

A baseball player in a white uniform with the number 3 on the back and a red helmet is captured mid-swing. A white baseball is in the air above the bat. The scene is set on a baseball field with brown dirt and white base paths. The entire image is framed by a dark blue background with faint, light blue mathematical symbols and equations scattered throughout. A large, semi-transparent blue silhouette of a baseball player in a batting stance is overlaid on the right side of the image.

Baseball Field Geometry

Growing Mathletes

Baseball Field Geometry Lesson Overview

Key Ideas in This Session:

Youth explore the dimensions of the baseball field such as distances between home plate and the pitching mound, distance between bases, and various angles within the infield. Youth also learn about neuroplasticity and adapting to new situations, such as different ballparks.

Driving Questions:

1. How can we measure different angles and distances on a baseball field?
2. How can we train our brain to adapt to a variety of situations?

Math Standards:

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

4.G.2 Classify two-dimensional figures based on the presence or absence of angles of a specified size. Recognize right triangles and identify right triangles.

4.MD.5 Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint and understand concepts of angle measurement.

7.G.2 Draw (freehand, with ruler and protractor, and with technology) geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle.

Activity	Time	Description
Activity 1	20 minutes	Youth learn about three different types of triangles, their angles and how to identify angles used on the baseball field. There are two options for this activity, one that is more appropriate for youth with less experience measuring angles and one that is more appropriate for youth with more experience measuring angles.
Activity 2	40 minutes	Repeated measurements improve accuracy and precision. Using a 10 foot and a 100 foot tape measure, youth will estimate and measure infield distances on the baseball field. Baseball fields have the same distances between bases but distances to outfield walls vary. Youth learn that just like baseball players, they can adapt to new situations and be successful.

Materials

- Pencils, Markers
- Rulers (1 per pair of youth)
- Bases (for home plate, and 3 bases)
- Tape measure (10ft.) (1 per small group)
- Tape measure (100ft.) (1 per small group)
- Protractors (1 per pair of youth)
- Making angles tool (2 rectangular strips of card stock joined by a metal brad) (1 per youth)
- Clipboards (to record measurements)
- Worksheet Baseball Field (one copy per youth)
- Worksheets 1-4 (one copy per youth)

Set-Up

See set up instructions on the following 2 pages for field set up.

For Activity 1, distribute pencils, a ruler, a protractor and **Worksheets 1-3** to each youth.

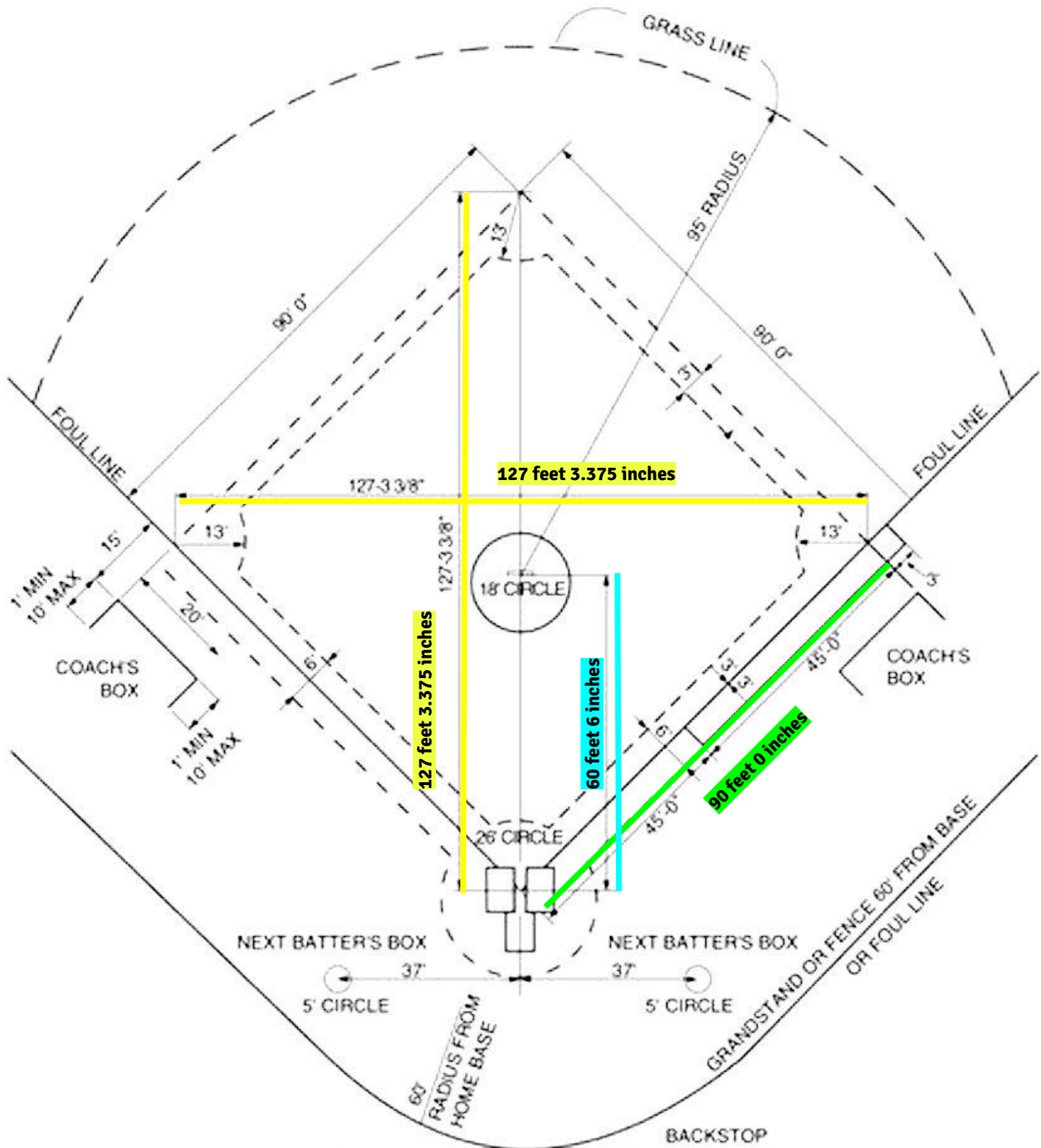
For Activity 2, distribute a 10 ft. and 100 ft. tape measure to each group for the outdoor activity on the baseball field and a copy of **Worksheet 4** to each youth.

