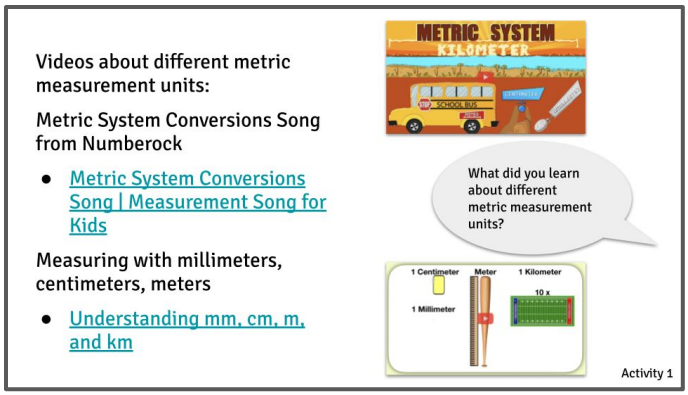
Show videos to demonstrate how to convert between metric units.

VIDEO: Metric System Conversions Song [2:22]:
https://www.youtube.com/watch?v=djTNUp4XIRo

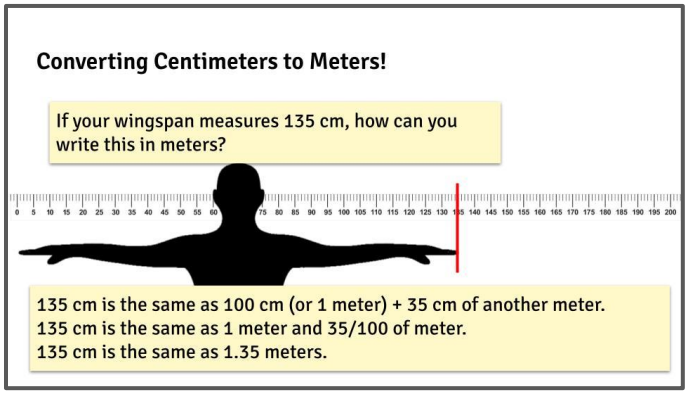
VIDEO: Understanding mm, cm, m, and km [4:26]
https://www.youtube.com/watch?v=XzhKc6jD0ws

After watching these videos, ask youth to practice with the examples on Slides 9 and 10:

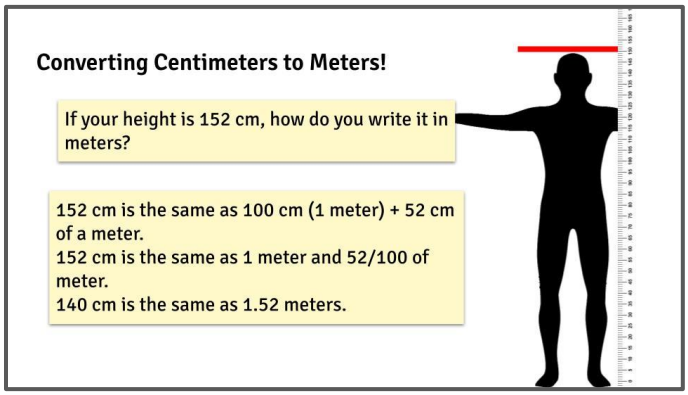
- If your wingspan measures 135 cm, how can you write this in meters? *(Answer: 135 cm is the same as 1.35 meters.)*
- If your height is 152 cm, how do you write it in meters? *(Answer: 140 cm is the same as 1.52 meters.)*



Wingspan and Height Youth Slides, Slide 8



Wingspan and Height Youth Slides, Slide 9



Wingspan and Height Youth Slides, Slide 10

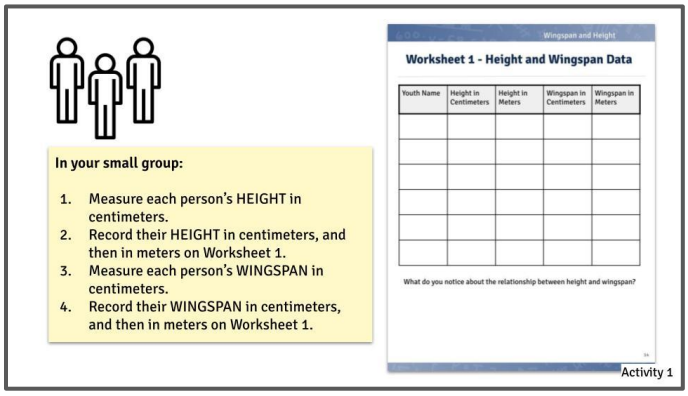
Activity 1 - Height and Wingspan Scatter Plots (5 of 7)

