

Accelerated Geometry - Law of Sines Discovery
Board Problems - Day 67

Yes, calculator. Need triangle picture.

1.) First person, one marker.

- Let's label the triangle on the left - triangle 1 and the triangle on the right - triangle 2. Add the numbers in the middle.
- Use Triangle 1 and write a sine equation to find h. Ans: $\sin A = h/b$ Box this.
- Use Triangle 2 and write a sine equation to find h. Ans: $\sin B = h/a$ Box this.
- Should h be the same in each equation? Ans: yes

2.) Keep picture, pass marker.

- Re-solve the first equation for h. Ans: $h = b \sin A$
- Re-solve the second equation for h. Ans: $h = a \sin B$
- They both equal h so set them equal. Ans: $b \sin A = a \sin B$
- Rearrange this equation so that each side has just one variable in it. Ans: $a/\sin A = b/\sin B$
- It is also true for side c. Let's add this to our proportion: $c/\sin C$. Box this.
- This is called the **Law of Sines**.

3.) New person. Pass the marker. Keep the law of sines.

- Draw a non-right triangle. Write this then label. Let $\angle A = 40$ degrees, $\angle B = 60$ degrees, and side c measures 20. Remember when labeling, capital letters for Angles and lowercase angles for sides.
- What combination of angles and sides is this? (ASA)
- Law of Sines works with ASA
- Let's solve this triangle = find all the sides and all the angles.
- First, find angle C Ans: 80 degrees
- Let's take one side at a time and solve for side a. Ans: $a = 13.05$
- Now solve for side b Ans: $b = 17.59$

4.) New person, Pass the marker. Keep the Law of Sines, erase all else.

- Draw a non-right triangle. Let $\angle A = 43$ degrees, $\angle C = 62$ degrees, and side c = 32.
- What combination of angles and sides do we have? Ans: AAS
- Law of Sines works with AAS
- Solve this triangle.
- Answer: $\angle B = 75$ deg, $a = 24.72$ $b = 35.01$

5.) Erase all. New person, pass the marker. Back to our original triangle.

- Write the $\sin B$ Ans: $\sin B = h/a$
- Solve this for h : Ans: $h = a \sin B$
- Write an equation for the area of this triangle using variables. Ans: $A = \frac{1}{2} a c \sin B$
- Box this. You can use any combinations of this. Write the other two.
- Ans: $A = \frac{1}{2} ab \sin C$ and $A = \frac{1}{2} bc \sin A$

6.) New person. Keep area formula. New problem.

- A surveyor measures a fence 440 meters long on one side of a triangular plot. One end of the fence is A and one is B. Angle A is 48 deg and $\angle B$ is 75 deg.
- Find the area of this plot. Hint: you will have to use Law of Sines to find another side first.
- Ans: side $b = 506.76$ and Area = 82,851.14 meters squared

Recap and practice