Sine. It's the Law.
ID: 11851

Time Required
15 minutes

Activity Overview
In this activity, students will explore the Law of Sines. Students will derive the formula through exploration and solve some application problems. As an extension, students will prove the Law of Sines through guided questions.

Topic: Right Triangles & Trigonometric Ratios
- *Law of Sines*

Teacher Preparation and Notes
- *This activity is geared towards geometry students and only the simplest case of the Law of Sines is explored. The ambiguous case is not explored in this activity.*
- *This activity was written to be explored with the Cabri Jr. app on the TI-84.*
- *Before beginning this activity, make sure that all students have the Cabri Jr. application and the Cabri Jr. file LAW1.8xv loaded on their TI-84 calculators.*
- ***To download the Cabri Jr. file (.8xv file) and student worksheet, go to education.ti.com/exchange and enter "11851" in the keyword search box.***

Associated Materials
- *SineItsTheLaw_Student.doc*
- *LAW1.8xv*

Suggested Related Activities
To download any activity listed, go to education.ti.com/exchange and enter the number in the keyword search box.
- *Law of Sines and Cosines (TI-Nspire technology) — 9849*

Problem 1 – Law of Sines

Before beginning this activity make sure the mode is set to degrees. To do this, press [MODE] and press [ENTER] when DEG is highlighted.

Students will begin this activity by looking at a triangle and investigating the ratio of the sine of an angle to the length of the opposite side. In *LAW1.8xv*, students are given triangle *ABC* with the measures of angles *A*, *B*, and *C*, and the measure of sides *a*, *b*, and *c*.

Students will collect data in the tables on their accompanying worksheet and asked what they notice about the last three columns of the table in Question 2. Discuss round off errors with the students.

Students are asked to compare the three columns to discover the Law of Sines.
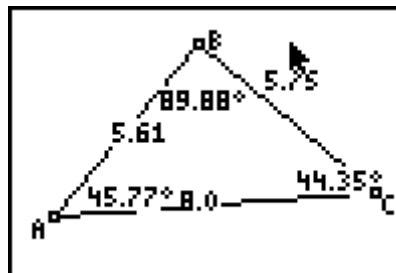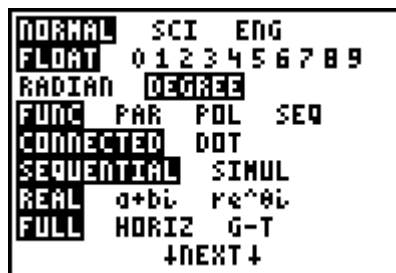
Problem 2 – Application of the Law of Sines

In Problem 2, students are asked to apply what they have learned about the Law of Sines.
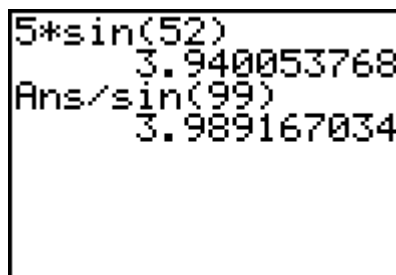

If using Mathprint OS:

Students can calculate the answer using the fraction template. To do this, from the Home screen press [ALPHA] [F1] and select **n/d**. Then enter 5*sin(52) in the numerator. Press [▼] to move to the denominator and enter sin(99). Press [ENTER] to evaluate.
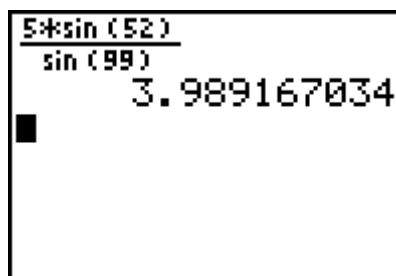
Extension – Proof of the Law of Sines

As an extension, students are asked to prove the Pythagorean theorem through guided questions.
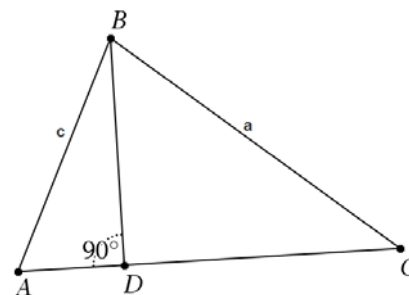
Student Solutions

1. Sample Answers

Position	*a*	b	c	A	B	C
1	5.88	8.00	5.12	47.05	93.35	39.60
2	8.97	8.00	4.01	89.99	63.44	26.57
3	8.16	8.00	3.01	81.90	76.71	21.39
4	4.84	8.00	4.00	27.41	130.24	22.35

2. Sample Answers

Position	sin(*A*)	sin(*B*)	sin(*C*)	$\dfrac{\sin(A)}{a}$	$\dfrac{\sin(B)}{b}$	$\dfrac{\sin(C)}{c}$
1	0.73135	0.99829	0.63742	0.12347	0.12478	0.12449
2	1	0.89446	0.44729	0.11148	0.11180	0.11154
3	0.99002	0.97321	0.36471	0.12132	0.12165	0.12116
4	0.46035	0.76334	0.38026	0.09511	0.09541	0.09506

3. They are approximately equal (not exactly equal due to round off errors).

4. $\dfrac{\sin A}{a} = \dfrac{\sin B}{b} = \dfrac{\sin C}{c}$

5. $\dfrac{\sin A}{a} = \dfrac{\sin B}{b} = \dfrac{\sin C}{c}$

6. Distance from Tower *A*: 2.45 mi; Distance from Tower *B*: 3.99 mi

7. 36.95 ft tall

8. Distance from lighthouse A: 6.65 mi; Distance from lighthouse B: 9.38 mi

9. $\sin(A) = \dfrac{BD}{c}$

10. $\sin(C) = \dfrac{BD}{a}$

11. BD; $c \cdot \sin(A) = BD$ and $a \cdot \sin(C) = BD$

12. $c \cdot \sin(A) = a \cdot \sin(C)$

$\sin(A) = \dfrac{a \cdot \sin(C)}{c}$

$\dfrac{\sin(A)}{a} = \dfrac{\sin(C)}{c}$