Small Group Activity: Measuring and Recording Height and Wingspan

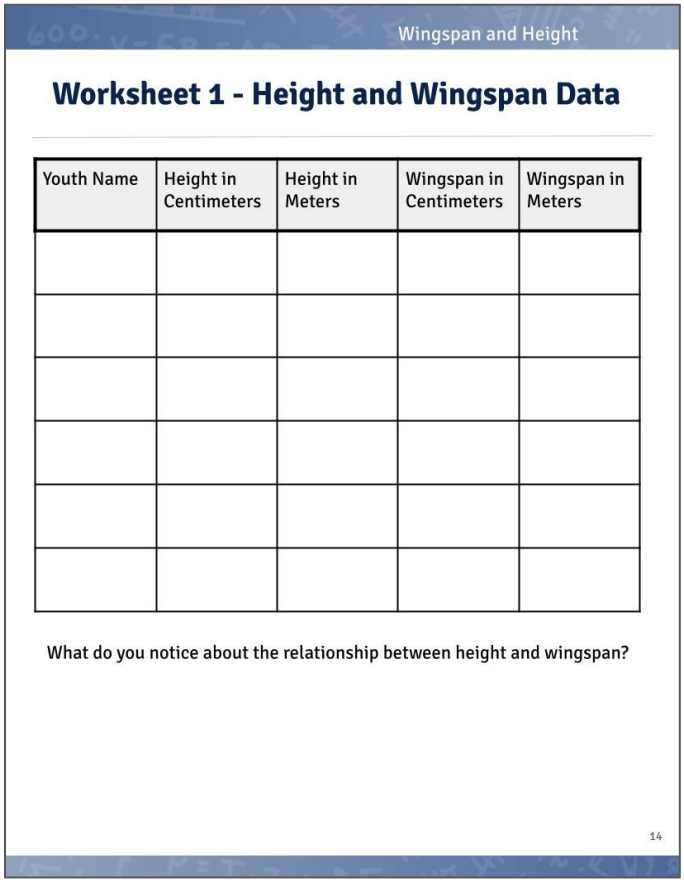
Youth will record their height and wingspan on **Worksheet 1.**

Youth will record the measurements first in **centimeters** and then in **meters**. For example, if a youth measures **1 meter and 52 centimeters,** they can record this length as:

- **152 centimeters** (because 1 meter is 100 centimeters, and 100 cm + 52 cm is 152 cm).
- **1.52 meters** because 1 represents 1 whole meter, and 0.52 represents 52/100 of a meter, or 52 centimeters out of the 100 centimeters that make up a meter.



Wingspan and Height Youth Slides, Slide 11



Activity 1 - Height and Wingspan Scatter Plots (6 of 7)

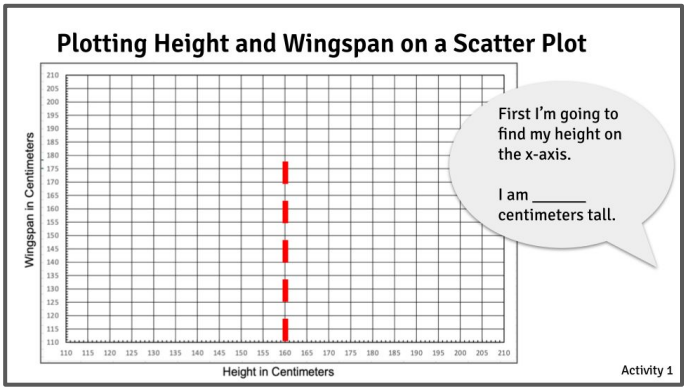
Whole Group Activity: Plotting Measurement Data on a Scatter Plot

Next, use youths' measurement data to create a group height and wingspan scatter plot. Youth will plot their own measurements onto a whole group scatter plot.

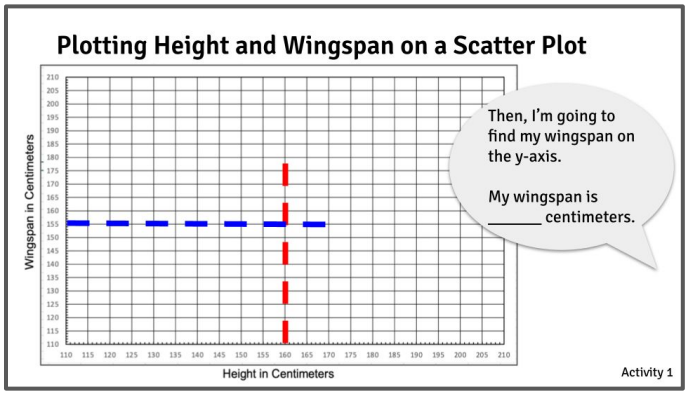
Use Slides 12-14 to support youth in plotting their data on the scatter plot. Youth will start by finding their height measurement (in cm) on the x-axis (horizontal axis). They should mark this measurement or hold a finger there for now.

