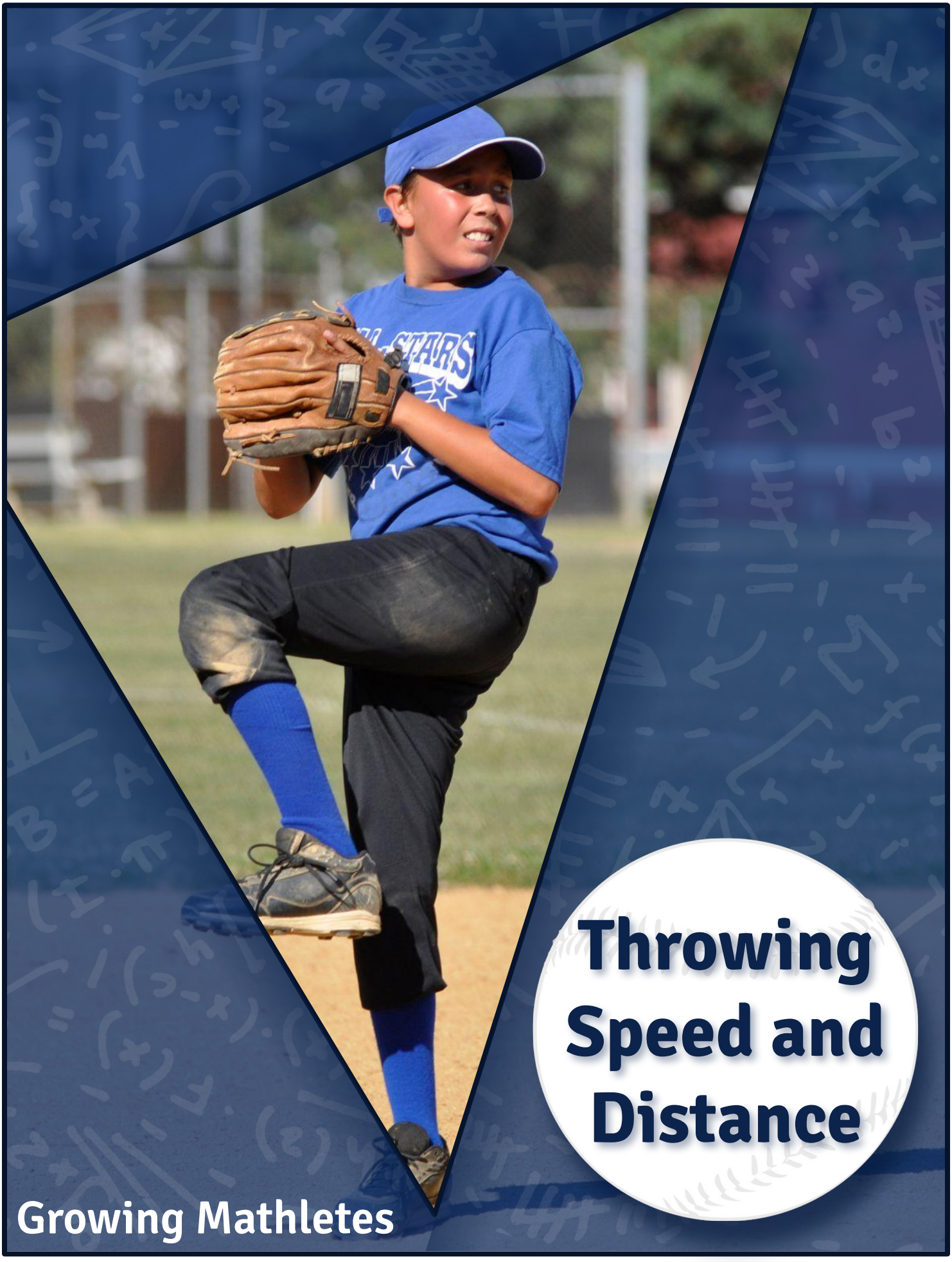


Throwing Speed and Distance

Growing Mathletes

Throwing Speed and Distance Overview

Key Ideas in this Session:

Youth will learn about the time it takes for a ball to travel due to different pitch speeds and different pitching distances. Youth will also learn about the value of different skills and abilities in baseball and other activities.

Driving Questions:

1. How does one's growth mindset contribute to their team's overall success?
2. How can we use different tools to measure distances (home plate to the pitcher's mound)?

Math Standards:

3.MD.4 Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch.

4.MD.1 Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two-column table.

5.MD.1. Convert like measurement units within a given measurement system. Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real world problems.

6.SP.A.3 Recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number.

Activity	Time	Description
Activity 1	15 minutes	Youth will consider the role of collaboration to a team and think about the skills that are needed to contribute to a team on the baseball field. Youth will participate in a whole group discussion of their own skills that they contribute to various aspects of their own lives (family, sports, classroom, etc.)
Activity 2	45 minutes	Youth will work with partners to measure and record their throwing distances. Youth will think about how measurement tools are used to calculate distance in baseball.

