<u>**WAMC Lab Template**</u>

Math Concept(s): Applying Pythagorean Theorem to Find Distance Between Two Points
Source / Text: Yummy Math – Benjamin Watson Saves
https://www.youtube.com/watch?v=XsZCTzYNBQE&pp=ygUTd2F0c29uIGludGVyY2VwdGlvbg%3D%3D
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<u>**Attach the following documents:**</u>
- Lab Instructions
- Student Handout(s)
- Rubric and/or Assessment Tool

<u>**Short Description (Be sure to include where in your instruction this lab takes place):**</u>
- This is a lab to apply Pythagorean Theorem to finding distance between two points. This lab will take place after students have learned about Pythagorean Theorem.

<u>**Lab Plan**</u>
Lab Title: Applying the Pythagorean Theorem in a Real-World Problem

Prerequisite skills: The student should have an understanding of the Pythagorean Theorem and how to use it to find the hypotenuse of a right triangle.

Lab objective: In this lab students will use the Pythagorean Theorem to find the distance a football player runs on a football field.

<u>**Standards:**</u> *(Note SPECIFIC relationship to Science, Technology, and/or Engineering)*
Mathematics K–12 Learning Standards:
- 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.

Standards for Mathematical Practice:
- MP 1: Make sense of problems and persevere in solving them.
- MP 2: Reason abstractly and quantitatively.
- MP 4: Model with mathematics.
- MP 5: Use appropriate tools strategically.
- MP 6: Attend to precision.

K-12 Learning Standards-ELA (Reading, Writing, Speaking & Listening):
SL.8.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 8 topics, texts, and issues, building on others' ideas and expressing their own clearly.

SL.8.2 Analyze the purpose of information presented in diverse media and formats (e.g., visually, quantitatively, orally) and evaluate the motives (e.g., social, commercial, political) behind its presentation.

SL.8.3 Delineate a speaker's argument and specific claims, evaluating the soundness of the reasoning and relevance and sufficiency of the evidence and identifying when irrelevant evidence is introduced.

Engineering
- MS-ETS1-4
  Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

[Leadership/21st Century Skills](#):

21st Century Interdisciplinary themes (Check those that apply to the above activity.)
- ☐ Global Awareness
- ☐ Health/Safety Literacy
- ☐ Financial/Economic/Business/Entrepreneurial Literacy
- ☐ Environmental Literacy
- ☐ Civic Literacy

21st Century Skills (Check those that students will demonstrate in the above activity.)

LEARNING AND INNOVATION
Creativity and Innovation
- ☐ Think Creatively
- ☐ Work Creatively with Others
- ☐ Implement Innovations
Critical Thinking and Problem Solving
- ☒ Reason Effectively
- ☒ Use Systems Thinking
- ☒ Make Judgments and Decisions
- ☒ Solve Problems
Communication and Collaboration
- ☒ Communicate Clearly
- ☒ Collaborate with Others

INFORMATION, MEDIA & TECHNOLOGY SKILLS
Information Literacy
- ☐ Access and Evaluate Information
- ☐ Use and manage Information
Media Literacy
- ☐ Analyze Media
- ☐ Create Media Products
Information, Communications and Technology (ICT Literacy)
- ☐ Apply Technology Effectively

LIFE & CAREER SKILLS
Flexibility and Adaptability
- ☐ Adapt to Change
- ☐ Be Flexible
Initiative and Self-Direction
- ☐ Manage Goals and Time
- ☐ Work Independently
- ☐ Be Self-Directed Learners
Social and Cross-Cultural
- ☐ Interact Effectively with Others
- ☐ Work Effectively in Diverse Teams

Productivity and Accountability
- ☐ Manage Projects
- ☐ Produce Results
Leadership and Responsibility
- ☐ Guide and Lead Others
- ☐ Be Responsible to Others

Teacher Preparation: (What materials and set-up are required for this lab?)

Materials
- Video: Watson Saves - https://www.youtube.com/watch?v=XsZCTzYNBQE&pp=ygUTd2F0c29uIGludGVyY2VwdGlvbg%3D%3D

Set-Up Required:
- To do this lab effectively, you will need a way to show the video in class. You will also need access to the football field, cones (pre-line the cones, one at starting points – just behind end zone and one at the 10 yd line, and one at ending point – 1 yd line at opposite end of field). You also might want to place a few cones in between to help students run in a straight line. You also need a tape measure to measure the distance between the cones.

Lab Organization Strategies:

Leadership (Connect to 21st Century Skills selected):

- For this lab students will use Critical Thinking and Problem Solving to figure out the distance the runners ran.
- Students will also Collaborate and Communicate when discussing the process and how to measure the distance, as well as how you could apply Pythagorean theorem to their work.

Cooperative Learning:

- For this lab, students will all watch a video – 2005 Divisional playoff game: Benjamin Watson (football player for New England Patriots) chased after Champ Bailey (football player for Denver Broncos) and tracked him down before the end zone.
- After the video, the whole class will go outside to the football field where cones have been set up and they will model the football play. Each student will be responsible for observing, helping measure, and discussing the distance the football players ran. They will work together to figure out the distance between the points.

Expectations:

- My expectations for this lab are to show the student practical applications for using Pythagorean Theorem by finding the distance between points.
- **Formative Assessment**: While students are doing this lab, I will be walking around monitoring to check their progress and help answer questions they have.

Timeline:

- This lab will take approximately 50 minutes to complete.
- Follow-up discussion should happen the following day as needed.

Post Lab Follow-Up/Conclusions:

Discuss real world application of learning from lab

- Real world applications would be any field that requires employees to follow simple instructions, working with peers to solve a problem. This encompasses all categories of work.

Career Applications

- Any which require people to work together to solve problems and/or build a product.

