

# Lesson Plan: Pythagorean Theorem

**Florida Benchmark:** MA.8.GR.1.3 – Use the Pythagorean Theorem to determine if a triangle is a right triangle

**NGSS Standard:** MS-ETS1-4 – Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process.

**Grade Level:** 8th Grade

**Subject:** STEM / Science Integration (Math + Physics Applications)

**Date:** Week of Instruction (5 consecutive days)

**Duration:** 45–50 minutes each day

**Lesson Focus:** Understanding, applying, and connecting the Pythagorean Theorem to mathematics, science, and real-world contexts.

**Materials:** PowerPoint slides, whiteboard, markers, projector, rulers, protractors, calculators, triangle cutouts, string, meter sticks, tape, task cards, science-based word problems.

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## Day 1 – Introduction to the Pythagorean Theorem

### Lesson Objectives:

- Students will understand the formula  $a^2+b^2=c^2$ .
- Students will identify the hypotenuse and recognize the right triangles.

### Procedures:

1. **Introduction (PowerPoint / Board Presentation):**
  - Slide 1: Benchmark & Objective.
  - Slide 2: Review of square roots.
  - Slide 3: Formula of the Pythagorean Theorem.
  - Teacher models guided examples: (3,4,5), (5,12,13), (7,24,25).
2. **Experiment / Activity:**
  - Rally Coach with triangle sets (9,40,41; 5,6,7; 20,21,29).
  - Students coach each other on whether triangles satisfy the theorem.
3. **Observation:**
  - Students compare results and identify hypotenuse patterns.
4. **Generalization:**
  - Teacher highlights that the theorem proves if a triangle is right.
5. **Assessment:**

- Exit ticket: 6 word problems (2 easy, 2 average, 2 challenging, one science-based).
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## Day 2 – Identifying Right and Non-Right Triangles

### Lesson Objectives:

- Students will classify triangles as right or not using side lengths.

### Procedures:

1. **Introduction (PowerPoint / Board Presentation):**
    - Slide 1: Recap formula.
    - Slide 2: Compare right vs non-right triangles.
    - Teacher-led guided examples: (5,6,7) not right, (12,35,37) right.
  2. **Experiment / Activity:**
    - Quiz-Quiz-Trade with triangle cards (12,35,37; 14,48,50; 5,5,8; 8,20,21).
  3. **Observation:**
    - Students justify why the hypotenuse must be the longest side.
  4. **Generalization:**
    - Link to science: forces along ramps, diagonals in structures.
  5. **Assessment:**
    - Exit ticket: 6 problems (mix of right and non-right, science-based).
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## Day 3 – Solving for Missing Sides

### Lesson Objectives:

- Students will apply the theorem to solve the missing sides in triangles.

### Procedures:

1. **Introduction (PowerPoint / Board Presentation):**
  - Slide 1: Missing hypotenuse:  $c = \sqrt{a^2 + b^2}$ .
  - Slide 2: Missing leg:  $b = \sqrt{c^2 - a^2}$ .
  - Teacher demonstrates with examples (6,8,?) and (5,?,13).
2. **Experiment / Activity:**
  - Rally Coach: Students solve guided examples in pairs.
3. **Observation:**

- Compare results and check with calculators.
  - 4. **Generalization:**
    - Connection to measurement in science experiments (e.g., ladder height, ramp length).
  - 5. **Assessment:**
    - Exit ticket: 2–3 missing side problems, including real-world examples.
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## Day 4 – Real-Life Applications of the Theorem

### Lesson Objectives:

- Students will apply the theorem to real-world situations.

### Procedures:

1. **Introduction (PowerPoint / Board Presentation):**
    - Slide 1: Real-life triangle problems (ladder, TV diagonal, baseball diamond).
    - Teacher models one example step-by-step.
  2. **Experiment / Activity:**
    - Team Jigsaw: Groups solve different real-world problems (each student responsible for a step).
  3. **Observation:**
    - Students compare solution methods across groups.
  4. **Generalization:**
    - Link to ramps, motion, engineering, and architecture.
  5. **Assessment:**
    - Exit ticket: 2 real-life problems (1 easy, 1 challenging) with reflection on science connection.
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## Day 5 – Hands-On Mini Project

### Lesson Objectives:

- Students will demonstrate mastery of the theorem through hands-on measurement and verification.

### Procedures:

1. **Introduction (PowerPoint / Board Presentation):**
  - Slide 1: Review key steps of the theorem.

- Slide 2: Project instructions.
  - 2. **Experiment / Activity:**
    - Students construct the right triangles using meter sticks, tape, and string OR measure classroom items (desks, boards, tiles).
    - Verify with theorem:  $a^2+b^2=c^2$ .
  - 3. **Observation:**
    - Students record results and check accuracy.
  - 4. **Generalization:**
    - Discuss how this applies to engineering, ramps, and science labs.
  - 5. **Assessment:**
    - Students present findings and reflect on real-world applications.
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### Note 1: Safety

Students should handle rulers, protractors, and other measuring tools with care during activities and projects. Clear walking paths should be maintained during measurements to prevent trips or accidents, especially when using string or meter sticks across the classroom. Teacher supervision ensures tools are used responsibly.

### Note 2: Accommodations

- **ELL:** Provide sentence frames (“Since  $a^2+b^2=c^2$ , the triangle is \_\_\_\_.”). Use visual aids and diagrams in slides.
- **ESE/504:** Allow calculators, give step-by-step templates, highlight hypotenuse on diagrams, provide extra time.
- **Advanced Learners:** Extend to 3D Pythagorean applications, design custom word problems, or act as peer coaches.