Growth Mindset Connection

Malleability of the brain and the role of struggle in learning.

Instructions for Setting Up Baseball Field (1 of 2)

MLB Infield Dimensions



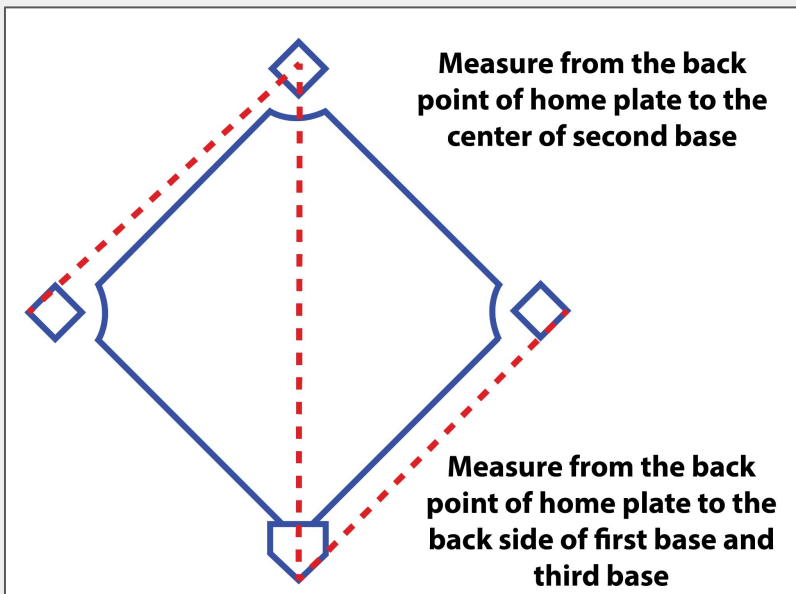
Instructions for Setting Up Baseball Field (2 of 2)

MLB, Little League, and Indoor/Small Space Infield Dimensions Chart

	Distance between Bases	Distance between home plate and pitcher's mound	Distance between home plate and second base
MLB	90 feet	60 feet 6 inches	127 feet 3.375 inches
Little League	60 feet	46 feet	~ 85 feet
Indoor and Small Space Set Up	30 feet	20 feet 2 inches	~ 42 feet

MLB dimensions source: <https://www.mlb.com/glossary/rules/field-dimensions>

How to Measure Between Bases



To measure from each base:

Measure from the back point of home plate along the outer edge of first base (1B) and third base (3B) to the far edge.

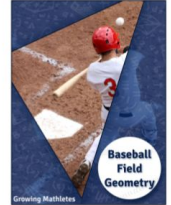
Measure from the far corner of first or third base (3B) along the outer edge to the center of second base (2B), and from the back point of home plate (HP) to the center of second base (2B).

Baseball Field Geometry Introduction

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

Baseball Field Geometry

Activity	Time	Description
Activity 1	20 minutes	You will learn about different types of angles and how to identify angles used on the baseball field.
Activity 2	40 minutes	You will use a 10 foot and then a 100 foot tape measure to estimate and record distances on the baseball field. Baseball players have to adapt to different field. You will learn how you can grow your brain to adapt to new situations.



Baseball Field Geometry Youth Slides, Slide 1

Next, share and discuss this quote.

“There are three types of baseball players: Those who make it happen, those who watch it happen and those who wonder what happens.”

– Tommy Lasorda.

Baseball Field Geometry



“There are three types of baseball players: Those who make it happen, those who watch it happen, and those who wonder what happens.”
–Tommy Lasorda

What does this quote mean to you?

What message is Tommy Lasorda trying to send?

Activity 1

Baseball Field Geometry Youth Slides, Slide 2

Activity 1 - Identifying Angles on a Baseball Field (1 of 5)

Description: Youth learn about three different types of triangles, their angles and how to identify angles used on the baseball field.

Math Ideas in Activity Option 1: For Younger Youth In this activity, youth discuss shapes and angles that they see on the baseball field. Shapes could include circles, different kinds of triangles, rectangles or squares. For each shape identified, ask youth to describe the properties of the shape including the number of sides, and the angles. For example, youth might recognize equilateral triangles - a triangle with three congruent sides and three congruent angles. All angles in an equilateral triangle measure 60 degrees. Youth may also recognize right triangles - a triangle with one right (90 degree) angle. Youth may also identify rectangles - shapes with four sides and four right (90 degree) angles. Youth will also explore different angles on a baseball field, including acute angles (less than 90 degrees), obtuse angles (more than 90 degrees) and right angles (equal to 90 degrees).

Math Ideas in Activity Option 2: For Older Youth In this activity, youth discuss and draw three different kinds of triangles. An isosceles triangle is a triangle with two congruent sides and angles. An equilateral triangle is a triangle with three congruent sides and three congruent angles. All angles in an equilateral triangle measure 60 degrees. A right triangle is a triangle with one right (90 degree) angle. Youth use rulers to measure lines and compare distances. Youth use protractors to measure and label angles on the baseball field, including acute angles (less than 90 degrees), obtuse angles (more than 90 degrees) and right angles (equal to 90 degrees). Youth also identify perpendicular lines on the baseball field. Perpendicular lines intersect to form four right (90 degree) angles.

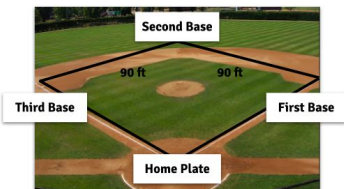
LAUNCH: Connecting to Prior Knowledge

Project an image of a real-life baseball field. Ask youth to share with a partner what shapes, lines and angles they see on the field.