Optional or Extension Activities

- This model can be modified for different lengths that the runners run to see at which points the runner will be caught.

Applying the Pythagorean Theorem in a Real-World Problem

Lab Instructions

Materials:

- Way to project video from youtube
- Access to football field
- Cones – (approx. 10-12 – 1 for each starting point and 1 at ending point, others to ensure students run in a fairly straight line)
- Measuring Tapes (2 or 3) – or some way to measure 100 yds.
- Flag football belts (2)

1. Teacher has set-up materials from the materials list above.
2. Students will watch the video – Benjamin Watson Saves
3. Teacher will present the set-up of this problem that is modeled outside.
4. Teacher and whole class will go outside to the football field.
5. Students will decide how to find the distance between points.
6. Two students will be chosen to be the runners to model the situation. Might want the two students to wear Flag football belts so as not to tackle each other.
7. Students discuss how Pythagorean Theorem can be used in this situation.
8. If time allows, students will return to the classroom and be give the worksheet Lab #2 Watson Saves. This will then lead into discussion the following day with students completing the worksheet in pairs.

Watson Saves

During the 2005 Divisional Playoff game between The Denver Broncos and The New England Patriots, Bronco's Champ Bailey intercepted Tom Brady's pass around the goal line (see the circled B). He ran the ball about 100 yards, along the sideline, roughly in a straight line almost all the way to the other goal line. Ben Watson of the New England Patriots (see the circled W) chased after Champ and tracked him down just before the other goal line.

Benjamin Watson

Champ Bailey

53 1/3 yards

PATRIOTS

BRONCOS

1 yd

Benjamin Watson (W)   Champ Bailey (B)
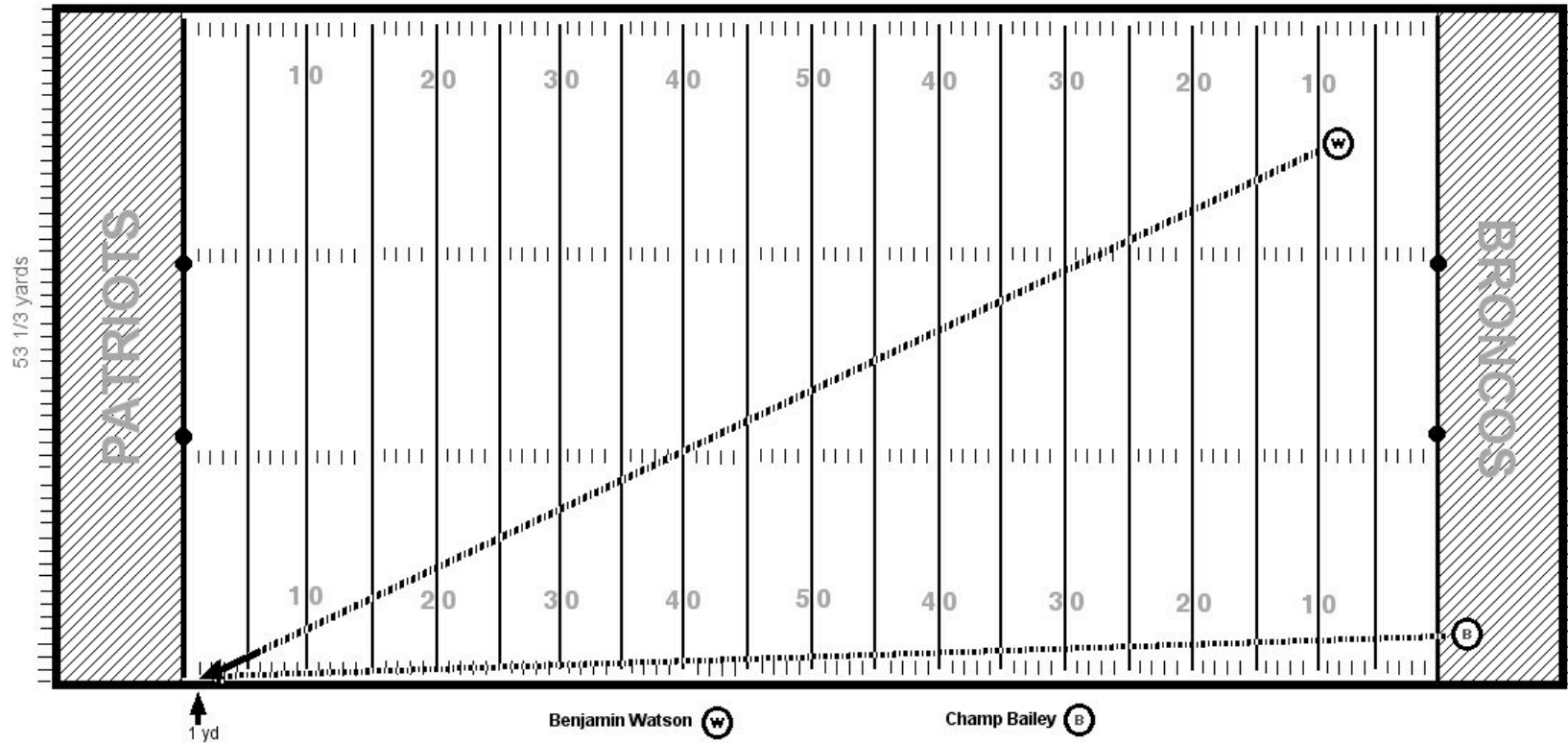
1. How can you use the diagram and the Pythagorean Theorem to find approximately how many yards Ben Watson ran to track down Champ Bailey?

2. Use the Pythagorean theorem to find approximately how many yards Watson ran in this play.

3. Which player ran further during this play? By approximately how many more yards?