Subject/Grade: Math 8 **Lesson Title:** An Introduction to Pythagorean Theorem **Teacher:** Chandra Wassill

Stage 1: Identify Desired Results

Established Goals: (Learning outcome/s & indicator/s from curriculum)

SS8.1 Demonstrate understanding of the Pythagorean Theorem concretely or pictorially and symbolically and by solving problems.

a. Generalize the results of an investigation of the expression $a^2+b^2=c^2$ (where a, b, and c are the lengths of the sides of a right triangle, c being the longest)

Note: This is the introduction of the relationship described by the Pythagorean Theorem, the expression will not yet be introduced

Understandings: (can also be written as 'I Can' statements) U
Students will understand…

I can understand the relationship described by the Pythagorean Theorem
I can solve problems about the Pythagorean Theorem

Essential Questions:

What is the relationship between the areas of squares formed off the 3 sides of a right triangle?

Students will know… K

Pythagorean Theorem, right triangle properties

Students will be able to…

Investigate the relationship described by the Pythagorean Theorem and generalize their findings
Demonstrate their understanding through solving problems

Stage 2: Determine Evidence for Assessing Learning

<u>Formative assessment throughout the lesson:</u>
Students can show an understanding of the relationship through class investigation and discussion.
Students will solve problems independently.

Stage 3: Build Learning Plan

Instructional Strategies:

Inquiry, whole-class discussion, independent problem solving

Set (Engagement): Concept Check In **Length of Time: 5 mins**

Plan:
Review how side length and area of a square relate (area = side length^2, side length = $\sqrt{}$area). Review properties of a right angle triangle (2 legs, hypotenuse across from right angle)

(slide 1 & 2)

Instructions:
If we know the side length of a square is 3, how can we find the area? How can we generalize this? (area = side length^2)

If we know the area of a square is 25, how can we find the side length? How can we generalize this? (side length = $\sqrt{}$area)

A right triangle is a triangle with a 90 degree angle. We can think of this like a corner. The side across from this 90 degree angle is the hypotenuse. The other sides are called legs.
On this right angle, is side 1, 2, or 3 the hypotenuse?

Development: Investigation **Time: 30 mins**

Plan:
Use floor tiles and tape to investigate the relationship between right triangles and squares. During investigation we have discussion about what we notice is happening. Guide the discussion to show that the area of leg 1 + the area of leg 2 = the area of the hypotenuse and to describe the relationship in terms of side length and area. Explore how this helps us find the side length, and what we could do if we knew the hypotenuse and one side leg, but not the other.

Provide textbook problems for students to solve independently page 34 3a, 4a, 5a, 6a

Instructions:
There is a relationship we can use to find one of the side lengths of a right triangle when we know the other 2 side lengths. This relationship is called the Pythagorean Theorem. We are going to work together to discover this relationship the same way legend says Pythagoras did.

We will start by using tape to make a right triangle in one tile. The legs will measure 1 tile each. Record side lengths on the tape.
Do we know what the length of the hypontantus is?

Materials/Resources:

Masking tape
Maker
Whiteboard
Math Makes Sense 8 Textbook
Exit slip
Aligned square tiles (if not available, use checker boards, graph paper, projection of tiles etc)

Possible Adaptations/ Differentiation:

Some students may not be able to work on the floor, projection of grid may also be used instead

Management Strategies:

Monitoring class discussion and keeping it focused by recentering
Ensure students know what to do do when they are complete their work so they stay on task and do not distract others

Safety Considerations:

Ensure there is enough space for students to safely gather while working on the floor

What do we notice about how it interacts with the other tiles?
Are there any shapes connected to the triangle? (Guide to making squares of each side with the tape).
What is the area of each square (record on tape)?
Now can we find the length of the hypotenuse?
What did we notice?

Repeat with a right triangle with legs measuring one 1 tile by 2 tiles

Finally, repeat with a triangle with dimensions of students choosing (between 1-4 tiles for space reasons)

Discuss:
Did we see a pattern? What generalizations could we make? (Guide to Area of leg 1 + area of leg 2 = area of hypotenuse).
How does this help us find the side length?
What could we do if we knew the hypotenuse and one side leg, but not the other?

During discussion note key findings on the board.

Once there is an understanding of the relationship, give textbook questions 3a, 4a, 5a, 6a on page 34 for independent work

Closure: Predicting what comes next **Time: 2 mins**

Instructions: Once students complete independent work (or a couple minutes remain in lesson time, whichever comes first) have them fill out an exit form where they will create a formula to generalize what they learned.

Stage 4: Reflection

-Went well, felt good about it, my timing was good, liked having the model on the floor to refer to when helping with questions
-How could I help solve the questions without I do-we do-you do (what alternatives can I use?)

- This lesson really engaged C***** right away
- Many students were engaged, especially since it visualized and explained the relations, not just having students "do it"

- Need to consider how this lesson could work for a class larger than 8