- What shapes do you see on the baseball field?
- What do you notice about the distance between the bases?
- What else do you notice?

Activity 1: Shapes on the Baseball Field

- What **SHAPES** do you see on the baseball field?
- What do you notice about distance between the bases?
- What else do you notice?



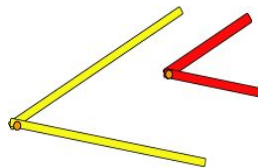
Activity 1

Baseball Field Geometry Youth Slides 3

Activity 1 - Identifying Angles on a Baseball Field (2 of 5)

Whole Group Activity Option 1: For Younger Youth - Learning About Angles on a Baseball Field

Provide each youth with a angle measure tool (2 rectangular strips joined at one end with a metal brad fastener) and use the tool to make acute, right, or obtuse angles during video.



To support youth learning about angles, share a video that describes different types of angles. Ask youth to share what they learned about angles.

VIDEO:

<https://www.youtube.com/watch?v=NVuMULQjb3o>

Finding and Classifying Angles on Images of Baseball Fields

Project different images of baseball fields and ask youth to share examples of angles that they see in the image. Encourage youth to identify angles as acute, right, or obtuse.

Ask youth to use their angle measurement tool to “measure” the angles that they see on the images. For each angle, ask youth to identify whether the angle is acute, obtuse, or a right angle.

Angles on a Baseball Field Exploration: Option 1

There are also ANGLES on a Baseball Field!

Angles Song | Acute, Obtuse, & Right Angles

RIGHT ANGLE
Exactly 90°

ACUTE ANGLE
Less than 90°

OBTUSE ANGLE
More than 90°

What did you learn about angles from the video?

Activity 1

Baseball Field Geometry Youth Slides, Slide 4

Angles on a Baseball Field Exploration: Option 1

Let's Find Angles on a Baseball Field!

Maps Data: Google, ©2022

What angles do you see at Oracle Park in San Francisco, the Giants' stadium?

Activity 2

Baseball Field Geometry Youth Slides, Slide 5

Angles on a Baseball Field Exploration: Option 1

Let's Find Angles on a Baseball Field!

Maps Data: Google, ©2022

What angles do you see at American Family Field in Milwaukee, the Brewers' stadium?

Activity 3

Baseball Field Geometry Youth Slides, Slide 6

Activity 1 - Identifying Angles on a Baseball Field (3 of 5)

Whole Group Activity

Option 2:

For Older Youth - Measuring Angles on Images of a Baseball Field using a Protractor

Ask youth to notice the two red lines drawn on the baseball field. One line goes from second base to home plate. The other line goes from third base to first base. Ask youth to share observations and ask:

- Are the lengths of the two lines the same? How can you check to be sure?
- What kind of angles are formed at the intersection of these lines? (right angles).

DEMONSTRATE:

Ask youth if they have ever used a protractor to measure angles. Share this video to explain how to use a protractor.

VIDEO:

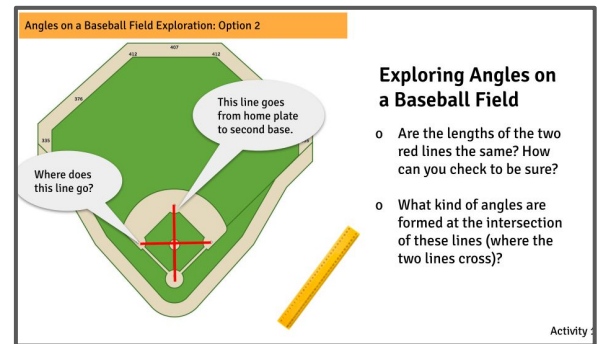
<https://www.youtube.com/watch?v=Fr46LtLG7iw>
(00:00 - 2:31)

Demonstrate: Using a Protractor to Measure Angles on a Field

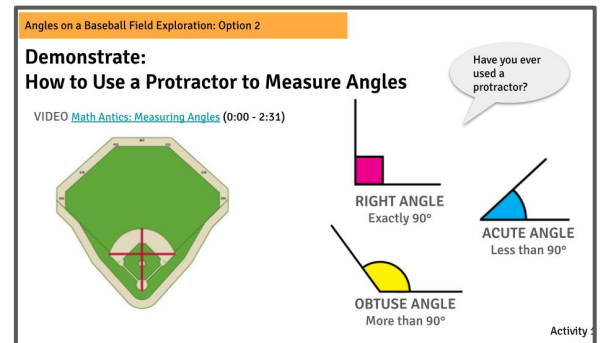
To help youth measure the angles created by the triangles drawn for each scenario, show them how to correctly place the protector. The base of the protractor should be aligned with one side of the triangle and the circle in the middle of the base of the protractor should be placed on a corner (vertex) of the triangle.

Using Baseball Scenarios to Form and Measure Angles on the Field

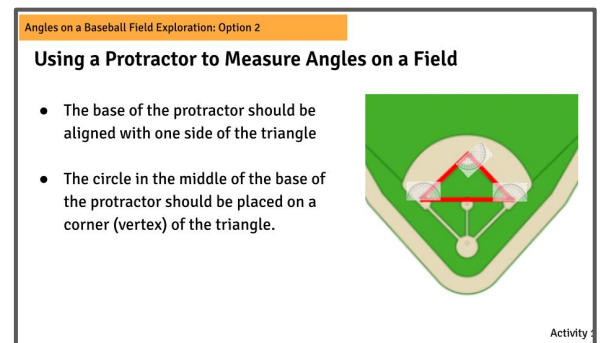
Share the following scenarios with youth. Each scenario is described on a different page, and asks youth to draw lines between different locations on the baseball field. (see **Worksheets 1, 2 and 3**). For each scenario, ask youth to measure the **ANGLES** formed using a protractor, and record the angle measurements on the worksheet. Then, ask youth to identify the **type of triangle** formed, and record their reasoning.



