Just in Time Quick Check

Standard of Learning G.TR.4

Strand: Triangles

Standard of Learning G.TR.4

The student will model and solve problems, including those in context, involving trigonometry in right triangles and applications of the Pythagorean Theorem.

Students will demonstrate the following Knowledge and Skills:

a) Determine whether a triangle formed with three given lengths is a right triangle.
b) Find and verify trigonometric ratios using right triangles.
c) Model and solve problems, including those in context, involving right triangle trigonometry (sine, cosine, and tangent ratios).
d) Solve problems using the properties of special right triangles.
e) Solve for missing lengths in geometric figures, using properties of 45°-45°-90° triangles, where rationalizing denominators may be necessary.
f) Solve for missing lengths in geometric figures, using properties of 30°-60°-90° triangles, where rationalizing denominators may be necessary.
g) Solve problems, including those in context, involving right triangles using the Pythagorean Theorem and its converse, including recognizing Pythagorean Triples.

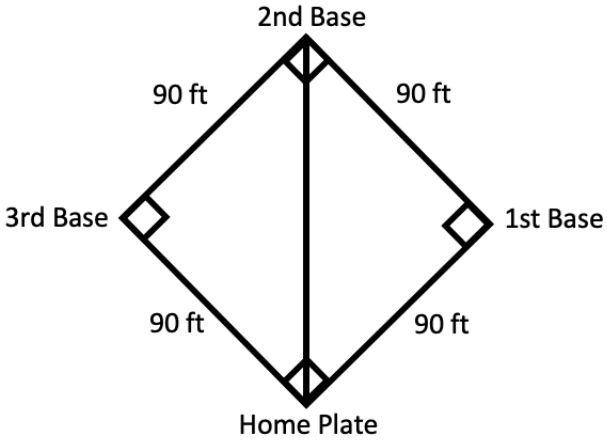
Just in Time Quick Check

Just in Time Quick Check Teacher Notes

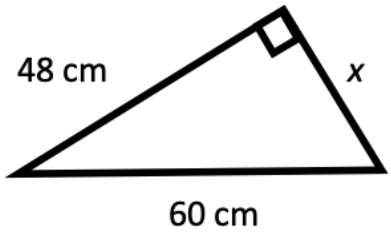
Supporting and Prerequisite SOL: 8.MG.4

Just in Time Quick Check G.TR.4

1. A player throws a baseball from second base to home plate. What is closest to the distance between second base and home plate? Round your answer to the nearest foot.



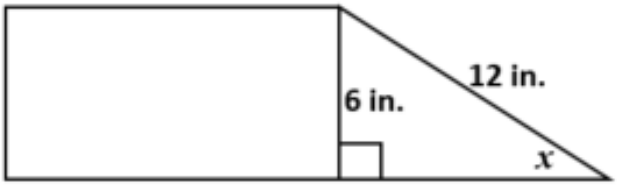
2. Find the value of *x* to the nearest centimeter.



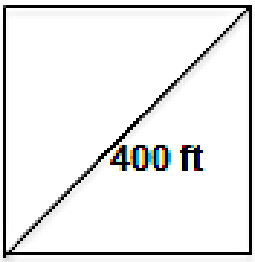
3. Determine whether a triangle with side lengths $\sqrt{3}$ cm, $\sqrt{4}$ cm, $\sqrt{5}$ cm is a right triangle. Justify your reasoning.

4. A door frame that appears to be rectangular has a height of 213 cm, width of 92 cm, and one diagonal that measures 231 cm. Determine if the door frame is rectangular. Justify your reasoning.

5. A figure is shown below. What is the angle measure of x?



6. Mr. Grant has a tree farm in the shape of a square. Half the farm has trees that he uses to make pencils, and the other half are maple trees that he uses to make maple syrup. The farm is divided into two equal sections along a 400-foot diagonal as shown. What is the length of one side of the tree farm? Represent your answer in simplest radical form and provide the decimal form to the nearest tenth.