Materials

- Tape measure (100 ft.)
- Cones
- Soft balls (wiffle balls, tennis balls, or rubber baseballs)
- Calculators
- **Worksheet 1** (one per youth pair)

Growth Mindset Connections

The value of collaboration. Everyone has unique skills to contribute to the team.

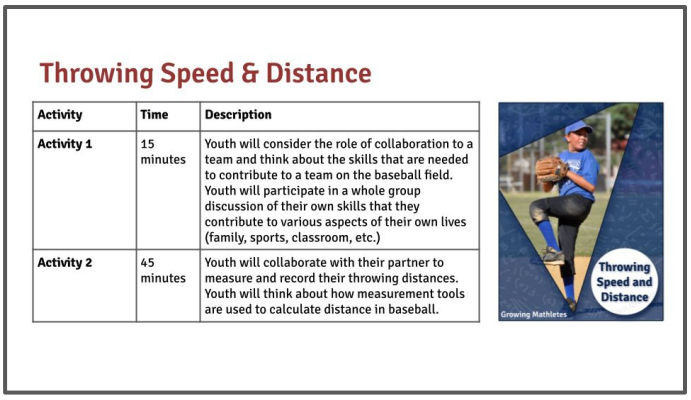
Set-Up

For Activity 1, prepare the video (link below) to show to youth.

For Activity 2, distribute **Worksheet 1** to each youth pair. Cones will be set up to use as a "starting line" for youth baseball throws. Tape measure will be provided to each pair of youth to measure their throws.

Throwing Speed and Distance Introduction

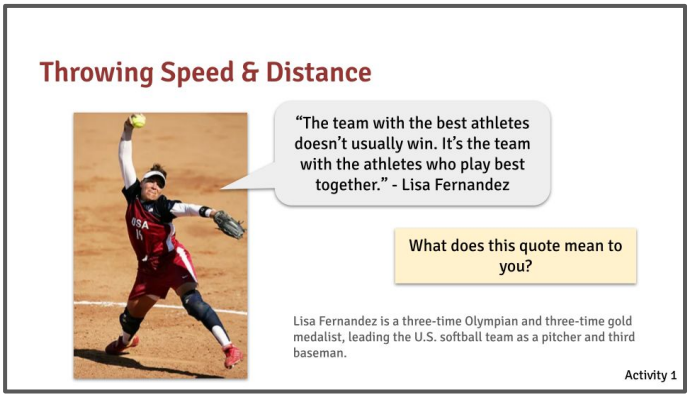
Start the session by providing youth with an overview of the key activities.



Throwing Speed Youth Slides, Slide 1

Next, share and discuss this quote.

"The team with the best athletes doesn't usually win. It's the team with the athletes who play best together."
– Lisa Fernandez



Throwing Speed Youth Slides, Slide 2

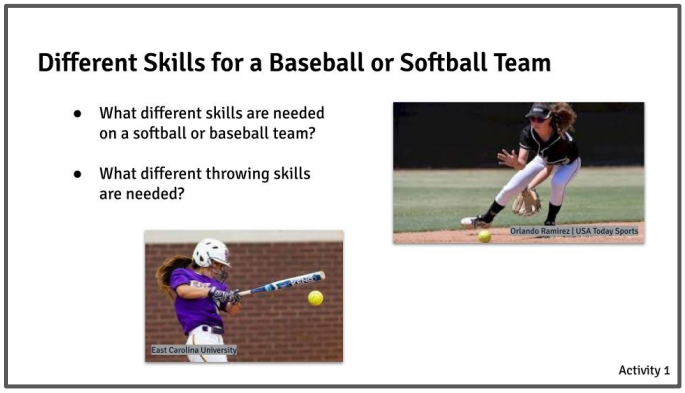
Activity 1 - Team Sports and Baseball Pitch Speed (1 of 5)

Description: In this activity, youth will consider the skills that are needed to contribute to a team on the baseball field as well as in their own lives (family, teams, classroom, etc.). Youth will also predict how fast they think a professional pitcher can throw a baseball and compare this speed to the speed of everyday activities. Youth will have a closing activity to recap their skills, contributions to a team, and how their growth mindset relates to these ideas.

Growth Mindset Idea: The value of collaboration. Everyone has unique skills to contribute to the team. In baseball, emphasize the value of different ball throwing skills. For example, teams need players who can throw fast, throw far, and throw accurately. Some players will excel at short, fast throws. Other players excel at long, accurate throws.

LAUNCH Connecting to Prior Knowledge: To launch the activity, ask youth to think about different skills that are used in a baseball game.

- What strategies and techniques do pitchers use in a baseball game?
- What different ball-throwing skills are needed on a baseball team?



