PreCalculus
Unit 6: Trigonometry of General Triangles

References

Textbook Connection: Glencoe PreCalculus Text: Chapter 4
www.connected.mcgraw-hill.com

Helpful Links:

GA Virtual Learning

http://cms.gavirtualschool.org/Shared/Math/GSEPrecalculus/TrigOfGeneralTriangles/index.html

- http://ccssmath.org/?page_id=2289
- http://ccssmath.org/?page_id=2291
- http://ccssmath.org/?page_id=2293

- http://www.shmoop.com/common-core-standards/ccss-hs-g-srt-9.html
- http://www.shmoop.com/common-core-standards/ccss-hs-g-srt-10.html
- http://www.shmoop.com/common-core-standards/ccss-hs-g-srt-11.html

- https://www.engageny.org/ccls-math/gsrt9
- https://www.engageny.org/ccls-math/gsrt11

- https://www.opened.com/search?category=similarity-right-triangles-and-trigonometry&grade=10&grade_group=high-school-geometry&standard=G.SRT.11&standard_group=common-core-math

Dear Parents,

Building on standards from Unit 1 and Unit 2, students will apply trigonometry to general triangles. Students will derive the trigonometric formula for the area of a triangle and prove and use the Laws of Sines and Cosines to solve problems.

Concepts Students will Use & Understand

- Expand the use of trigonometric functions beyond right triangles into more general triangles.
- Develop the trigonometric formula for area of triangle.
- Use the Laws of Sines and Cosines to solve problems.

Vocabulary

Altitude of a Triangle: The perpendicular distance between a vertex of a triangle and the side opposite that vertex. Sometimes called the height of a triangle. Also, sometimes the line segment itself is referred to as the altitude.
Hinge Theorem: If two sides of one triangle are congruent to two sides of another triangle, and the included angle of the first is larger than the included angle of the second, then the third side of the first triangle is longer than the third side of the second triangle. (Wikipedia)
Included Angle: The angle between two given sides of a triangle
Law of Cosines: The square of the length of any side of a triangle equals the sum of the squares of the lengths of the other two sides minus twice the product of the lengths of the other two sides and the cosine of the angle between them. (Swokowski, Cole)
Law of Sines: In any triangle, the ratio of the sine of an angle to the side opposite that angle is equal to the ratio of the sine of another angle to the side opposite that angle (Swokowski, Cole)
Oblique Triangle: A triangle that is not a right triangle
Vertex of a Triangle: The common endpoint of the two legs that serve as the sides of a triangle

Law of Sines

Case: ASA or AAS

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

Case: SSA

$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

Law of Cosines

Case: SAS

$$a^2 = b^2 + c^2 - 2bc\cos A$$

$$b^2 = a^2 + c^2 - 2ac\cos B$$

$$c^2 = a^2 + b^2 - 2ab\cos C$$

Case: SSS

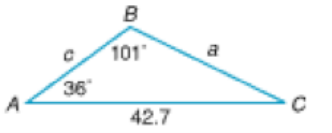
$$\cos A = \frac{b^2 + c^2 - a^2}{2bc}$$

$$\cos B = \frac{a^2 + c^2 - b^2}{2ac}$$

$$\cos C = \frac{a^2 + b^2 - c^2}{2ab}$$

Sample Practice Problems

In triangle ABC find c if $A = 36°$, $B = 101°$, and $b = 42.7$.



- **a.** About 13.8 units
- **b.** About 40.2 units
- **c.** About 29.666 units
- **d.** About 1.6 units

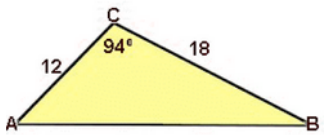
Two observers 3 miles apart and facing each other find that the angles of elevation of a balloon in the same vertical plane with themselves are 28° and 31° respectively. Find the distance from the balloon to the observer located at the 28° angle.

- **a.** About 2.4 miles
- **b.** About 3.5 miles
- **c.** About 1.8 miles
- **d.** About 1.6 miles

Determine the number of possible solutions for traingle ABC, given $A = 40°$, $a = 7$, and $b = 9$.

- **a.** Two
- **b.** Three
- **c.** None
- **d.** One

Given the following triange, find its area and express it rounded to three decimal places.



$$A = \frac{1}{2}abSinC$$

From the figure, we know the following:

a = 18, b = 12, and C = 94°

Substituting the values into the equation yields:

$$A = \frac{1}{2}18 \cdot 12 \cdot Sin94^{\circ}$$

$$A = 107.736914 \left(\text{Make sure your calculator is set to degree mode}\right)$$

$$A = 107.737$$