

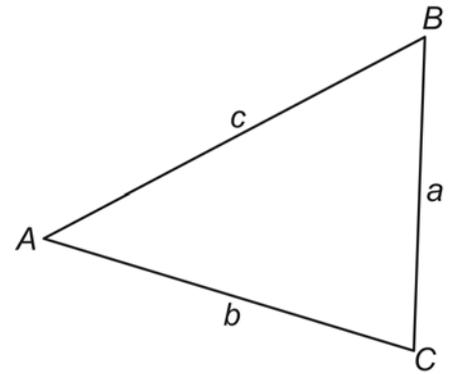
The Law of Sines

NAME _____

Right triangle trigonometry can be used to solve problems involving right triangles. However, many interesting problems involve non-right triangles. In this lesson, you will use right triangle trigonometry to develop the *Law of Sines*. The law of sines is important because it can be used to solve problems involving non-right triangles as well as right triangles.

Consider oblique $\triangle ABC$ shown to the right.

1. Sketch an altitude from vertex B.
2. Label the altitude k .
3. The altitude creates two right triangles inside $\triangle ABC$. Notice that $\angle A$ is contained in one of the right triangles, and $\angle C$ is contained in the other. Using right triangle trigonometry, write two equations, one involving $\sin A$, and one involving $\sin C$.



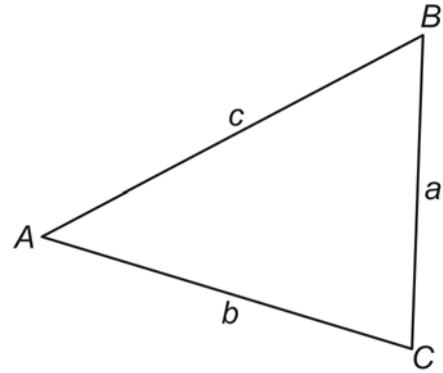
$$\sin A = \text{_____}$$

$$\sin C = \text{_____}$$

4. Notice that each of the equations in Question 3 involves k . (Why does this happen?) Solve each equation for k .
5. Since both equations in Question 4 are equal to k , they can be set equal to each other. (Why is this possible?) Set the equations equal to each other to form a new equation.
6. Notice that the equation in Question 5 no longer involves k . (Why not?) Write an equation equivalent to the equation in Question 5, regrouping a with $\sin A$ and c with $\sin C$.

Again, consider oblique $\triangle ABC$.

7. This time, sketch an altitude from vertex C .
8. Label the altitude k .
9. The altitude creates two right triangles inside $\triangle ABC$. Notice that $\angle A$ is contained in one of the right triangles and $\angle B$ is contained in the other. Using right triangle trigonometry, write two equations, one involving $\sin A$ and one involving $\sin B$.



$$\sin A = \text{—————}$$

$$\sin B = \text{—————}$$

10. Notice that each of the equations in Question 9 involves k . (Why does this happen?) Solve each equation for k .
11. Since both equations in Question 10 are equal to k , they can be set equal to each other. (Why is this possible?) Set the equations equal to each other to form a new equation.
12. Notice that the equation in Question 11 no longer involves k . (Why not?) Write an equation equivalent to the equation in Question 11, regrouping a with $\sin A$ and b with $\sin B$.
13. Use the equations in Question 6 and Question 12 to write a third equation involving b , c , $\sin B$, and $\sin C$.

Together, the equations in Questions 6, 12, and 13 form the *Law of Sines*. The law of sines is important, because it can be used to solve problems involving both right and non-right triangles, because it involves only the sides and angles of a triangle.