**Problem 1 – Law of Sines**

Open the *Cabri Jr.* application by pressing APPS and selecting **CabriJr**. Open the file **LAW1** by pressing Y=, selecting **Open…**, and selecting the file. You are given $\triangle ABC$ with the measure of all angles and sides calculated.

1. Grab and drag point *B* (use the ALPHA button to grab the point), and record the values of *a*, *b*, *c*, $\angle A$, $\angle B$, and $\angle C$. Repeat this three more times.

| Position | *a* | b | c | A | B | C |
|---|---|---|---|---|---|---|
| 1 | | | | | | |
| 2 | | | | | | |
| 3 | | | | | | |
| 4 | | | | | | |

2. On the calculator home screen calculate **sin(*A*)**, **sin(*B*)**, and **sin(*C*)**. Then, calculate the following ratios: $\frac{\textbf{sin(}A\textbf{)}}{a}$, $\frac{\textbf{sin(}B\textbf{)}}{b}$, and $\frac{\textbf{sin(}C\textbf{)}}{c}$.

| Position | sin(*A*) | sin(*B*) | sin(*C*) | $\frac{\textbf{sin(}A\textbf{)}}{a}$ | $\frac{\textbf{sin(}B\textbf{)}}{b}$ | $\frac{\textbf{sin(}C\textbf{)}}{c}$ |
|---|---|---|---|---|---|---|
| 1 | | | | | | |
| 2 | | | | | | |
| 3 | | | | | | |
| 4 | | | | | | |

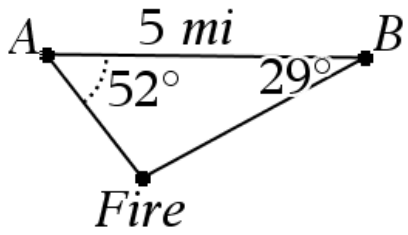
3. What do you notice about the last three columns of the table in Question 2?

4. Make a conjecture relating $\frac{\sin A}{a}$, $\frac{\sin B}{b}$, and $\frac{\sin C}{c}$.

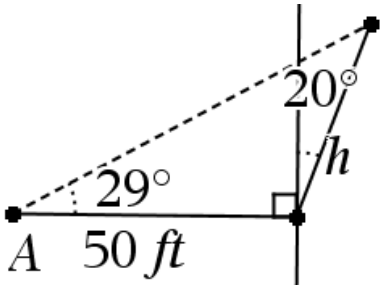
**Problem 2 – Application of the Law of Sines**

5. State the Law of Sines.

6. The distance between two fire towers is 5 miles. The observer in tower *A* spots a fire 52° SE and the observer in tower *B* spots the same fire 29° SW. Find the distance of the fire from each tower.



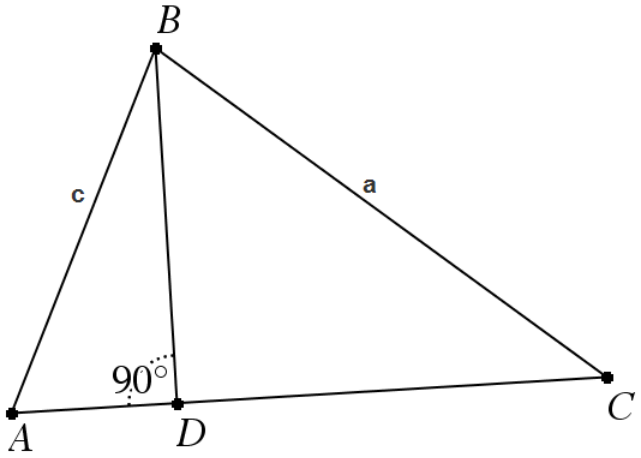

7. A tree leans 20° from vertical and at a point 50 ft. from the tree the angle of elevation to the top of the tree it 29°. Find the height, *h*, of the tree.




8. A boat is spotted by lighthouse *A* at 25° NE and spotted by lighthouse *B* at 50° NW. The lighthouses are 10 miles apart. What is the distance from the boat to each lighthouse?

**Extension – Proof of the Law of Sines**

We will now prove the Law of Sines. We will prove that $\frac{\sin(A)}{a} = \frac{\sin(C)}{c}$. You can use similar methods to show that $\frac{\sin(A)}{a} = \frac{\sin(B)}{b}$ and $\frac{\sin(B)}{b} = \frac{\sin(C)}{c}$. You are given $\triangle ABC$, altitude $BD$, and sides $a$ and $c$.




9. Using right triangular trigonometry, what is the sine ratio for $\angle A$?

10. Using right triangular trigonometry, what is the sine ratio for $\angle C$?

11. What side is common to the sine of $A$ and the sine of $C$? Solve for this common side in the ratio for sine of $A$ and sine of $C$.

12. Since the side from Exercise 13 is common to both equations we can set them equal to each other. Set your two equations equal and try to show that $\frac{\sin(A)}{a} = \frac{\sin(C)}{c}$.