Just In Time Quick Check

Standard of Learning (SOL) G.8c

Strand: Triangles

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The student will solve problems, including practical problems, involving right triangles. This will include applying trigonometric ratios.

Grade Level Skills:

- Solve problems, including practical problems, using right triangle trigonometry and properties of special right triangles.
- Solve problems, including practical problems, involving right triangles with missing side lengths or angle measurements, using sine, cosine, and tangent ratios.

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Supporting Resources:

- VDOE Mathematics Instructional Plans (MIPS)
  - G.8bc – Special Right Triangles and Right Triangle Trigonometry (Word) / PDF Version
- VDOE Word Wall Cards: Geometry (Word)|(PDF)
  - Trigonometric Ratios
  - Inverse Trigonometric Ratios
- VDOE Rich Mathematical Tasks: Take Me Out to the Ball Game Task
  - G.8 Take Me Out to the Ball Game (Word) / PDF Version
- Other VDOE Resources
  - Geometry, Module 7, Topic 5 – Right Triangle Trigonometry [eMediaVA]
  - Geometry, Module 7, Topic 6 – Inverse Trigonometry [eMediaVA]
  - Geometry, Module 7, Topic 7 – Practical Problems Involving Trigonometry [eMediaVA]
- Desmos Activities
  - Right Triangle Trigonometry

Supporting and Prerequisite SOL: G.8b, A.4a, A.4e

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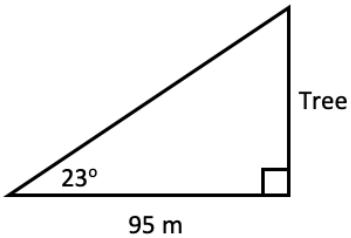
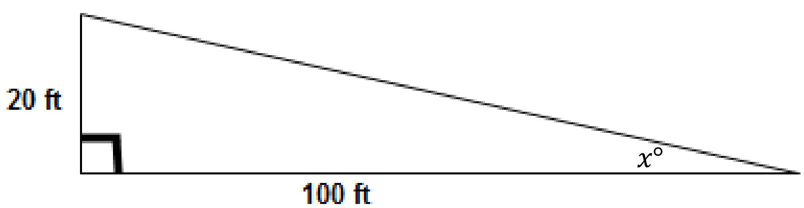
SOL G.8c - Just in Time Quick Check

1. A person is 95 meters from the base of a tree. He observes that the angle between the ground and the top of the tree is 23°. Estimate the height, *h*, of the tree to the nearest tenth of a meter.



2. A ladder leaning against a vertical wall makes an angle of 35° with the ground. The foot of the ladder is 3 meters from the base of the wall. What is the length of the ladder to the nearest meter?

3. A street in San Francisco rises 20 feet for every 100 feet horizontally. What is the measure of the angle of elevation, *x*, to the nearest degree?



4. Ella is standing on top of a 50-foot building and spots her friend Jada on the ground. The horizontal distance from Jada to the base of the building is 30 feet. What is the closest measure, in degrees, of the angle of depression from Ella to Jada?

5. Given: ΔABC, $\measuredangle C = 90°$, $\measuredangle A = 38°$, $c = 85$ cm.

   a) Draw and label ΔABC.

   b) Solve for each unknown value of ΔABC. Round all answers to the nearest hundredth.

   a = ___________

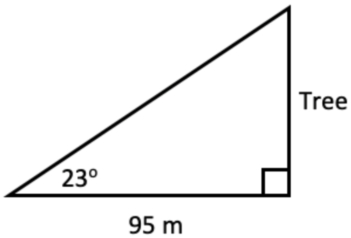
   b = ___________

   $\measuredangle B$ = ___________

SOL G.8c - Just in Time Quick Check Teacher Notes

Common Errors/Misconceptions and their Possible Indications

1. A person is 95 meters from the base of a tree. He observes that the angle between the ground and the top of the tree is 23°. Estimate the height, *h*, of the tree to the nearest tenth of a meter.

