

## Classroom Examples for Pre-Calculus #13

$$\text{Law of Sines: } \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$\text{Law of Cosines: } c^2 = a^2 + b^2 - 2ab \cos C$$

$$\text{Area of a triangle: } \textit{area} = \frac{1}{2} ab \sin C$$

Airplane headings are 0 degrees for due north and go clockwise

Review – ASA, SAS, SSS, AAS, and \*ASS\* one, two, or none!

- 1) Josh is interested in buying a triangular piece of property to build a house. He needs to provide the mortgage company with the dimensions of the property and the area (in acres) in order to qualify for a loan to buy the property. The property is so overgrown that it is impossible to walk through it or around it so she can't measure anything directly but Josh has some information from an old survey. He knows that one side of his property, the side on the road, is exactly 634.2 feet long. He also knows that the angle the left side of his property makes when it hits the road side is exactly  $83^{\circ}24'48''$  and that the angle the right side makes when it hits the road side is exactly  $75^{\circ}38'24''$ . Given this information, and the knowledge that 1 acre = 43,560 square feet, determine the lengths of the two missing sides of Joshua's property and calculate the area in acres (round all answers to one decimal place).
- 2) If angle B =  $131^{\circ}48'20.4''$ , angle A =  $16^{\circ}50'11.2''$ , and side c = 359, solve all possible triangles and find the area of each. Give all angles in degrees, minutes, and seconds rounded to the nearest tenth of a second and round all sides and the areas to one decimal place.
- 3) An airplane leaves Los Angeles International Airport and flies at a heading of  $241^{\circ}$  out over the Pacific Ocean. An engine malfunction forces the plane to change its heading to  $134^{\circ}$  so it can attempt to land at San Diego International Airport. If San Diego Airport is  $S31^{\circ}E$  of Los Angeles Airport and the two airports are exactly 117 miles away from each other, how far did the plane fly before landing in San Diego? (round your answer to one decimal place)
- 4) If side a = 34, side c = 47, and side b = 23, solve all possible triangles and find the area of each. Give all angles in degrees, minutes, and seconds rounded to the nearest tenth of a second and round all sides and the areas to one decimal place.
- 5) A cruise ship is damaged and blown off course by a typhoon. Captain Silas must try to determine how far away they are from the closest port, which he assumes is Puerto Vallarta, Mexico and all he knows for certain is this: the ship is  $S23^{\circ}W$  of San Diego, it is  $S83^{\circ}E$  of Puerto Vallarta, Puerto Vallarta is  $S33^{\circ}E$  of San Diego, and San Diego and Puerto Vallarta are exactly 1,124 miles apart. How far is the ship from Bermuda? (round your answer to one decimal place)

- 6) If side  $c = 47$ , angle  $C = 38.2^\circ$ , and side  $a = 58$ , solve all possible triangles and find the area of each. Round all angles, sides, and areas to one decimal place.
- 7) Unfortunately, Captain Silas's compass was broken. He headed his cruise ship in the wrong direction and it tragically sank somewhere in the Pacific Ocean. The US Navy immediately begins a search and rescue effort. Three navy ships, a patrol boat, a cruiser, and a destroyer happen to be in the area and their locations mark the vertices of the triangular area to be searched. The cruiser is at a bearing of  $N37^\circ W$  from the destroyer. The destroyer is exactly 735 miles away, and at a bearing of  $S81^\circ E$  from the patrol boat. If the cruiser is at a bearing of  $N23^\circ E$  from the patrol boat, how far is the patrol boat from the cruiser, how far is the destroyer from the cruiser, and how large is the search area in square miles? (round all answers to one decimal place)
- 8) If side  $b = 24.7$ , angle  $C = 47.3^\circ$ , and side  $a = 38.9$ , solve all possible triangles and find the area of each. Round all angles, sides, and areas to one decimal place.
- 9) Two ships leave the same port at the same time. One ship sails off at a speed of 23 miles per hour at a bearing of  $S61^\circ E$  from the port while the other ship sails off at a speed of 14 miles per hour at a bearing of  $N12^\circ W$  from the port. How far will the ships be from one another after 9 hours? (round your answer to one decimal place)
- 10) If side  $b = 63.8$ , angle  $A = 124^\circ$ , and side  $a = 49.1$ , solve all possible triangles and find the area of each. Round all angles, sides, and areas to one decimal place.
- 11) Nina and Silas, the only two survivors of Captain Silas's ill-fated cruise, decide to take a hike in a national park to a remote camp, deep in the woods. Knowing Silas's issues with compasses, Nina decides to navigate the hike. The map says that they must leave the visitor's center and walk for 23 miles at a bearing of  $S64^\circ W$  but, in a rush to get going, she misread the map and thought it said travel at a bearing of  $N64^\circ W$ . Not realizing her mistake, they hike for 8 hours at an average rate of 4 miles per hour. At that point, they stop to take a break and Nina reexamines the map. She immediately realizes her error and knows just how lost they must be but she remains calm because she knows trigonometry! She breaks out a pencil and paper and calculates the rest of their hike. How far are they from the camp and what should their bearing be, from their present location, to get to the camp? (round all answers to one decimal place)