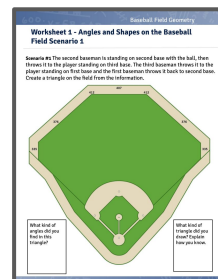
Baseball Field Geometry Youth Slides, Slide 7



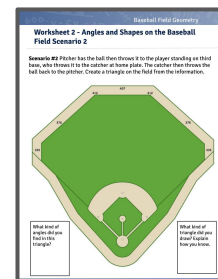
Baseball Field Geometry Youth Slides, Slide 8



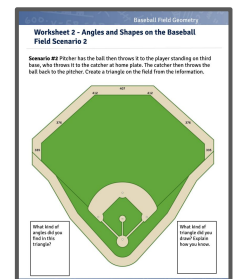
Baseball Field Geometry Youth Slides, Slide 9



Worksheet 1



Worksheet 2



Worksheet 3

Activity 1 - Identifying Angles on a Baseball Field (4 of 5)

Using Baseball Scenarios to Form and Measure Angles on the Field (Cont.)

Scenario 1.

The second baseman is standing on second base with the ball, then throws it to the player standing on third base. The third baseman throws it to the player standing on first base and the first baseman throws it back to second base. Create a triangle on the field from the information. (Worksheet 1)

Angles on a Baseball Field Exploration: Option 2

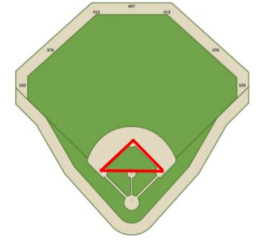
Scenario 1

Directions: Use the information in the scenario to draw a triangle on a baseball field (Worksheet 1).

The second baseman is standing on second base with the ball, then throws it to the player standing on third base. The third baseman throws it to the player standing on first base and the first baseman throws it back to second base. Create a triangle on the field from the information.

Measure each of the angles using a protractor. Record the angle measurements on your worksheet.

Then identify the type of triangle that you formed.



You can use a protractor to determine if the angles are acute, obtuse, or right angles.

Baseball Field Geometry Youth Slides, Slide 10

Scenario 2.

Pitcher has the ball then throws it to the player standing on third base, who throws it to the catcher at home plate. The catcher then throws the ball back to the pitcher. Create a triangle on the field from the information. (Worksheet 2)

Angles on a Baseball Field Exploration: Option 2

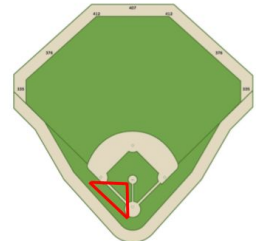
Scenario 2

Directions: Use the information in the scenario to draw a triangle on a baseball field (Worksheet 2).

Pitcher has the ball then throws it to the player standing on third base, who throws it to the catcher at home plate. The catcher then throws the ball back to the pitcher. Create a triangle on the field from the information.

Measure each of the angles using a protractor. Record the angle measurements on your worksheet.

Then identify the type of triangle that you formed.



You can use a protractor to determine if the angles are acute, obtuse, or right angles.

Baseball Field Geometry Youth Slides, Slide 11

Scenario 3.

The pitcher pitches to the batter. The batter hits the ball towards right field. The right fielder catches the ball and throws it back to the pitcher. Create a triangle on the field from the information. (Worksheet 3)

Angles on a Baseball Field Exploration: Option 2

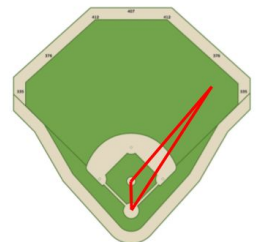
Scenario 3

Directions: Use the information in the scenario to draw a triangle on a baseball field (Worksheet 3).

The pitcher pitches to the batter. The batter hits the ball towards right field. The right fielder catches the ball and throws it back to the pitcher. Create a triangle on the field from the information.

Measure each of the angles using a protractor. Record the angle measurements on your worksheet.

Then identify the type of triangle that you formed.



You can use a protractor to determine if the angles are acute, obtuse, or right angles.

Baseball Field Geometry Youth Slides, Slide 12

ANSWERS:

Scenario 1: Isosceles Right Triangle, Angles: 1 right angle, 2 acute angles

Scenario 2: Right Triangle, Angles: 1 right angle, 2 acute angles

Scenario 3: Scalene, Angles: 1 obtuse angle, 2 acute angles

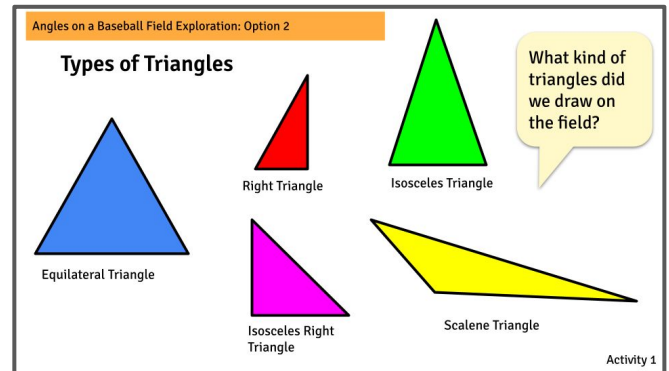
Activity 1 - Identifying Angles on a Baseball Field (5 of 5)

Group Discussion of Measuring Angles on Images of a Baseball Field using a Protractor:

Ask youth to discuss what they notice about the triangles formed in each baseball scenario.