Next, youth find their wingspan measurement (in cm) on the y-axis (vertical axis), again marking the point temporarily.

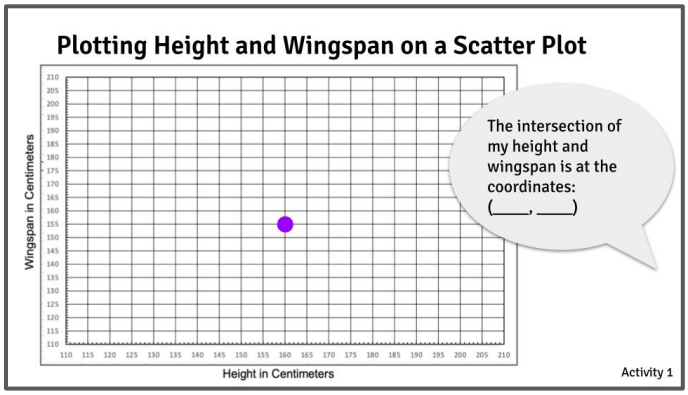
Finally, youth plot their measurements at the point on the graph where their two measurements intersect by sticking a dot sticker, or drawing a dot or X, on the scatter plot. As an option, youth can label their point with their name or initials.



Wingspan and Height Youth Slides, Slide 12



Wingspan and Height Youth Slides, Slide 13

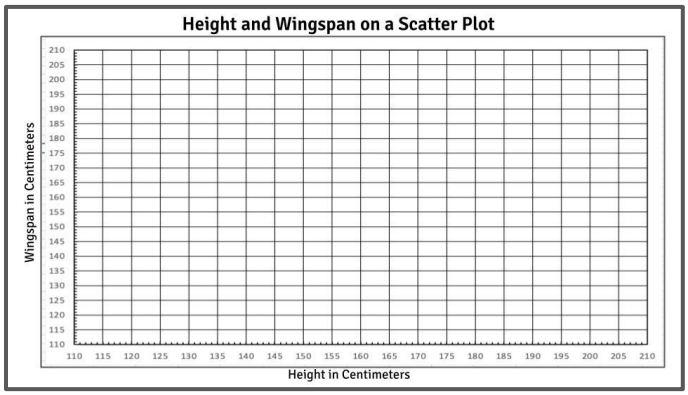


Wingspan and Height Youth Slides, Slide 14

Activity 1 - Height and Wingspan Scatter Plots (7 of 7)

Whole Group Activity: Plotting Measurement Data on a Scatter Plot (Cont.)

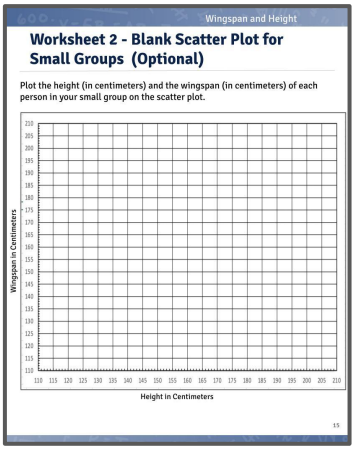
Project the blank scatter plot from Slide 15 on a white board or wall covered with chart paper or butcher paper. Ask each youth to plot their measurements on the scatter plot.



Wingspan and Height Youth Slides, Slide 15

Optional Small Group Adaptation: Plotting Measurement Data From Small Group Members on a Small Group Scatter Plot

If it is not possible to project the blank scatter plot onto a wall or white board so that all youth can represent their data on the same graph, youth can use Worksheet 2 to create small group scatter plots, using the height and wingspan measurements of each person in their small group.

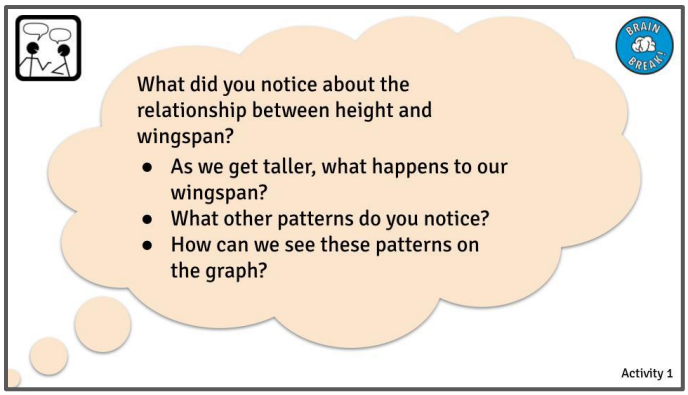


Worksheet 2 (Optional)

Whole Group Discussion: Scatter Plots

Ask youth to observe the data on the scatter plot and to share what they notice about the relationship between the two measurements.

