Pythagorean Theorem & Kites

Total Number of Lessons: [3-4]
Total Estimated Time for Module: [6 hours]

Section 1: Module Overview and Curricular Connections – Required

- **Module goal**: [At the end of this module, SWBAT apply what they've learned about the pythagorean theorem and graphing translations to make a kite, test its flight success, and present their results to their peers.]

- **Connection to standards**:
  - 8.GM.1 Explore dilations, translations, rotations, and reflections on two-dimensional figures in the coordinate plane.
  - (E) 8.GM.2 Solve real-world and other mathematical problems involving volume of cones, spheres, and pyramids and surface area of spheres.
  - (E) 8.GM.3 Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and other mathematical problems in two dimensions. (E)
  - 6-8.DI.4: Create visuals such as flowcharts, diagrams, and pseudocode to represent complex problems as algorithms. (E)

- **RET materials/ideas to be leveraged**: [I plan on using ChatGPT to create extra practice problems for when I introduce the Pythagorean Theorem to my students. Using ChatGPT, I can quickly generate LaTeX code for extra practice problems that will allow me to differentiate my lessons. I'll input that LaTeX code into Overleaf to create the student and teacher version of the newly generated practice.
- I also plan to do a mini lesson on appropriate usage of AI for my students prior to their work on their presentation.]

Section 2: Overview of Module Framework – Required

- **Real-world context**: [Describe in 1-2 paragraphs]

  - **Possible Lesson Ideas**: [I would like to facilitate a project that allows to students to use their knowledge of the pythagorean theorem to design and build a kite. After testing their completed kite, they will use their measurements to graph how high their kite flew and the angle at which the kite flew during their test. They will then use their data and their visual representation of their data to share their findings with their peers.
  - Improve upon the cheapest amazon kit
  - competition between groups - as if they had to present that to manufacturer]

- **<u>Background STEM content</u>**: [Describe in 1-2 paragraphs]
    - **Possible Lesson Ideas**: [
        - I will be teaching the Pythagorean Theorem to my students in advance. I will also be teaching an entire on unit on graphing transformations. Both of these concepts will be spiral reviewed even after they are formally assessed in order to reinforce these topics and ensure student mastery. Students will also have practice using their technology, sharing their work, and explaining their thinking throughout the year.
        - For their visual representation of their data, I would like to students to practice using AI appropriately. They will practice asking AI the right kind of questions to yield an accurate visual, graph, image, etc. Students will ONLY be able to use AI for their digital presentations. Their computing & use of the pythagorean theorem will need to be done manually to show mastery. Students will also be required to "check" the work of the AI responses. They'll need to do this to ensure and accurate representation of data. Students will be receiving a mini lesson (approx. 10 min) on appropriate use of AI to prepare them and set the expectation of how they are expected to utilize this tool. I plan on having them use ChatGPT.]

- **<u>Description of Main Activity/Project</u>**: [Describe in 1-3 paragraphs]
    - **Possible Activity/Project Ideas**: [
        - This will be a partner project (maybe 3 per team at most). Students will be designing and building a kite out of basic materials (either a kite kit I purchase w/ my RET funds or just regular things like cardboard, glue, dowel rods, etc.) using the pythagorean theorem and their knowledge of the laws of right triangles. The object of this project is for students to participate in the real world application of some skills they have learned in my math class. I would like for them to be able to make all measurements on their own & with very minimal "given" information.
        - Once they have constructed their kite, we will test it outside. Students will have to measure the exact length of their kite string, how high off the ground they are holding the handle, and then use those measurements & the pythagorean theorem to calculate how high their kite can fly in the sky.

They will also have to calculate the angle at which their kite flew, taking into account that they are holding the handle & it's not on the ground.

- After the flight tests and calculations, each group will compile their design process, struggles they had to overcome, and create visual representations of their data to present to the class. Part of their visual data will include graphing where their kite started (in their hands) and show through a translation where their kite ended up (at it's peak height in the sky. This graph should also include labels that show the height of the kite once it reached its peak in the sky, the angle at which the kite flew, and the length of the kite string. Again, these will be calculated through the student's use of the pythagorean theorem and application of the rules of right triangles. Students may us AI to help them create a visual for their presentation. They must check the accuracy of the image, graph, visual that is generated by the AI program to ensure they presenting quality information that correctly represents their numbers.
    - Students will submit a photo of their kite at it's highest point to AI and ask the following questions to test its accuracy
        1. How many feet off the ground is the kite in this image?
        2. The person holding the kite is _'_" tall, how many feet off the ground is the kite in this image?
        3. The person holding the kite is _'_" tall and the length of the string holding the kite is ___ feet long, how many feet off the ground is the kite in this image?]
    - Students will share their AI results in their final presentations

Section 3: Module Sequencing and Assessment – Required

- **Brief description of sequenced learning objectives**: [How do learning objectives build from lesson to lesson to meet the module goal?
    - The students first goal is to become confident in their ability to calculate the sides of a right triangle using the pythagorean theorem.
    - For the second leg of this module, students will need to show mastery in graphing transformations, specifically translations & rotations of polygons.
    - Lastly, the students will need to apply both mastered skills in a real world context by designing, building, testing and presenting their kites while appropriately using an AI tool.]

- **Brief description of formative and summative assessment approaches**: [When/what techniques will you use to assess student progress towards objectives during and at the end of the module?

- Formative - I will be constantly monitoring student progress informally by walking around the room during work time, being available for questions, ideas, and guidance.
- Summative - Students will have hard and fast check points that they will have to complete throughout the duration of this module. They will receive a grade for each checkpoint. Their final assessment will be their peer share presentation during which they will share the key points and major data with their classmates.
    - **Checkpoint #1: Measurements check** - students will have to check all of their kite measurements with me before cutting & assembling their kite.
    - **Checkpoint #2: Completed assembly of kite** - students will have to get their final kite draft checked by me. It must include labeled measurements & angles on the "underneath" side of their kite. Students will also have to measure out the length of their kite string prior to flight testing.
    - **Checkpoint #3: Successful flight test & data collection:** students will have to measure & calculate height and the angle at which the kite flies in the air.
    - **Peer Share Presentation:** students will be graded on their appropriate use of AI to help create their visual, the accuracy of their graph, and the quality of their presentation to their peers.]

- **Recommendations for implementation**: [Students will be given instructions about appropriate use of basic materials (cutting tools, hot glue, etc). Students will also receive a brief mini lesson of appropriate AI use prior to using it to generate a helpful image that represents their data correctly..]

Section 4: Module Files – Optional

- **List of attached files**: [should include any lesson plans and handouts relevant to the Module, if you have them ready]
    - [File name 1 and one line description]
    - [File name 2 and one line description]
    - [File name 3 and one line description]
    - [File name 4 and one line description]
    - [File name 5 and one line description]