Simplest radical form: _____

Decimal form to the nearest tenth: _____

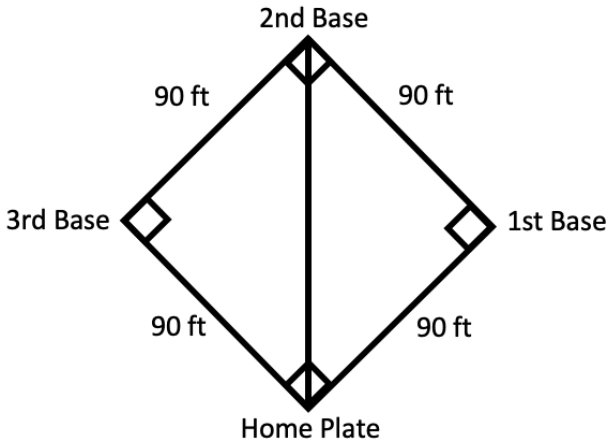
7. If the hypotenuse of a 30°-60°-90° triangle is 8 cm, what is the measure of the longer leg of the triangle?

8. ΔABC is an equilateral triangle with a side length 12 inches. What is the height of ΔABC? Provide your answer in simplest radical form.

G.TR.4 Just in Time Quick Check Teacher Notes

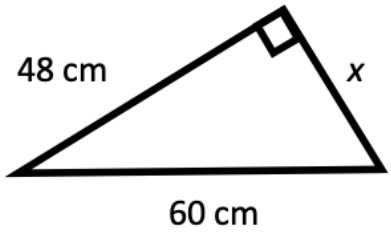
Common Errors/Misconceptions and their Possible Indications

1. A player throws a baseball from second base to home plate. What is closest to the distance between second base and home plate? Round your answer to the nearest foot.



A common error students may make is not squaring the values once they are substituted in the Pythagorean Theorem formula. This may indicate that some students think the formula is a + b = c. In this case, some students may add 90 + 90 and then try to take the square root of 180. Teachers are encouraged to use Quick Check 8.MG.4 with students that might exhibit this type of error. A strategy that could be beneficial to use with students is to model the relationship between the legs and hypotenuse of a right triangle using concrete manipulatives or dynamic software to illustrate the Pythagorean Theorem. Additionally, it may be beneficial to use Quick Check 8.MG.4 to verify the Pythagorean Theorem.

2. Find the value of *x* to the nearest centimeter.



A common error some students may make is confusing the hypotenuse for the leg of the triangle. Students who are confused will place the unknown variable in the position of the hypotenuse regardless of which side it represents. This would lead a student to set up an equation to solve for the missing side as $48^2 + 60^2 = a^2$. *Further, some students may not recognize the appropriate values in which to substitute into the Pythagorean Theorem formula (e.g., leg*

lengths as "a" and "b" and hypotenuse as "c"). This may indicate that some students are not aware that the hypotenuse is always opposite the right angle of a right triangle. Students may benefit from performing activities with concrete manipulatives and dynamic software to learn about the relationship between the sum of the squares of the two legs and the square of the hypotenuse in a right triangle.

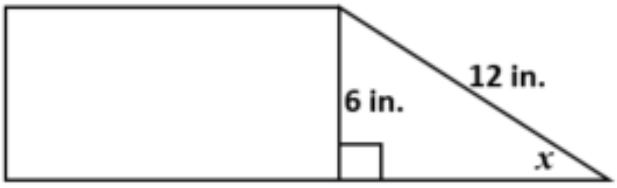
3. Determine whether a triangle with side lengths $\sqrt{3}$ cm, $\sqrt{4}$ cm, $\sqrt{5}$ cm is a right triangle. Explain your reasoning.

A common misconception that some students may have is not applying the Converse of the Pythagorean Theorem. This may indicate that students do not understand that since the square of the length of the longest side is the sum of the squares of the other two sides, by the Converse of Pythagorean Theorem, the triangle is a right triangle. Further, a common error that students may make is recognizing that a 3, 4, 5 triangle is a common right triangle (Pythagorean Triple), yet assume that the square roots of these three numbers will also form a right triangle. Teachers are encouraged to have students investigate the Pythagorean Triples and generalize about those lengths.

4. A door frame that appears to be rectangular has a height of 213 cm, width of 92 cm, and one diagonal that measures 231 cm. Determine if the door frame is rectangular. Justify your reasoning.

