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Unit 4
Trig III

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AFM

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4.1 Law of Sines

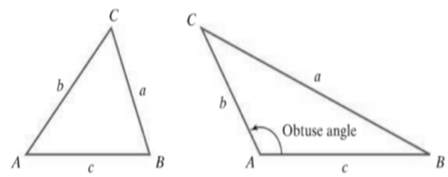
- Objective: I will be able to recognize when to use Law of Sines. I will be able to solve oblique triangles using the Law of Sines. I will be able to apply the Law of Sines to ambiguous cases.

- Vocabulary

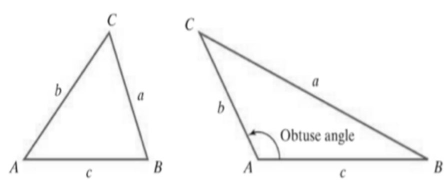
Oblique Triangles	Law of Sines	SAA Triangle	ASA Triangle	Ambiguous Case (SSA)

+ 4.1 Law of Sines

- Law of Sines
  - An oblique triangle is a triangle that does not contain a right angle.
    - Has three acute angles or two acute angles and one obtuse angle.
    - Relationships for right triangles do not work for oblique triangles.



+ 4.1 Law of Sines



- Law of Sines
  - If A, B, and C are the measures of the angles of a triangle, and a, b, and c are the lengths of the sides opposite these angles, then

$$a/\sin A = b/\sin B = c/\sin C$$

  - The ratio of the length of the side of any triangle to the sine of the angle opposite that side is the same for all three sides of the triangle.

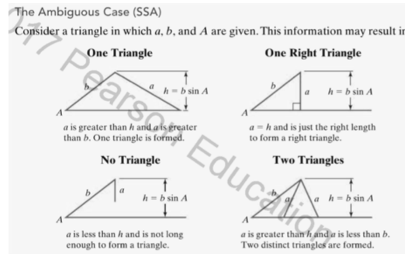
+ 4.1 Law of Sines

- Solving an Oblique Triangle
  - Solving an oblique triangle means finding the lengths of its sides and the measurements of its angles.
  - Law of Sines can be used to solve SAA and ASA triangles
    - SAA – two angles and a non-included side are known.
    - ASA – two angles and the included side are known.

+ 4.1 Law of Sines

- Angles can be solved for by remembering the triangle angle sum theorem (the three angles in a triangle add up to 180°)
- To use the Law of Sines to solve for the missing sides, we must know one of the three ratios.
- The known ratio can be set equal to a second ratio with an unknown side to solve for the side.

4.1 Law of Sines



- The Ambiguous Case (SSA)
  - In SSA, two sides and a non-included angle are known.
  - The information given in this case can result in one, two, or no triangles.
  - In this situation, it is not necessary to draw an accurate sketch. The law of Sines determines the number of triangles, if any, and gives the solution for each triangle.

4.2 Applications of Law of Sines

- Objective: I will be able to find the area of an oblique triangle. I will be able to apply the Law of Sines to real-world situations.

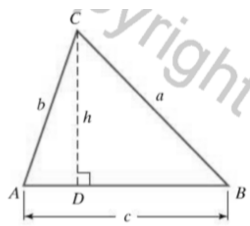
- Vocabulary

Area of an Oblique Triangle	

+ 4.2 Applications of Law of Sines

- Area of an Oblique Triangle
  - The area of a triangle equals one-half the product of the lengths of two sides times the sine of their included angle.

$$Area = \frac{1}{2}\, bc \sin A = \frac{1}{2}\, ab \sin C = \frac{1}{2}\, ac \sin B$$



+ 4.2 Applications of Law of Sines

- Applications of the Law of Sines
  - Similar to working with right triangles, the law of sines allows for
    many different kinds of applied problems.
  - Areas of use include engineering, surveying, astronomy, navigation, and the environment.
  - Can even be used to detect potential disasters, like wildfires, through triangulation.

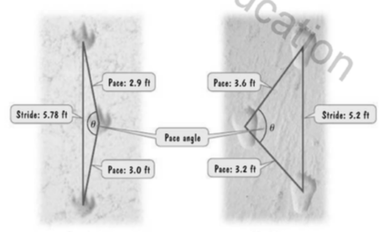
+ 4.3 Law of Cosines

- Objective: I will be able to recognize when to use the Law of Cosines. I will be able to solve an oblique triangle using the Law of Cosines.

- Vocabulary:

Pace	Stride	Law of Cosines	SSS Triangle	SAS Triangle

+ 4.3 Law of Cosines



- Law of Cosines
  - The law of cosines can help paleontologists to study the movement of extinct animals, like dinosaurs.
    - Fossilized footprints allow scientists to measure the pace and stride of these creatures.
      - Pace – the distance from the left footprint to the next right footprint, and vice versa.
      - Stride – the distance from one left footprint to the next left footprint (or one right footprint to the next)

+ 4.3 Law of Cosines

- If A, B, and C are the measures of the angles of a triangle, and a, b, and c are the lengths of the sides opposite these angles, then

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

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

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

+ 4.3 Law of Cosines

- The law of cosines is used to solve SAS and SSS triangles
  - SAS – two sides and an included angle are known
  - SSS – all three sides are known

+ 4.3 Law of Cosines

- Solving Oblique Triangles
  - Solving an SAS Triangle
    - Use the Law of Cosines to find the side opposite the given angle.
    - Use the Law of Sines to find the angle opposite the shorter of the two given sides. This angle is always acute.
    - Find the third angle by subtracting the measure of the given angle and the angle found in step 2 from 180°.

+ 4.3 Law of Cosines

- Solving a SSS Triangle
  - Use the Law of Cosines to find the angle opposite the longest side.
  - Use the Law of Sines to find either of the two remaining acute angles.
  - Find the third angle by subtracting the measures of the angles found in steps 1 and 2 from 180°.

4.4 Applications of Law of Cosines

- Objective: I will be able to solve applied problems using the Law of Cosine. I will be able to find the area of an oblique triangle using Heron's Formula.

- Vocabulary:

Heron's Formula	

4.4 Applications of Law of Cosines

- Heron's Formula
  - Finds the area of a triangle.
  - The area of a triangle with sides a, b, and c is

$$Area = \sqrt{[s(s-a)(s-b)(s-c)]}$$

where s is one-half its perimeter: $s = ½ (a+b+c)$