Discuss:

- What do you notice about the ANGLES formed by the lines?
- What different kinds of TRIANGLES do you see on the baseball field? (Ask youth to share properties of triangles)



Baseball Field Geometry Youth Slides, Slide 12

ADDITIONAL SUPPORT: Show video about types of triangles (0:00-2:50)

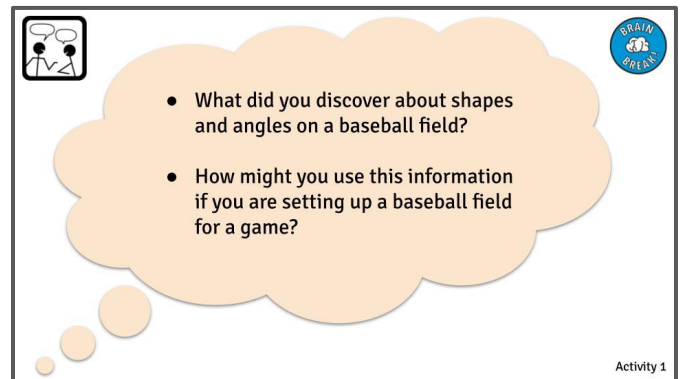
VIDEO:

<https://www.youtube.com/watch?v=i95n30i0Oq8>

CLOSURE Reflection:

Wrap up the activity with a discussion of driving questions for the lesson.

- What did you discover about shapes and angles on a baseball field?
- How might you use this information if you are setting up a field for a baseball game?



Baseball Field Geometry Youth Slides, Slide 14

Activity 2 - Measure the Dimensions of Your Baseball Field (1 of 5)

Description: Create small groups of 2-4 (3 is the ideal) for this activity. Using a 10 foot and then a 100 foot tape measure, youth will estimate, measure and record distances of the infield.

Math Ideas: 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. In measurement, **precision** refers to the closeness of repeated measurements to one another. If youth measure a given distance 3 times, and get the same distance each time, then the measurement is very precise. By measuring distances repeatedly, youth can improve the accuracy of their measurements.

Growth Mindset Ideas: While all baseball fields have the same distances between bases, the distance to the outfield wall may vary. To score home runs, players have to adapt to the distances of each ballpark. The brain can be trained to adapt to new situations as they arise. Youth learn that just like baseball players, they too can adapt to new situations and be successful.

LAUNCH Connection to Prior Knowledge:

Show youth a picture of a baseball field and ask youth to share what they know about distances on the field and how to use tools to measure distances:

- What do you know about measuring distance? What tools do you use?
- Where do you start when you measure? What do the numbers on the measuring tape mean?

Safety Tips: do not pull the tape out too hard, but slowly pull it out, and let it return slowly after use. Do not let go of one end while another person is holding the other.

Use the images of measuring tapes on Slide 15 to review how to read inches and feet on a measuring tape & tips for using the tools safely.

Activity 2 - Part 1: Let's Measure Distances on our Baseball Field!

- What do you know about measuring distance? What tools do you use?
- Where do you start when you measure? What do the numbers on the measuring tape mean?



Activity 2

Baseball Field Geometry Youth Slides, Slide 15

What do these lines tell us?

What does this tell us? What does the F stand for?

Safety first!
How do we keep each other and ourselves safe while using a measuring tape?

Activity 2

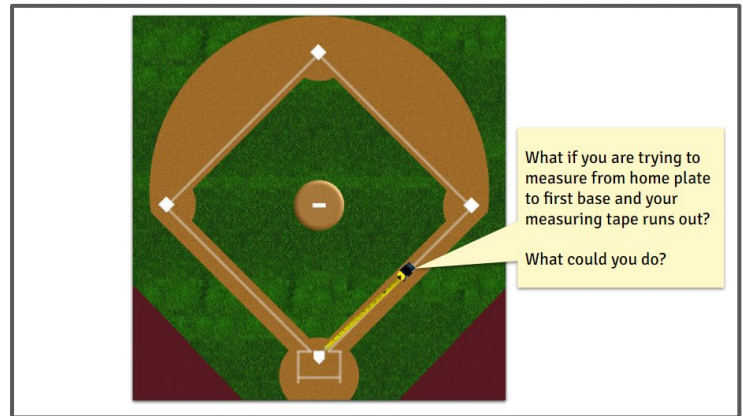
Baseball Field Geometry Youth Slides, Slide 16

Activity 2 - Measure the Dimensions of Your Baseball Field (2 of 5)

Outdoor Activity: Measuring Infield Distances with 10-foot and 100-foot Measuring Tapes

Tell youth that they will work in small groups to measure an infield distance using a 10 foot measuring tape, and a 100 foot measuring tape.

Ask youth to notice the different units on the measuring tape and to discuss which side of the measuring tape they should use.



Baseball Field Geometry Youth Slides, Slide 17

Clarify key concepts such as keeping the measuring tape flat and straight, and aligning the beginning of the measuring tape with the beginning of the distance to be measured. Also discuss how to measure distances that are longer than the measuring tape.

Transition to the Small Group Activity

Divide youth into small groups with 2-4 youth per group (3 is ideal). Assign each small group one infield distance to measure.

- home plate to first base
- home plate to second base
- home plate to third base
- home plate to the pitcher's mound

Measure INFIELD Dimensions of your Baseball Field

Directions: Work with your group of 2-4 to measure infield distances on the baseball field.

1. Estimate each distance and record your estimate.
2. Measure the distance using a 10-foot measuring tape, as accurately as possible.
3. Measure the distance again, using a 100-foot measuring tape.
4. Record your measurements on Worksheet 4.
5. Follow your facilitator's instructions for what to do when you are done!



Baseball Field Geometry Youth Slides, Slide 18

Engagement Tip!

Have a plan for youth who finish measuring. Ex: have them measure other things on the field, or have one facilitator facilitate a game, stretching, art activity, etc. This can prevent misbehavior.

Explain the instructions.

