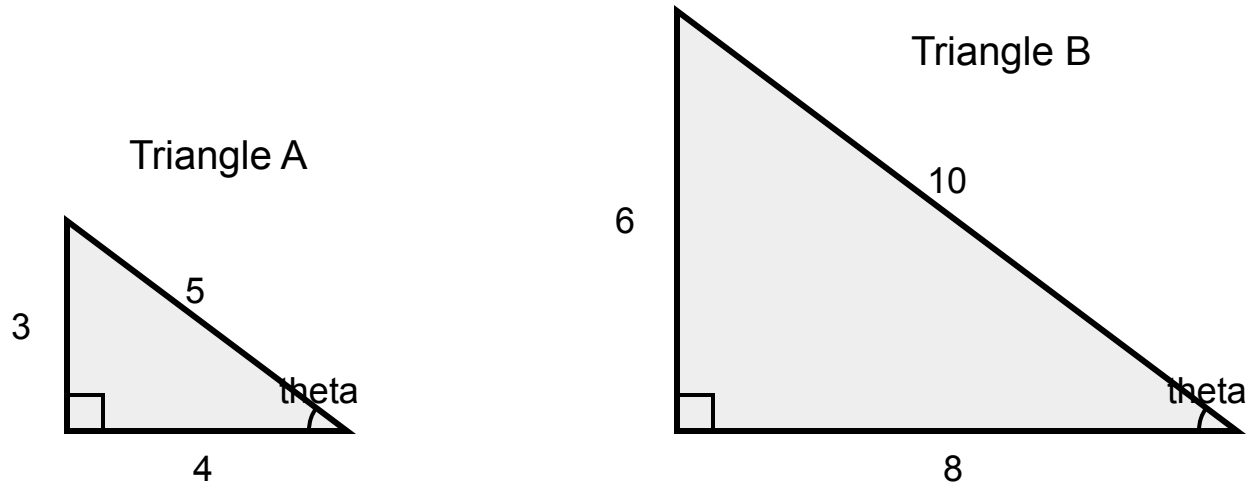
Same Angle, Same Ratios

Use similar right triangles to define sine, cosine, and tangent of an acute angle

Name: _____ Date: _____

Part 1 - Compare similar right triangles

Both diagrams are accurately scaled models. The marked acute angles are both theta. Each triangle has a right angle. For theta, the opposite side is across from theta, the adjacent side touches theta but is not the hypotenuse, and the hypotenuse is across from the right angle.



1. Complete every cell. Write each fraction in lowest terms in the last column.

Ratio for theta	Triangle A	Triangle B	Common value
opposite / hypotenuse			
adjacent / hypotenuse			
opposite / adjacent			

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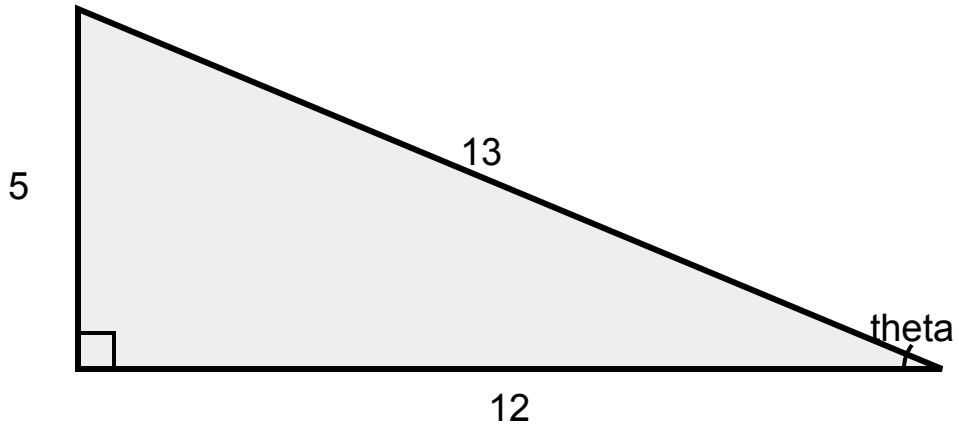
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Part 2 - Name the angle ratios

2. The matching values in Part 1 show that a ratio depends on the angle theta, not on the size of a similar right triangle. Complete the definitions.

Name	Definition for an acute angle
sine of theta, sin(theta)	_____ / _____
cosine of theta, cos(theta)	_____ / _____
tangent of theta, tan(theta)	_____ / _____



3. For the theta shown, find each exact ratio in lowest terms: sin(theta) = _____ cos(theta) = _____ tan(theta) = _____

4. In 2-3 sentences, explain why Triangle A and Triangle B have the same three ratios for theta.

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Answer key and teaching notes

Materials and setup: Print and supply all student pages, keeping teacher-key pages separate. Students need pencils and may use scratch paper. No calculator is needed. Display or distribute the pages so students can see both accurately scaled model triangles in Part 1. Triangle B is a scale drawing of Triangle A with every side doubled.

Teaching script: Say: “Locate theta first. The hypotenuse is always opposite the right angle. Of the two remaining sides, the opposite side is across from theta and the adjacent side touches theta. We will compare ratios, not just lengths.” After students begin Item 1, say: “Reduce each fraction. What stays unchanged when every side length doubles?” Do not state the ratio names until students have compared the rows.

Observation method: Circulate and check whether each student identifies, for theta, A: opposite 3, adjacent 4, hypotenuse 5; B: opposite 6, adjacent 8, hypotenuse 10. Ask one student to point to the hypotenuse and explain why it is not an adjacent leg. Record whether the student (a) uses the correct orientation, (b) reduces accurately, and (c) connects matching ratios to similar triangles.

1. Opposite/hypotenuse: A 3/5; B 6/10; common value 3/5. Adjacent/hypotenuse: A 4/5; B 8/10; common value 4/5. Opposite/adjacent: A 3/4; B 6/8; common value 3/4. Pythagorean checks: 3^2 + 4^2 = 5^2 and 6^2 + 8^2 = 10^2.

2. sin(theta) = opposite/hypotenuse; cos(theta) = adjacent/hypotenuse; tan(theta) = opposite/adjacent.

3. The 5-12-13 triangle has opposite 5, adjacent 12, hypotenuse 13. sin(theta) = 5/13; cos(theta) = 12/13; tan(theta) = 5/12. Check: 5^2 + 12^2 = 13^2.

4. Sample response: “The triangles are similar because their corresponding angles match. Each side length in Triangle B is twice its matching side length in Triangle A, so ratios of corresponding sides reduce to the same values.” Accept equivalent reasoning that explicitly mentions similarity or a common scale factor and unchanged ratios.