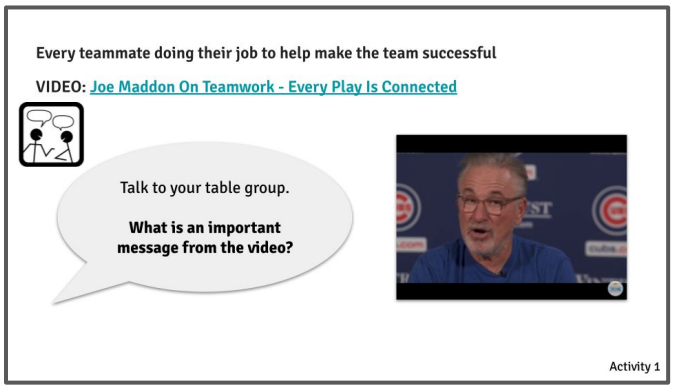
Throwing Speed Youth Slides, Slide 3

Activity 1 - Team Sports and Baseball Pitch Speed (2 of 5)

Whole Group Discussion:

Youth will watch a video featuring Joe Madden (former Manager of the Chicago Cubs). In the video, Joe Madden talks about every teammate doing their job to help make the team successful,

VIDEO: Joe Maddon On Teamwork - Every Play Is Connected [1:22]
https://devzone.positivecoach.org/resource/video/joe-maddon-teamwork-every-play-connected



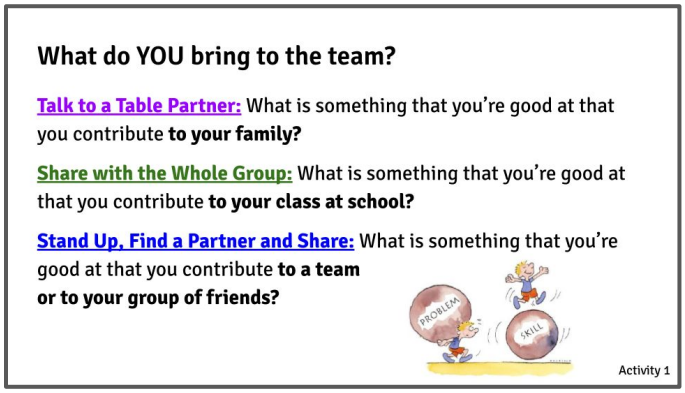
Throwing Speed Youth Slides, Slide 4

After the video, discuss key takeaways:

- What is an important message from the video? *(Emphasize that the ball throwing skills of ALL players are important to the team.)*

Next, youth discuss specific things that they contribute to their family, classroom, team, etc. Be sure to guide youth to distinguish between something they contribute to their family and a characteristic they have, such as "I am kind."

To add movement alternate between participation structures, as prompted below:



Throwing Speed Youth Slides, Slide 5

DISCUSS:

- Talk to a table partner: What is something you're good at that you contribute to your **family?**
- Share with whole group: What is something you're good at that you contribute to your class **at school?**
- Stand up, find a new partner, and share: What is something that you're good at that you contribute to **a team or your group of friends?**

Activity 1 - Team Sports and Baseball Pitch Speed (3 of 5)

Whole Group Discussion: (Cont.)

Ask youth to share their prior knowledge about the strength needed to throw different kinds of objects.

- What are some objects that you have thrown? *(Examples: basketball, shot-put, baseball, tennis ball, etc.)*
- How much strength do you need to throw these objects?

Throwing Speed Youth Slides, Slide 6

Show the image on Slide 6, and discuss the various phases of the pitching motion. Highlight the importance of the legs, core body, shoulders, arms, and hands. Highlight the strain placed on a baseball player's arm/shoulder when accelerating/decelerating during their throwing motion. Emphasize the need for strength, flexibility, and arm conditioning.

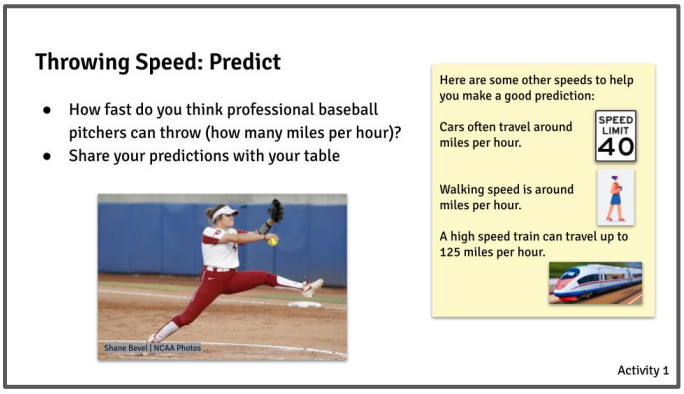
Whole Group Activity:

PREDICT: Ask youth how fast they think MLB pitchers can throw the baseball (in miles per hour).

To help them make a reasonable prediction, share several common speeds (cars often travel 30-40 mph, people walk 3 mph, and high speed trains travel 125 mph).

DISCUSS:

- How fast do you think professional baseball players/pitchers can throw?
- Who can share their predictions with the group?