- First, youth will **estimate** their assigned distance.
- Next, youth **measure their assigned distance** (in feet) using a **10-ft tape measure**.
- Finally, youth use a **longer tape measure (100 ft)** to **measure the same infield distance** previously measured.
- Youth record their estimates and measured distances on **Worksheet 4**.
- Tell them what to do when they've finished

	Estimate of Distance in feet	Measured distance with 10ft tape (in feet)	Measured distance with 100ft tape (in feet)
Home plate to first base			
Home plate to second base			
Home plate to third base			
Home plate to pitcher's mound			
Other:			

Youth Worksheet 4

Activity 2 - Measure the Dimensions of your Baseball Field (3 of 5)

Group Discussion:

Ask youth to **compare their measurements using the 10-foot measuring tape and the 100-foot measuring tape.**

- How do your estimates compare to your actual measurements?
- Which measuring tool (the 10 ft tape or 100 ft tape) resulted in more accurate measurements? Why do you think that is?

Reflecting on our Findings (Comparing Measurements)

Look at what you wrote on Worksheet 4.

- How do your estimates compare to your actual measurements?
- Which measuring tool (the 10 ft tape or 100 ft tape) resulted in more accurate measurements? Why do you think that is?

Baseball Field Geometry

Worksheet 4 - Measuring & Recording Distance

Directions: Work with your group to measure infield distances on the baseball field.

1. Estimate each distance and record your estimate.
2. Measure the distance using a 10-foot measuring tape, as accurately as possible.
3. Measure the distance again, using a 100-foot measuring tape.
4. Record your measurements in the table below.
5. Follow facilitator's instructions for what to do when you are done!

	Estimate of Distance in feet	Measured distance with 10ft tape (in feet)	Measured distance with 100ft tape (in feet)
Home plate to first base			
Home plate to second base			
Home plate to third base			
Home plate to pitcher's mound			
Other:			

Baseball Field Geometry Youth Slides, Slide 19

Whole Group Discussion: Field Distances at Different Ballparks

Share Youth Slide 18 showing outfield distances at different ballparks.

Ask youth to share what they notice and wonder about the differences in the distances (left field, center field, right field) at different ballparks.

- Are they all the same?
- What differences do you notice?
- How do you think these distances impact baseball players?

Activity 2 - Part 2: Growth Mindset

What do you notice about the OUTFIELD DISTANCES (left field, center field, right field) at different ballparks?

- Are they all the same?
- What differences do you notice?
- How do you think these distances impact baseball players?



Ballpark Name	Left Field (feet)	Center Field (feet)	Right Field (feet)
Chase Field	335	407	335
Wrigley Field	355	390	355
Fenway Park	310	390	302
Yankee Stadium	318	408	314
Oracle Park	365	410	335
Petco Park	334	396	322

Baseball Field Geometry Youth Slide 20

Share images of different ballparks and discuss how baseball players have to adjust.

Every time they go to a different ballpark, the field distances are different and they have to adjust. If they want to hit a home run they have to think about the best place to hit the ball.



Every time players go to a different ballpark, the field distances are different and they have to adjust.

If they want to hit a home run they have to think about the best place to hit the ball.



Baseball Field Geometry Youth Slide 21

Activity 2 - Comparing Distances at Different Ballparks (5 of 5)

Whole Group Video and Discussion: Our Brains Adapt to Learn New Things!

Show youth one of the following videos about neuroplasticity and how our brains adapt to learn new things.

VIDEO 1:
<https://www.youtube.com/watch?v=g7FdMi03CzI&list=PLcfBCltNc-Xzr5VaM0KBMbkBnvgY2Zm&index=3>

VIDEO 2:
<https://www.youtube.com/watch?v=88OL8NdkV-s>

How do you adapt to different or new situations?



Are you learning something new in school or outside of school?

Did you know? Your brain is always changing to help you learn new things!

[Video about how our brains adapt when we learn new things](#)

OR
[Neuroplasticity and learning explained](#)

Activity 2

Baseball Field Geometry Youth Slides, Slide 22

Ask youth to think of a situation in their own life that is making their brains grow. Provide individual think time for youth to reflect on the following:

- A time when you had to adapt to a new situation or a new place
- A time you had to learn something new related to a hobby, in school, in sports or in another activity

Ask youth to turn and talk to a partner about their “adapting” or “new learning” situation. Youth should discuss what was happening in their brains as they learned new things.

CLOSURE Reflection:

Wrap up the activity with a discussion of driving questions for the lesson.

- What do you do when you are trying to learn something new?
- What helps you grow your brain?

Ask youth to stand up and find a partner, and share their ideas.