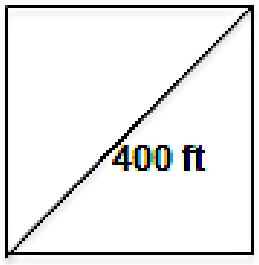
A common misconception that some students may have is not recognizing that the diagonal of a rectangle forms two congruent right triangles within this rectangle. This may indicate that some students do not recognize that the diagonal represents the hypotenuse of the two right triangles. Teachers should encourage students to draw a diagram and label all the given information provided before attempting to set up an equation to solve the problem. Being able to visualize the scenario will help students to see how the Pythagorean Theorem can be applied.

5. A figure is shown below. What is the angle measure of *x*?



A common misconception some students may have is to state the angle measure of x as 45 degrees. This may indicate that a student has mistakenly associated the relationship of leg to hypotenuse as 1:2 instead of 1:$\sqrt{2}$. Teachers are encouraged to facilitate a class discussion to determine an angle measure when given the side lengths of a triangle using either inverse trigonometric functions or identifying the characteristics of special right triangles.

6. Mr. Grant has a tree farm in the shape of a square. Half the farm has trees that he uses to make pencils and the other half are maple trees that he uses to make maple syrup. The farm is divided into two equal sections along a 400-foot diagonal as shown. What is the length of one side of the tree farm? Represent your answer in simplest radical form and provide the decimal form to the nearest tenth.



Simplest radical form: _____

Decimal form to the nearest tenth: _____

A common misconception some students may have is that they do not realize that the diagonal bisects the vertices to form two 45°degree angles, hence producing a 45°-45°-90° triangle. This may indicate that some students are not able to visualize why the diagonal of a square becomes the hypotenuse of a right triangle and the other two sides of a square become the two sides (base and opposite) of a right triangle. Teachers may wish to demonstrate how two congruent 45°-45°-90° triangles are formed when a diagonal is drawn in a square.

If students do not recognize the ratio relationships between the sides of the special right triangle, then teachers are encouraged to have students separate the figure into two triangles and label each side as x since it is given that the tree farm is in the shape of a square. Next, teachers may model for students that the Pythagorean Theorem can be applied by setting up the equation $x^2 + x^2 = 400^2$. *Teachers should guide students to discover the 45°-45°-90° triangle pattern using the Pythagorean Theorem and a square with any side length, instead of having students simply memorize the 45°-45°-90° Triangle Theorem.*

7. If the hypotenuse of a 30°-60°-90° triangle is 8 cm, what is the measure of the longer leg of the triangle?

A common error in this problem is that students may want to find the longer leg length without first finding the shorter leg. This is particularly true when no figure is given. Students should be encouraged to draw a figure and label it with the given information. Some students will remember that the square root of 3 is part of the answer to finding the longer leg, but they may try to divide 8 by the square root of three to get their answer.

A common misconception some students may have is to incorrectly apply the ratios for the side lengths of the 30°-60°-90° special right triangle. While some students may recognize that the hypotenuse is the longest side in a right triangle, they may not recognize that the ratio of the shorter leg to the hypotenuse is $1:2$ *and the ratio of the longer leg to hypotenuse is* $\sqrt{3}:2$*. Teachers may model for students the angle-side relationships in a triangle (the longest side is opposite the greatest angle and the shortest side is opposite the smallest angle) when working with the 30°-60°-90° special right triangle, however teachers should bring to the students' attention that* $2 > \sqrt{3}$*. Additionally, teachers are encouraged to model the ratio of the sides as short leg: long leg: hypotenuse (i.e., x :* $x\sqrt{3}$ *: 2x).*

8. ΔABC is an equilateral triangle with a side length of 12 inches. What is the height of ΔABC? Provide your answer in simplest radical form.

   A common misconception some students may have is that they do not realize the height of an equilateral triangle is also the perpendicular bisector. This may indicate that some students are not aware that the altitude (height) of the triangle creates a right triangle within triangle ABC. Alternatively, students may not recall that an equilateral triangle is also equiangular; therefore, each angle measures 60°. Teachers are encouraged to provide learning opportunities for students to explore the 30°-60°-90° pattern created by equilateral triangles and their heights with the Pythagorean Theorem, instead of having students simply memorize the 30°-60°-90° Triangle Theorem.