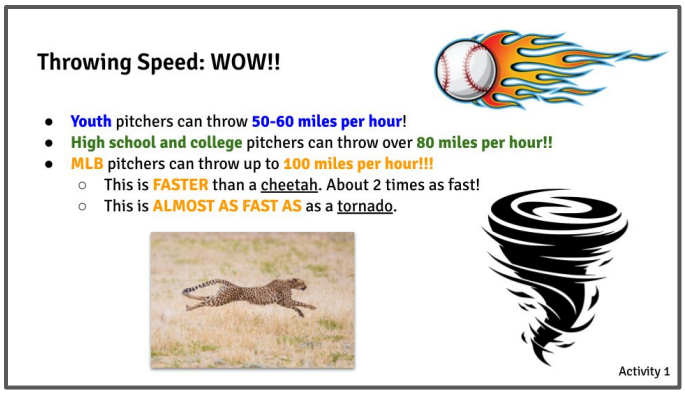
Throwing Speed Youth Slides, Slide 7

Activity 1 - Team Sports and Baseball Pitch Speed (4 of 5)

Whole Group Activity: (Cont.)

DISCOVER: Explain that youth pitchers can throw 50-60 mph, high school pitchers can throw over 80 mph, and MLB pitchers can throw 100 miles per hour.

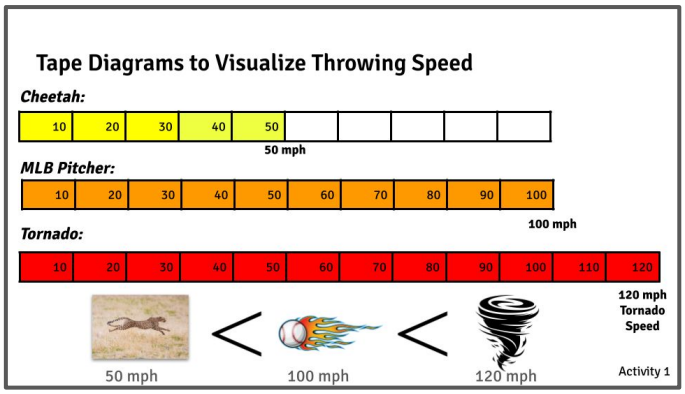
Explain that MLB pitchers speed is about twice (2.0x) as fast as a cheetah can run, and almost as fast as the speed of a tornado (the speed of an MLB pitch is about five-sixths as fast as a tornado) .



Throwing Speed Youth Slides, Slide 8

Use tape diagrams to support youth understanding of the relationships between these speeds.

- The first two tape diagrams (yellow and orange) compare the speed of a cheetah (yellow) to that of a MLB pitch (orange). Each section of the tape diagram represents 10 mph.
- The second and third tape diagrams (orange and red) compare the speed of a MLB pitch to that of a tornado (red). Each section represents 10 mph.



Throwing Speed Youth Slides, Slide 9

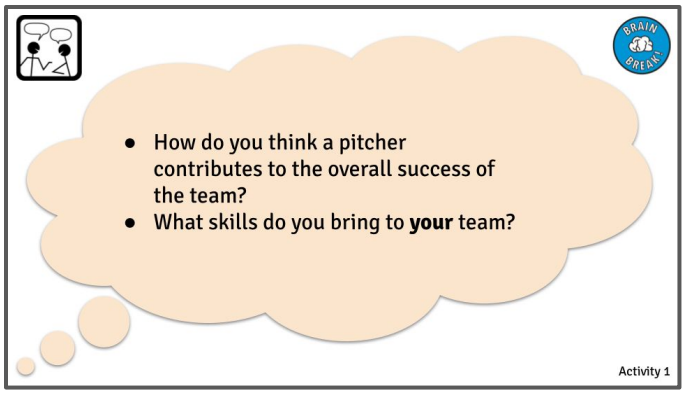
- The inequality shown on Slide 9 shows the ordering of speeds: tornados are faster than MLB pitch speed. MLB pitch speed is faster than a cheetah.

Activity 1 - Team Sports and Baseball Pitch Speed (5 of 5)

CLOSURE Reflection:

Ask youth to reflect on the different skills and abilities that are important in an activity that they do – this could be baseball, another sport, or some other activity.

- How do you think a pitcher contributes to the overall success of the team?
- What skills do you bring to **your** team?



Throwing Speed Youth Slides, Slide 10

Activity 2 - Measuring Distance of Throws (Set Up)

