7th - 8th GRADE LESSON PLAN *WE'RE TALKIN' BASEBALL!*

120 MINS

Google

WE'RE TALKIN' BASEBALL!

OVERVIEW: The most exciting part of a baseball game is watching a hard hit ball leave the ballpark! Students will use Google Earth and geometry concepts to explore how far baseball players need to hit the ball to hit a home run in different baseball Major League Baseball Stadiums.

SUBJECT/TOPIC:
Math/Geometry

GRADE LEVEL:
7th-8th Grade

LEARNING OBJECTIVES:

- Students will apply geometry concepts to solve real world problems.
- Students will formulate an argument and support it with multiple pieces of evidence.

MATERIALS NEEDED:

- Student access to Google Earth.
- Student copies of the We're Talkin' Baseball Student Template.

LESSON SUMMARY:

- **Engage:** Watch the YouTube.com video: Longest Home Runs Ever.
- **Explore**: Use the Google Earth Measure Tool to compare distances of different baseball stadiums.
- **Explain**: Calculate the distance needed to hit a home run to different locations within Fenway Park and one other baseball stadium.
- **Apply**: Use stadium data to formulate an argument in response to a real world scenario.

SUSTAINABLE DEVELOPMENT GOALS:

CULMINATING TASK/ASSESSMENT:

- Students will formulate and argument in response to the following prompt:

  Use data collected showing minimum distance needed to hit a home run at various baseball stadiums to make a prediction about which baseball stadium will have the highest number of home runs hit next season. Use specific evidence to support your answer.

SUGGESTED STANDARDS
GRADES 7th - 8th

Common Core State Standards:

CCSS.MATH.CONTENT.7.G.A.1- Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.

CCSS.MATH.CONTENT.7.G.B.6- Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.

CCSS.MATH.CONTENT.8.G.B.6- Explain a proof of the Pythagorean Theorem and its converse.

CCSS.MATH.CONTENT.8.G.B.7- Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.

CCSS.MATH.CONTENT.8.G.B.8- Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.

LESSON PLAN

ENGAGE (10 minutes)

1. Activate prior knowledge with the YouTube.com video, Longest Home Runs Ever.

2. Those are some examples of the longest home runs ever hit! Today we are going to use Google Earth to visit several baseball stadiums and use geometry concepts to calculate the shortest or minimum distance a player needs to hit the ball to hit a home run.

EXPLORE (30 minutes)

1. Provide student copies of the We're Talkin' Baseball Student Template. Introduce Google Earth and the Measure Tool. Have students search for and travel to Fenway Park. Model how to use the Measure Tool to measure the following aspects of the park:
   - Distance between the bases (home to first, first to second, etc.)
   - Distance from home plate to the outfield wall in various locations (left field, center field, right field)

2. Share the following link Clem's Baseball Blog- Stadium Statistics to find the outfield fence height in left, center and right field.

3. Have students use Google Earth to find a different baseball stadium of their choice. Examples include Wrigley Field, Yankee Stadium, Coors Field, AT&T Park, PNC Park, Safeco Field, etc.

4. Students will then use the Measure Tool in Google Earth to measure the same aspects of the selected park.
   - Distance between the bases (home to first, first to second, etc.)
   - Distance from home plate to the outfield wall in various locations (left field, center field, right field)
   - Outfield fence height (left, center, right field) using Clem's Baseball Blog- Stadium Statistics.

5. Organize students into partners or small groups. Have students compare the measurements of the park they researched to those of their classmates. What are the differences between them? Discuss which parks would be best or worst for hitting a home run.

LESSON PLAN CONTINUED

EXPLAIN
(40 minutes)

1. How can we use the information gathered about Fenway Park to calculate the minimum launch angle needed to hit a home run? What information do we have that will help us solve for an unknown launch angle?

2. Return students to the We're Talkin' Baseball Student Template. Allow time for students to fill in the information that is already known in the "Explain" section for Fenway Park.

3. Prompt students to draw a model of the problem as a right triangle with points at home plate, the base of the outfield fence and the top of the outfield fence, including all known measurements of sides and angles. Ask students to interpret what measure the hypotenuse represents in this scenario (the minimum distance the ball will need to travel to be a home run).

4. Prompt students to solve for the hypotenuse in each scenario using the Pythagorean Theorem ($a^2 + b^2 = c^2$).

5. Discuss the following questions:
   - How do changes in outfield fence height affect the minimum distance needed to hit a home run?
   - What direction should a player aim to hit the ball to increase their chances of hitting a home run at Fenway?

6. Students work independently to calculate the minimum home run distances for the stadium of their choice.

7. Students report their findings. Chart distances needed to hit a home run to each of the stadiums reported on.

8. Allow time for students to share their observations and questions with the class.

APPLY
(40 minutes)

1. Using the charted information of minimum distances needed to hit a home run at various baseball stadiums, students will respond to the following question:

   Use data collected showing minimum distance needed to hit a home run at various baseball stadiums to make a prediction about which baseball stadium will have the highest number of home run hits next season. Use specific evidence to support your answer.

2. Allow time for students to share their answers with the class.

EVALUATE: CULMINATING TASK RUBRIC

	Exceeding	Meeting	Approaching	Beginning
Claim & Evidence	Student provides a clearly stated claim predicting one baseball stadium will have the most home run hits next season. Claim is supported by several pieces of specific evidence. Student is able to explain how each piece of evidence supports their claim and strengthens their argument. Student acknowledges the counterclaim and refutes it.	Student provides a clearly stated claim predicting one baseball stadium will have the most home run hits next season. Claim is supported by 1-2 pieces of relevant evidence. Student is able to explain how each piece of evidence supports their claim and strengthens their argument. Student acknowledges the counterclaim and refutes it.	Student provides a claim predicting one baseball stadium will have the most home run hits next season. Claim is supported by 1 piece of relevant evidence. Student **does not** adequately explain how their piece of evidence supports their claim and strengthens their argument. Student acknowledges the counterclaim but does not refute it.	Student provides a claim predicting one baseball stadium will have the most home runs hit next season. Evidence is either absent or does not support the student's claim. Student does not acknowledge the counterclaim.
Calculations	Student calculations demonstrate mastery of procedures, are complete, error free and clearly show how they arrived at their conclusion.	Student calculations are adequately complete, error free and show how they arrived at their conclusion.	Student calculations are partially complete or have 1-2 errors.	Student calculations are missing or have multiple errors.

RESOURCES

ADDITIONAL RESOURCES:	• Related Google Earth Voyager Stories:
	  • International Cricket Grounds
	  • Where Champions Are Made
	  • Historic Tennis Stadiums
	
	• Related Articles:
	  • Washington Post- These Days in Baseball, Every Batter is Trying to Find an Angle
	  • Washington Post- The Physics Behind Hitting a Home Run
	  • Bardown.com- The Shortest Home Run of the Statcast Era Show How Unfair Baseball Can Be

OPTIONS FOR DIFFERENTIATION:	• Assign each student a baseball stadium to research. • Allow students to work in partners or small groups.
CREDITS:	Lesson by Jesse Lubinsky, Andrew McDonald, Jeffery Heil and David Saunders in collaboration with Sarah Schwartz Johnson