- As we get taller, what happens to our wingspan?
- What other patterns do you notice?
- How can we see these patterns on the graph?



Wingspan and Height Youth Slides, Slide 16

Activity 2 - Stories of Inspirational Athletes (1 of 2)

Whole Group Activity: Video of Athlete Who Persisted in the Face of Challenges

Tell youth that while certain physical characteristics may help athletes (like a long wingspan in basketball), it is an athlete's persistence and effort that really matters. In fact, athletes face all kinds of physical challenges and limitations and still find ways to succeed. A key element to their success is persistence and effort.

Wingspan and Height Youth Slides, Slide 17

Share one of the following videos with youth about a famous baseball player, Jim Abbott, who was a professional pitcher even though he only had one hand.

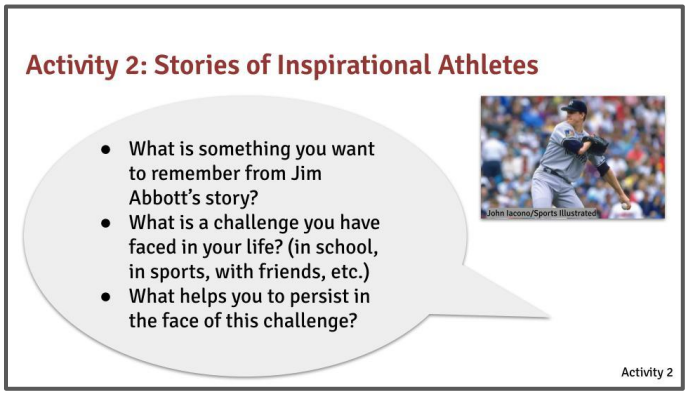
VIDEO: Jim Abbott - The one handed pitcher [3:36]
https://www.youtube.com/watch?v=3Gcl5IBGZEE

VIDEO: Jim Abbott An inspiration to all [5:13]
https://www.youtube.com/watch?v=ffFuqG54XWI

Whole Group Discussion

Ask youth to discuss key take away messages from the video. Provide opportunities for youth to talk in small groups or with a partner, and then to share their ideas with the whole group:

- What is something you want to remember from Jim Abbott's story?
- What is a challenge you have faced in your life? (in school, in sports, with friends, etc.)
- What helps you to persist in the face of this challenge?



Wingspan and Height Youth Slides, Slide 18

Activity 2 - Stories of Inspirational Athletes (2 of 2)

Small Group Activity: Wall of Inspiration

Youth will create inspirational posters to hang around the room.

In small groups, ask youth to:

- Think of inspirational phrases - words that can help you persist even when things are challenging.
- Record your phrases on your group poster.
- Add pictures and images too!

These posters can remain in place for the duration of the program. Use them to aid additional reflection sessions!

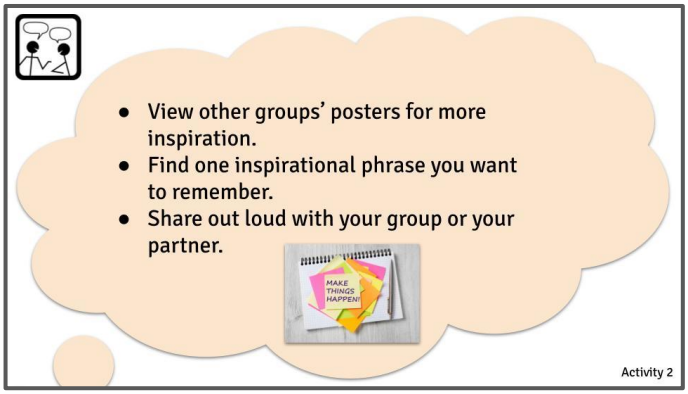
Wingspan and Height Youth Slides, Slide 19

Gallery Walk: Whole Group Reflection

Ask youth to walk around and view other groups' inspirational posters.

Ask them to find one inspirational phrase that they want to remember.

Once everyone has looked around, ask youth to circle up and share what they noticed with the whole group or with a partner.



Wingspan and Height Youth Slides, Slide 20

Worksheet 1 - Height and Wingspan Data

Youth Name	Height in Centimeters	Height in Meters	Wingspan in Centimeters	Wingspan in Meters

What do you notice about the relationship between height and wingspan?

Worksheet 2 - Blank Scatter Plot for Small Groups (Optional)

Plot the height (in centimeters) and the wingspan (in centimeters) of each person in your small group on the scatter plot.