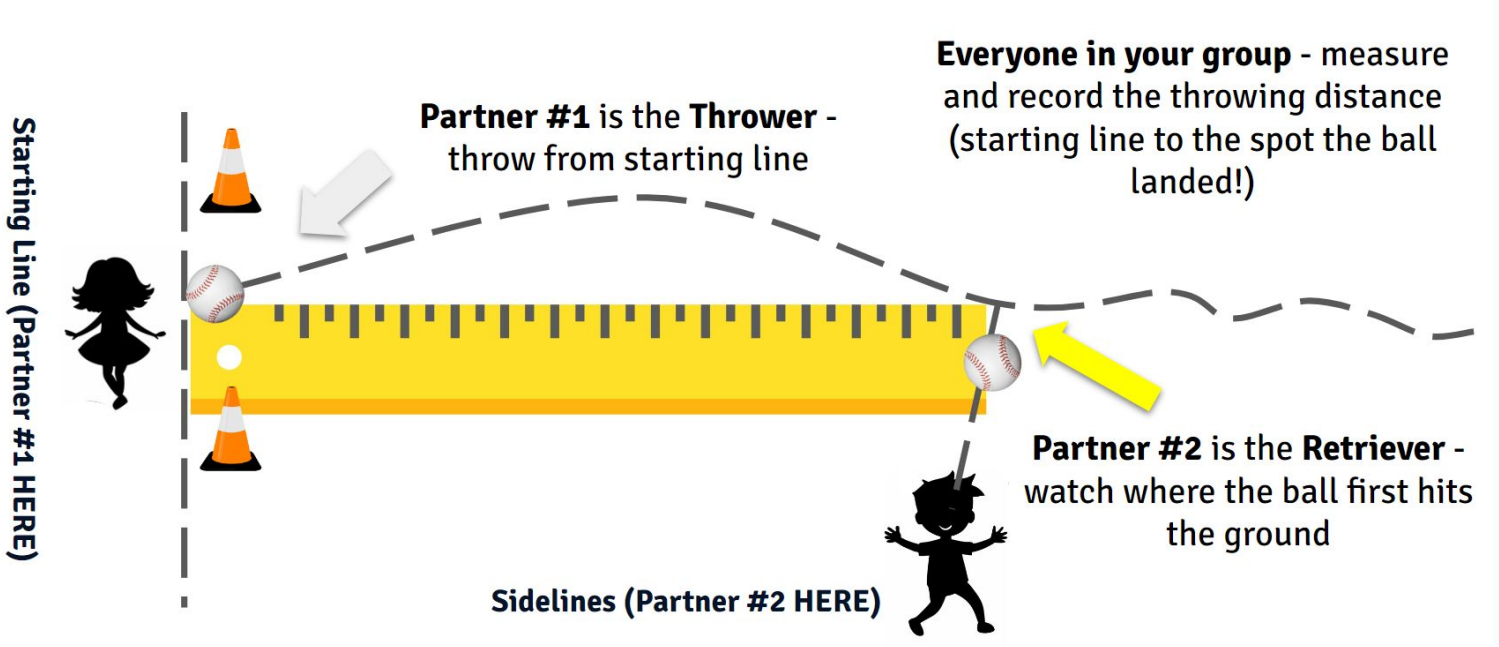
Set Up: Throwing Lines

Set up several throwing lines, one for each pair or group of three youth. Use cones to mark the starting line, and set up a 100 ft. measuring tape with zero at the starting line, extending outward from the line.

- Each partner will be assigned a role to begin the activity.
- Partner #1 is the **Thrower**. The Thrower starts at the line of cones and throws the ball as far as possible.
- Partner #2 is the **Retriever**. The retriever stands approximately 30-40 feet from the starting line, and off to the side (safely away from where the Thrower is throwing). The Retriever retrieves the ball that is thrown.
- If youth are working in a group of three, Partner #3 can act as a **Recorder**. The recorder stands on the sidelines near Partner #2.

SAFETY NOTES:

- Make sure to space youth far enough apart on the starting line to allow them to throw safely.
- If working in an indoor gym or other large space, use soft balls, such as wiffle balls, tennis balls, or rubber baseballs.



Activity 2 - Measuring Distance of Throws (1 of 5)

Description: In this activity, youth collaborate with a partner to measure the distance of their baseball throws. Youth record the distance on Worksheet 1.

Math Idea: Accuracy in Measurement

In measurement, **accuracy** refers to how close a measurement is to the actual, agreed upon value. If a distance measures 10 feet, and youth measure the distance and get 10 feet, then the measurement is considered accurate. By measuring distances repeatedly, youth can improve the accuracy of their measurements. In this activity, youth will use a 100-foot tape measure to measure distances in feet and inches (i.e., 35 feet and 7 inches). Youth can also round their measurements to the nearest foot, for example, 35 feet and 7 inches round up to 36 feet, while 35 feet and 3 inches rounds down to 35 feet. Rounding measurements to the nearest foot can help youth to calculate their average throwing distance.

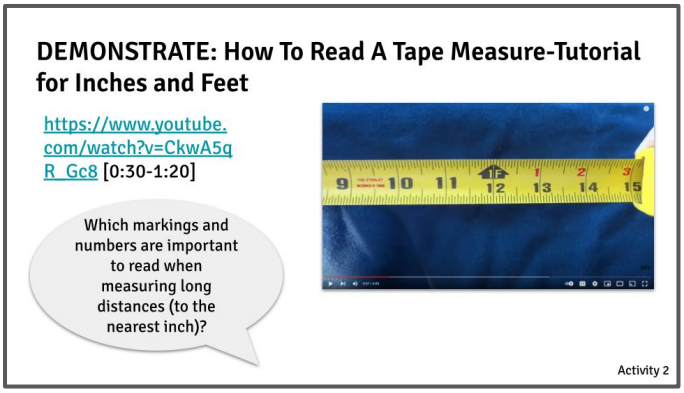
Math Idea: Mean

The term "**mean**" is used to describe data and **is a measure of central tendency**. Also called the "average," the mean value is found by adding up all the values in a data set and dividing by the total number of values in the set.