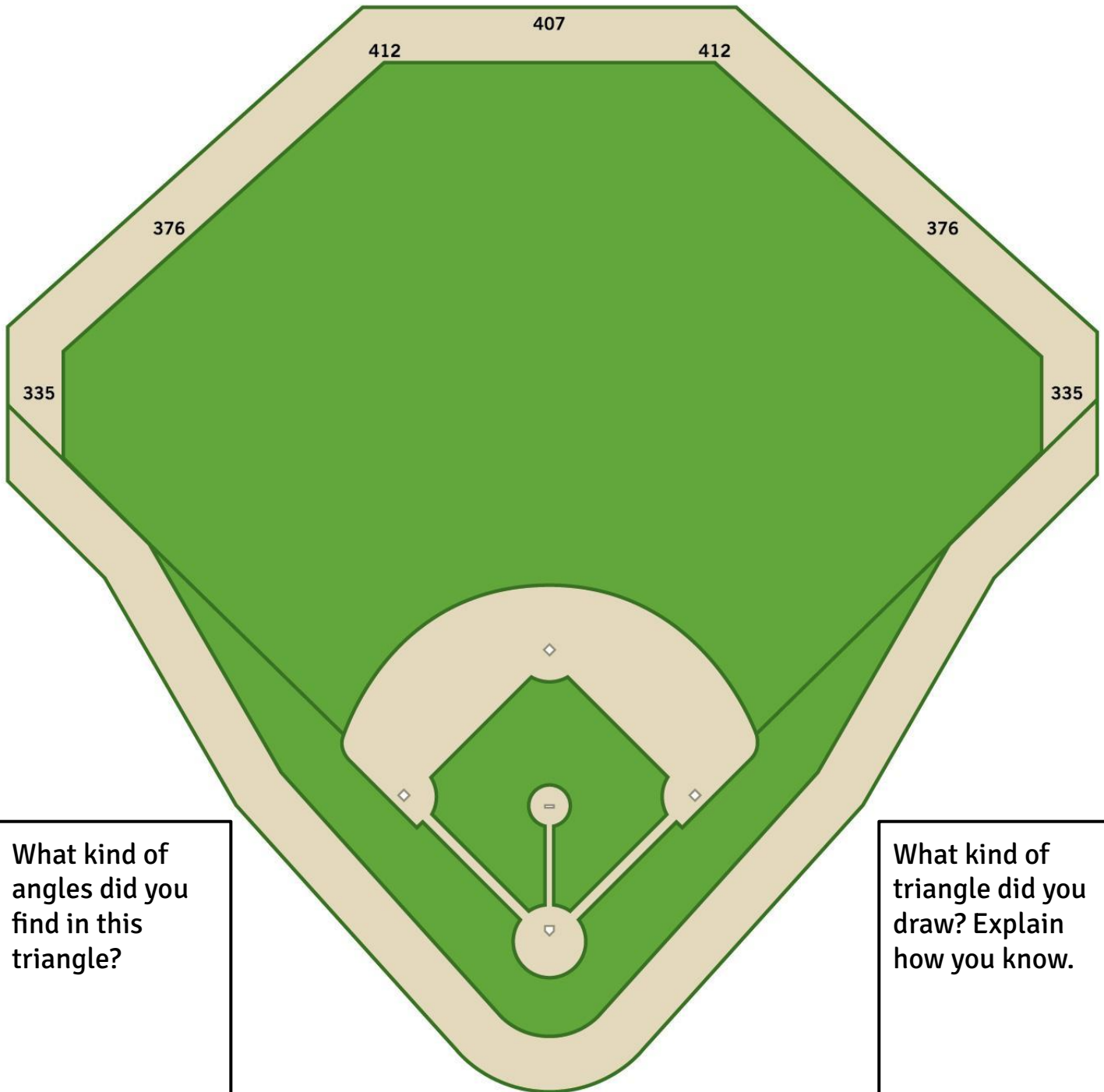
- What do you do when you are trying to learn something new?
- What helps you grow your brain?
- Share your ideas with a partner.

Activity 2

Baseball Field Geometry Youth Slides, Slide 23

Worksheet 1 - Angles and Shapes on the Baseball Field Scenario 1

Scenario #1 The second baseman is standing on second base with the ball, then throws it to the player standing on third base. The third baseman throws it to the player standing on first base and the first baseman throws it back to second base. Create a triangle on the field from the information.

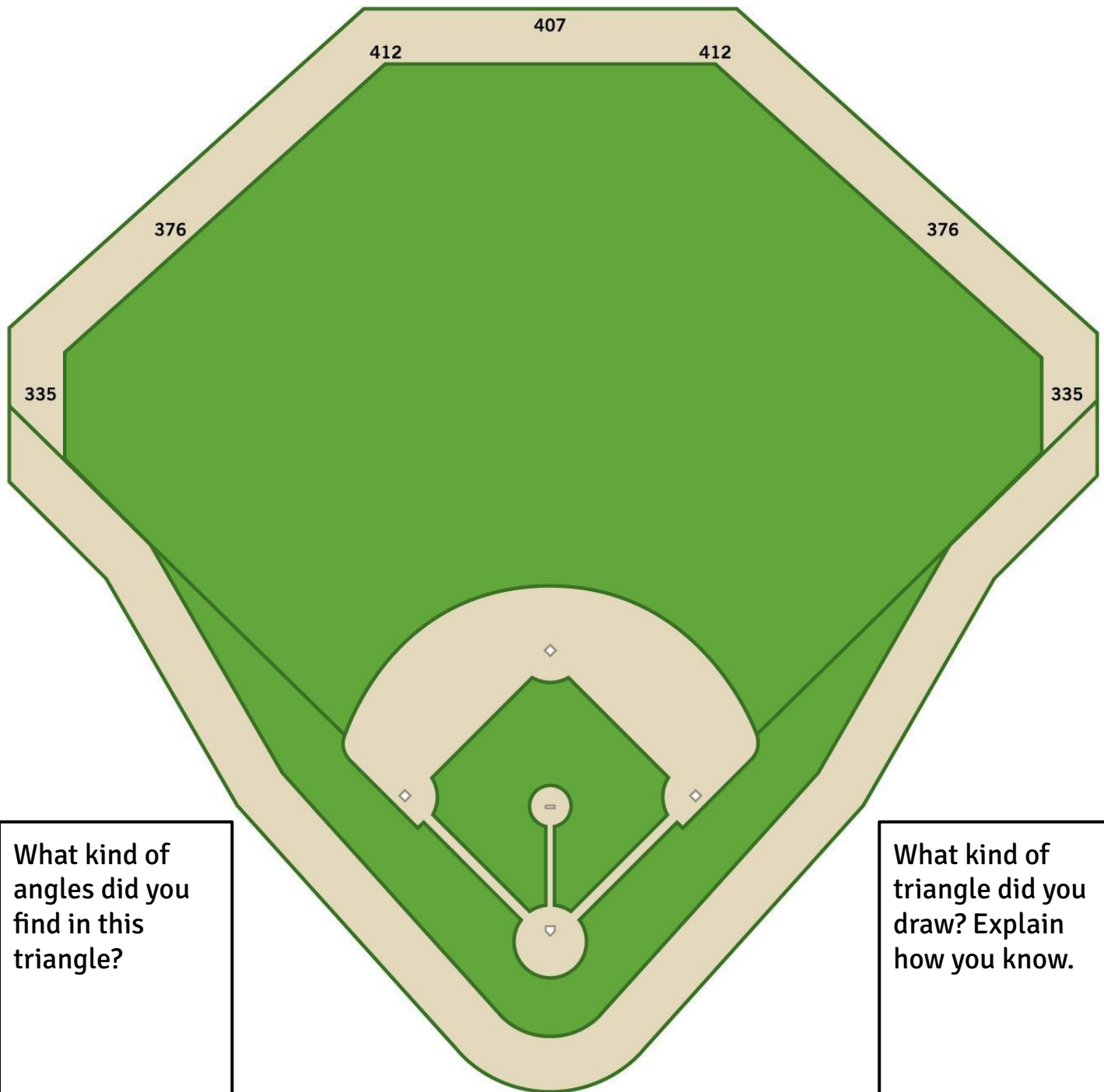


What kind of angles did you find in this triangle?