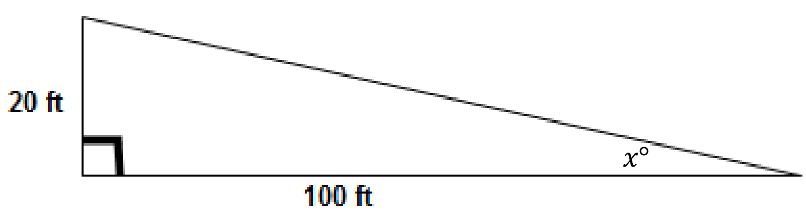


A common error that some students may make is to set up an incorrect trigonometric ratio to find the height of the tree. This may indicate that some students misunderstand the sine, cosine, and tangent ratios of a specific angle. Additionally, students may not be able to determine which trigonometric ratios to apply when solving for an unknown side measure. Teachers should model how to solve practical problems involving trigonometric ratios by first identifying the relationship the known and unknown side measures have to the given angle. Students may find it helpful to label the hypotenuse, the adjacent leg, or the opposite leg before determining which trigonometric ratio will be used to solve the problem correctly.

2. A ladder leaning against a vertical wall makes an angle of 35° with the ground. The foot of the ladder is 3 meters from the base of the wall. What is the length of the ladder to the nearest meter?

A common error some students may make is to divide cos 35° by 3 when solving for the length of the ladder. This may indicate that a student can set up the correct trigonometric ratio but did not apply the correct algebraic procedure for finding the length of the ladder. Teachers are encouraged to demonstrate the process for solving for a missing side length when the unknown value is in the denominator.

3. A street in San Francisco rises 20 feet for every 100 feet horizontally. What is the measure of the angle of elevation, *x*, to the nearest degree?



A common misconception some students may have is to use the ratio tan $\left(\frac{20}{100}\right)$ *to solve for the angle of elevation. This may indicate that some students are confused to when to use inverse trigonometric ratios. When introducing inverse trigonometric functions, teachers are encouraged to emphasize the idea of inverse operations. Teachers may emphasize with students that trigonometric functions use given angle measures and an unknown/known side ratio, while inverse trigonometric functions use known side ratios and an unknown angle measure.*

4. Ella is standing on top of a 50-foot building and spots her friend Jada on the ground. The horizontal distance from Jada to the base of the building is 30 feet. What is the closest measure, in degrees, of the angle of depression from Ella to Jada?

A common error that some students may make is to draw the angle of depression incorrectly in their diagram. As a result, an incorrect inverse trigonometric function is applied. This may indicate that students do not realize the angle of depression is the reference angle from the position in a downward direction from a horizontal line. Teachers may consider teaching the angle of depression in relation to the movement of students' eyes. Ask students to look straight ahead, then lower (depress) their eyes to look at the ground level. Additionally, teachers may highlight the relationships between the angle of elevation and the angle of depression. Since the horizontal line in the angle of depression is always parallel to the ground level (the horizontal line in the angle of elevation), thus the angle of depression must form alternate interior angles with the angle of elevation.

5. Given: ΔABC, $\measuredangle C = 90°$, $\measuredangle$A = 38°, $c = 85$ cm.

   a) Draw and label ΔABC.

   b) Solve for each unknown value of ΔABC. Round all answers to the nearest hundredth.

   a = ___________

   b = ___________

   $\measuredangle B$ = ___________

A common error that some students may make is to find all the missing side lengths correctly, but switch the answers for sides a and b. This indicates that students labeled the triangle incorrectly. Teachers are encouraged to practice with students consistent methods for labeling vertices and sides. Given this example for triangle ABC, teachers may model vertices of triangles with capital letters and the sides with lowercase letters. Further, teachers may model labeling the side opposite angle A with a small a, the side opposite angle B with a small b, and the side opposite angle C with a small c. In this manner, teachers can engage students in discourse about mathematical conventions.

Another common error that some students may make is to apply sine and cosine incorrectly when using 38 degrees – of which is contingent on their ability to draw and label triangle ABC correctly based on the given information. Teachers are encouraged to show students several similar right triangles, mark reference angles, and then determine which trigonometric ratio should be applied to solve for any unknown values.