Demonstrate: How to Measure Distance Using a Tape Measure

DEMONSTRATE: Show video about use of the measuring tape.

VIDEO: How To Read A Tape Measure-Tutorial For Inches, Feet, And Fractions of An Inch [show 0:30-1:20] https://www.youtube.com/watch?v=CkwA5qR_Gc8



Throwing Speed Youth Slides, Slide 11

After watching the video, **ask youth to discuss:**

- Which markings and numbers are important to read when measuring long distances (to the nearest inch)? *(Youth will measure in feet and inches, using the foot marking and the inch markings. For example, a throw might be 10 feet 6 inches, and should be recorded that way instead of 126 inches.)*

NOTE: Measuring tapes mark feet and inches using different colors. Make sure to review conventions applicable to the measuring tapes youth will use in the activity. For a quick review of reel measuring tapes see the following video: **Open Reel Measuring Tapes [1:51]** https://www.youtube.com/watch?v=CIbNUhIC00k&t=13s.

Activity 2 - Measuring Distance of Throws (2 of 5)

Small Group Activity: Measuring Distance of Throws

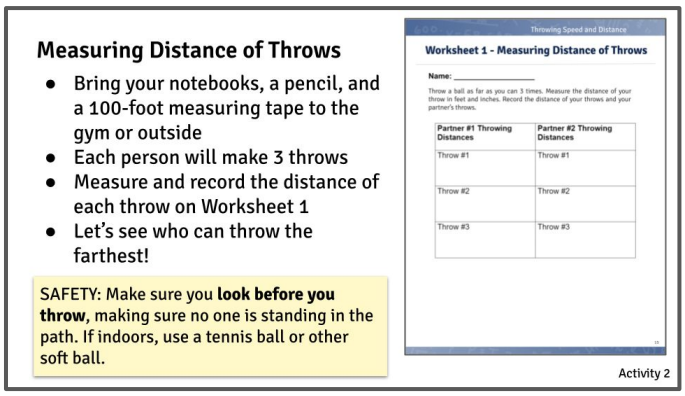
Youth begin the activity by finding a partner. Use the diagrams on Slides 14-16 to explain the outdoor activity to youth. First, review the activity and safety considerations on Slide 12.

Each partner will be assigned a role to begin the activity.

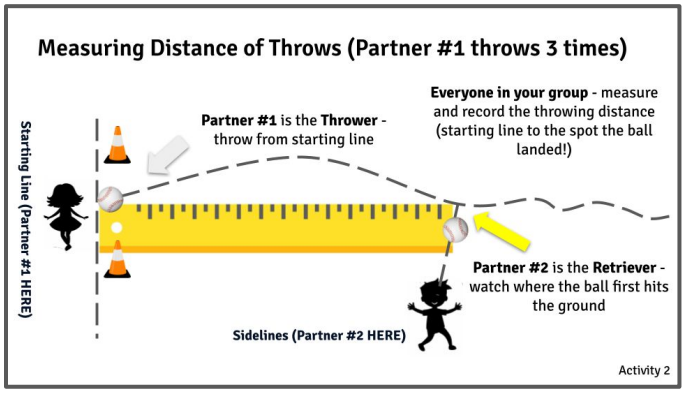
Partner #1 is the **Thrower**. The Thrower starts at the line of cones and throws the ball as far as possible.

Partner #2 is the **Retriever**. The retriever stands approximately 30-40 feet from the starting line, and off to the side (safely away from where the Thrower is throwing). The Retriever retrieves the ball that is thrown.

- Partner #2 also pays attention to where the Thrower's throw first lands on the ground. Partner #2 moves to stand on that spot (once all throws are completed and it is safe).



Throwing Speed Youth Slides, Slide 12



Throwing Speed Youth Slides, Slide 13

Activity 2 - Measuring Distance of Throws (3 of 5)

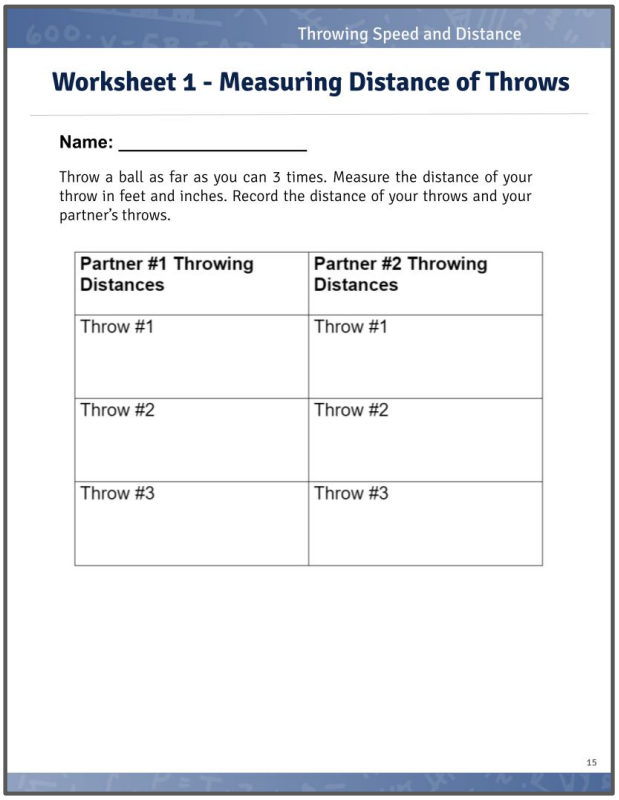
Small Group Activity: Measuring Distance of Throws (Cont.)