What kind of triangle did you draw? Explain how you know.

Worksheet 2 - Angles and Shapes on the Baseball Field Scenario 2

Scenario #2 Pitcher has the ball then throws it to the player standing on third base, who throws it to the catcher at home plate. The catcher then throws the ball back to the pitcher. Create a triangle on the field from the information.

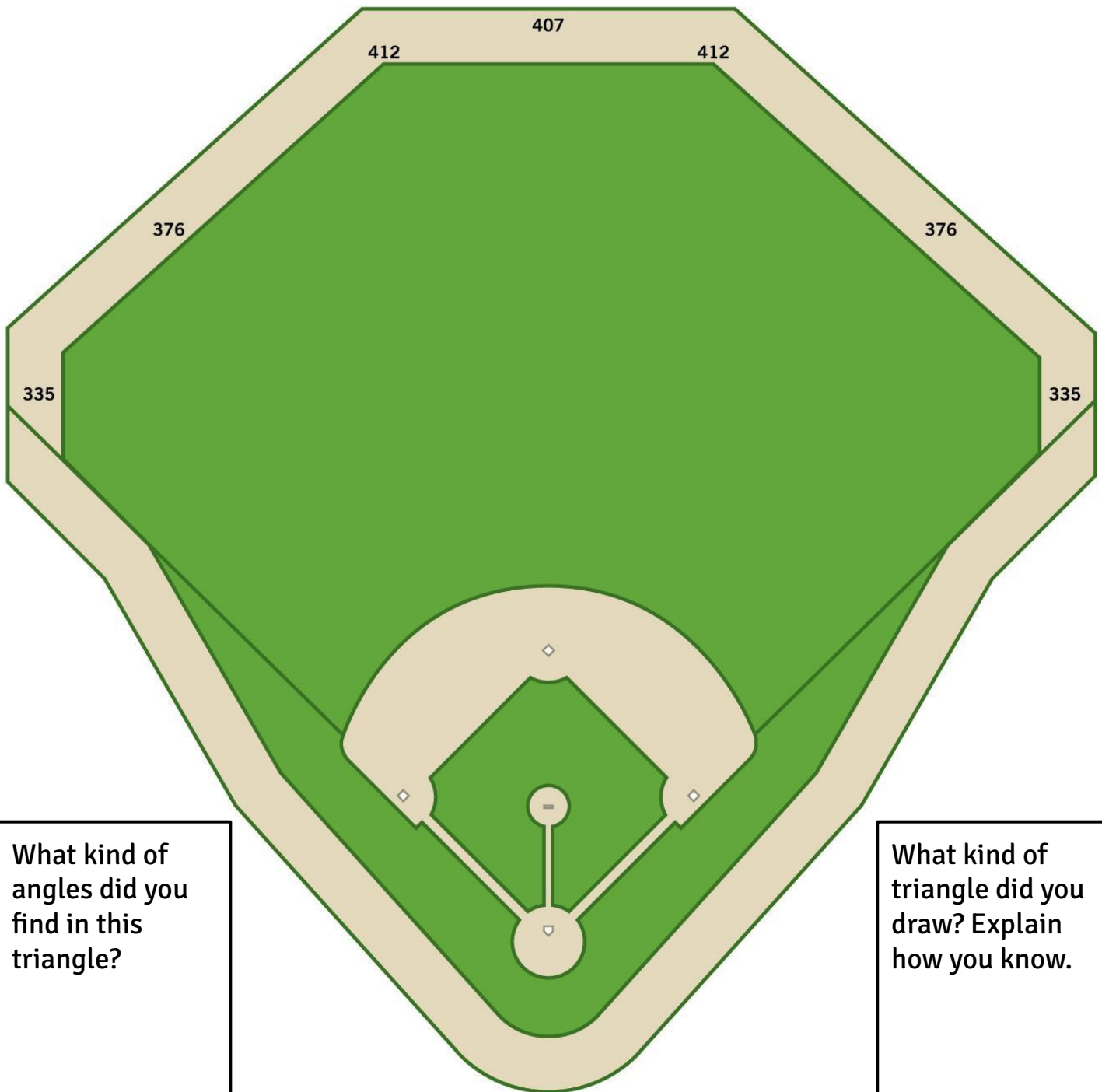


What kind of angles did you find in this triangle?

What kind of triangle did you draw? Explain how you know.

Worksheet 3 - Angles and Shapes on the Baseball Field Scenario 3

Scenario #3 The pitcher pitches to the batter. The batter hits the ball towards right field. The right fielder catches the ball and throws it back to the pitcher. Create a triangle on the field from the information.



What kind of angles did you find in this triangle?

What kind of triangle did you draw? Explain how you know.

Worksheet 4 - Measuring & Recording Distance

Directions: Work with your group to measure infield distances on the baseball field.

1. Estimate each distance and record your estimate.
2. Measure the distance using a 10-foot measuring tape, as accurately as possible.
3. Measure the distance again, using a 100-foot measuring tape.
4. Record your measurements in the table below.
5. Follow facilitator's instructions for what to do when you are done!

	Estimate of Distance in feet	Measured distance with 10ft tape (in feet) 	Measured distance with 100ft tape (in feet) 
Home plate to first base			
Home plate to second base			
Home plate to third base			
Home plate to pitcher's mound			
Other:			