Unit 07: Right Triangles

Content Area: **Mathematics**
Course(s): **Mathematics**
Time Period: **Week 17**
Length: **3 Weeks**
Status: **Published**

Unit Overview

During this unit, students will work with right triangles and apply right triangle properties to solve problems. Although introduced in previous courses, students will revisit the Pythagorean Theorem in a rigorous manner to introduce the 45–45–90 and 30–60–90 relationships in right triangles. Similarity in terms of right triangles and the famous corollaries will be investigated. Trigonometry will be introduced and used to solve problems that contain figures that are not special right triangles. These right triangle problem-solving techniques will be used to solve problems involving squares, equilateral triangles, rectangles, rhombi, parallelograms, and trapezoids.

Standards

MA.G-SRT.B.5	Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.
MA.G-SRT.C.6	Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles.
MA.G-SRT.C.7	Explain and use the relationship between the sine and cosine of complementary angles.
MA.G-SRT.C.8	Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.

Essential Questions

1) Why is proof necessary?

2) How can right triangle theorems be used to solve real world situations?

3) How can algebraic principles be used to solve problems or prove geometric statements?

Application of Knowledge and Skills...

Students will know that...

- 1) if the altitude is drawn from the right angle of a right triangle, then it is the geometric mean between the two segments of the hypotenuse.
- 2) the leg of a right triangle is the geometric mean between the hypotenuse and the segment of the hypotenuse formed when the altitude to the hypotenuse is drawn.
- 3) Pythagorean triples are sets of three integers which can be sides of a right triangle.
- 4) the converse of the Pythagorean Theorem is used to identify acute, obtuse, and right triangles when three side lengths are given.
- 5) the distance formula for two coordinate points is d = √((x2- x1)2 + (y2 - y1)2).
- 6) the relationship between the sides of a 45–45–90 right triangle is x, x, and x√2.
- 7) the relationship between the sides of a 30–60–90 right triangle is x, x√3, and 2x.
- 8) the sine, cosine, and tangent relationships in a right triangle can be used to find missing side lengths.
- 9) the inverse of the sine, cosine, and tangent ratios can be used to find the missing acute angles in a right triangle.

Students will be skilled at...

Students will be able to:

- a) find missing sides of right triangles using altitude-on-hypotenuse theorems.
- b) find missing sides of right triangles using the Pythagorean Theorem.
- c) determine if a triangle is right, obtuse, or acute given the three side lengths.
- d) find the distance between two coordinate points.
- e) find missing sides of special right triangles.
- f) find missing sides and angles of right triangles using trigonometric ratios.
- g) find missing sides and angles of geometric figures using special right triangles or trigonometry.
- h) solve problems involving angles of elevation and angles of depression using trigonometry.

Assessments

- Daily Formative Assessments Formative: Other written assessments Formative assessments, such as Do-Now assignments, homework assignments, Tickets-to-Leave, and SmartPal response board practice problems, will provide daily data for teachers.
- Pre-Assessment Diagnostic: Other written assessments Students will be assessed on their prior knowledge of the Pythagorean Theorem and simplifying radical expressions.
- Unit Quiz Formative: Written Test Students will be assessed on solving problems that utilize altitude-on-hypotenuse theorems, the Pythagorean Theorem, the Distance Formula, and special right triangles.
- Unit Test Summative: Written Test Students will be assessed on solving problems that utilize altitude-on-hypotenuse theorems, the Pythagorean Theorem, the Distance Formula, special right triangles, and trigonometry.

Activities

Communicator Practice

Students will complete differentiated practice problems on SmartPal response boards.

Cooperative Problem-Solving

Students will work cooperatively on challenge problems. This work may be presented by students, discussed as a class, or turned in for grading and comments.

Special Right Triangles Investigation

Students will investigate the relationship between 45-45-90 triangles and 30-60-90 triangles.

Activities to Differentiate Instruction

Interactive Smartboard Activities will be utilized.

Students will work in mixed-level groups.

Students will be assigned optional and mandatory challenge problems on homework assignments.

Enrichment worksheets will be available for classwork and/or homework.

Guided notes and study guides will be provided accordingly.

Appropriately-leveled problems for students to complete. Proofs can range from having few steps to requiring multiple steps using multiple geometric figures.

Integrated/Cross-Disciplinary Instruction

Students will build connections between geometry and architecture by discovering that knowledge of trigonometry can assist in calculating the height of tall structures.

Resources

McDougal Littell *Geometry for Enjoyment and Challenge* textbook and resources

Smartboard

Smart Exchange

McDougal Littell *Activity Generator* CD-ROM

Protractors

Rulers

Smart Exchange

21st Century Skills

CRP.K-12.CRP2.1	Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They make connections between abstract concepts with real-world applications, and they make correct insights about when it is appropriate to apply the use of an academic skill in a workplace situation.
CRP.K-12.CRP4.1	Career-ready individuals communicate thoughts, ideas, and action plans with clarity, whether using written, verbal, and/or visual methods. They communicate in the workplace with clarity and purpose to make maximum use of their own and others' time. They are excellent writers; they master conventions, word choice, and organization, and use effective tone and presentation skills to articulate ideas. They are skilled at interacting with others; they are active listeners and speak clearly and with purpose. Career-ready individuals think about the audience for their communication and prepare accordingly to ensure the desired outcome.
CRP.K-12.CRP8.1	Career-ready individuals readily recognize problems in the workplace, understand the nature of the problem, and devise effective plans to solve the problem. They are aware of problems when they occur and take action quickly to address the problem; they thoughtfully investigate the root cause of the problem prior to introducing solutions. They carefully consider the options to solve the problem. Once a solution is agreed upon, they follow through to ensure the problem is solved, whether through their own actions or the

	actions of others.
CRP.K-12.CRP11.1	Career-ready individuals find and maximize the productive value of existing and new technology to accomplish workplace tasks and solve workplace problems. They are flexible and adaptive in acquiring new technology. They are proficient with ubiquitous technology applications. They understand the inherent risks-personal and organizational-of technology applications, and they take actions to prevent or mitigate these risks.
CRP.K-12.CRP12.1	Career-ready individuals positively contribute to every team, whether formal or informal. They apply an awareness of cultural difference to avoid barriers to productive and positive interaction. They find ways to increase the engagement and contribution of all team members. They plan and facilitate effective team meetings.