The **Thrower and Retriever** work together to measure the distance from the starting line to the estimated point where the Thrower's throw first landed on the ground using a 100-foot tape measure.

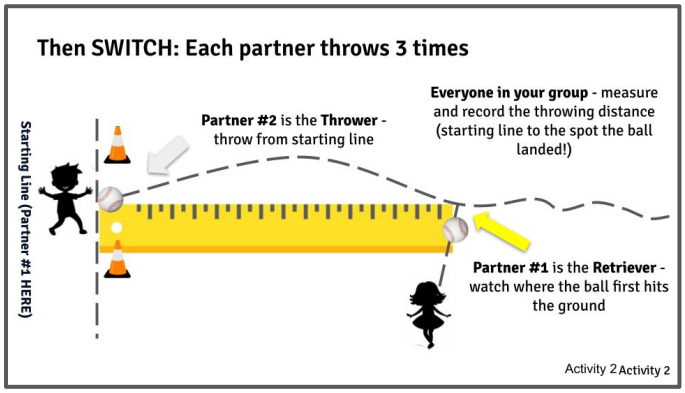
- Partner #1 holds the tape measure at the starting line.
- Partner #2 extends the tape measure to the spot where the throw landed, and reads the length on the tape measure. (Demonstrate how to extend the measuring tape, and how to read measurements in feet and inches.)
- Partner #1 (or, if working in a group of 3, Partner #3) is the **Recorder**, and records the distance on **Worksheet 1.**

Youth repeat this process so Partner #1 has a total of 3 throws.

Partners switch roles and repeat the process.



Worksheet 1



Throwing Speed Youth Slides, Slide 14

Activity 2 - Measuring Distance of Throws (4 of 5)

Extension (Optional) Demonstrate: Finding Mean and Converting Measurement Units

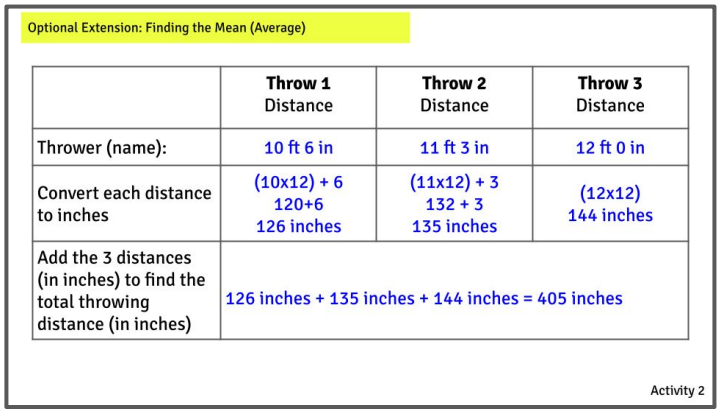
To find the mean (average) throwing distance, youth use **Worksheet 2** to add the distances from each of their throws, and then divide that total by the number of throws.

First, ask youth to convert each of their measurements to inches. For example, if a youth threw the ball 10 ft 6 inches, they can multiply 10 times 12 to find the number of inches in 10 feet (120) and then add 6 to find the total number of inches (126). If a youth threw the ball 11 ft 3 inches, they can multiply 11x12 to find the number of inches in 11 feet (132) and then add 3 to find the total number of inches (135). For a throw of 12 ft, youth can multiply 12 times 12 to find the number of inches in 12 feet (144).

Once youth have converted each of their throws to inches, **they will add the three distances to together to find a total distance.** Then, youth will **divide by three for three throws to find the average distance**.

For example, 126+135+144 equals 405 inches. 405 inches divided by 3 is 135 inches. Youth can then convert this distance back to feet by dividing by 12. 135 divided by 12 is 11 feet and 3 inches.

Youth may need support with calculations, and should be provided with calculators.

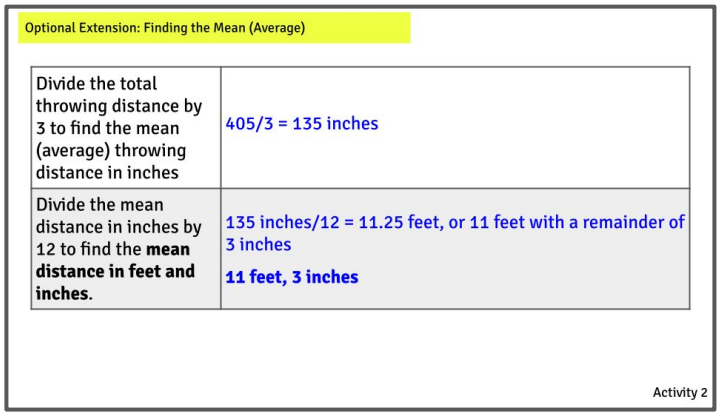


Optional Extension: Finding the Mean (Average)

	Throw 1 Distance	Throw 2 Distance	Throw 3 Distance
Thrower (name):	10 ft 6 in	11 ft 3 in	12 ft 0 in
Convert each distance to inches	(10x12) + 6 120+6 126 inches	(11x12) + 3 132 + 3 135 inches	(12x12) 144 inches
Add the 3 distances (in inches) to find the total throwing distance (in inches)	126 inches + 135 inches + 144 inches = 405 inches		

Activity 2

Throwing Speed Youth Slides, Slide 15

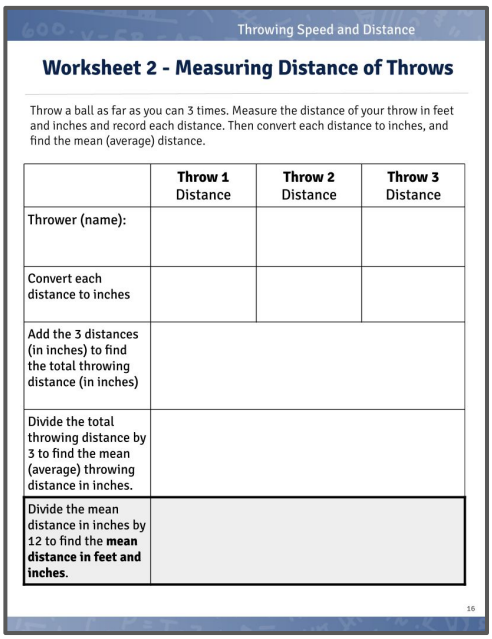


Optional Extension: Finding the Mean (Average)

Divide the total throwing distance by 3 to find the mean (average) throwing distance in inches	405/3 = 135 inches
Divide the mean distance in inches by 12 to find the **mean distance in feet and inches**.	135 inches/12 = 11.25 feet, or 11 feet with a remainder of 3 inches **11 feet, 3 inches**

Activity 2

Throwing Speed Youth Slides, Slide 16



Throwing Speed and Distance

Worksheet 2 - Measuring Distance of Throws

Throw a ball as far as you can 3 times. Measure the distance of your throw in feet and inches and record each distance. Then convert each distance to inches, and find the mean (average) distance.

	Throw 1 Distance	Throw 2 Distance	Throw 3 Distance
Thrower (name):			
Convert each distance to inches			
Add the 3 distances (in inches) to find the total throwing distance (in inches)			
Divide the total throwing distance by 3 to find the mean (average) throwing distance in inches.			
Divide the mean distance in inches by 12 to find the **mean distance in feet and inches**.			

16

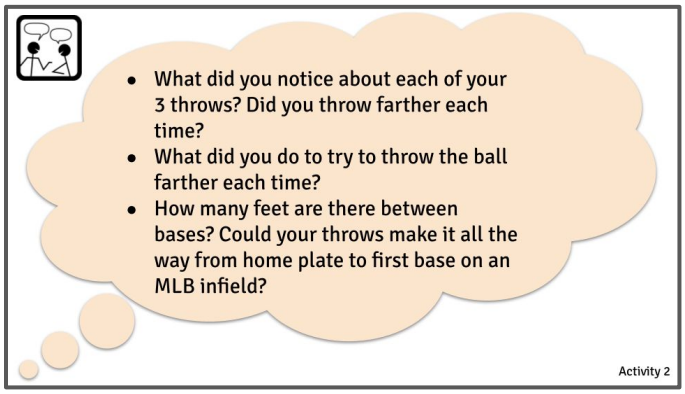
Worksheet 2

Activity 2 - Measuring Distance of Throws (5 of 5)

Whole Group Reflection:

Once all throws and measurements are complete, ask youth to share and compare their throwing distances with other pairs.

- What did you notice about each of your 3 throws? Did you throw farther each time?
- What did you do to try to throw the ball farther each time?
- How many feet are there between bases? Could your throws make it all the way from home plate to first base on an MLB infield?



Throwing Speed Youth Slides, Slide 17

Worksheet 1 - Measuring Distance of Throws

Name: _____

Throw a ball as far as you can 3 times. Measure the distance of your throw in feet and inches. Record the distance of your throws and your partner's throws.

Partner #1 Throwing Distances	**Partner #2 Throwing Distances**
Throw #1	Throw #1
Throw #2	Throw #2
Throw #3	Throw #3

Worksheet 2 - Measuring Distance of Throws

Throw a ball as far as you can 3 times. Measure the distance of your throw in feet and inches and record each distance. Then convert each distance to inches, and find the mean (average) distance.

	Throw 1 Distance	**Throw 2** Distance	**Throw 3** Distance
Thrower (name):			
Convert each distance to inches			
Add the 3 distances (in inches) to find the total throwing distance (in inches)			
Divide the total throwing distance by 3 to find the mean (average) throwing distance in inches.			
Divide the mean distance in inches by 12 to find the **mean distance in feet and inches**.			