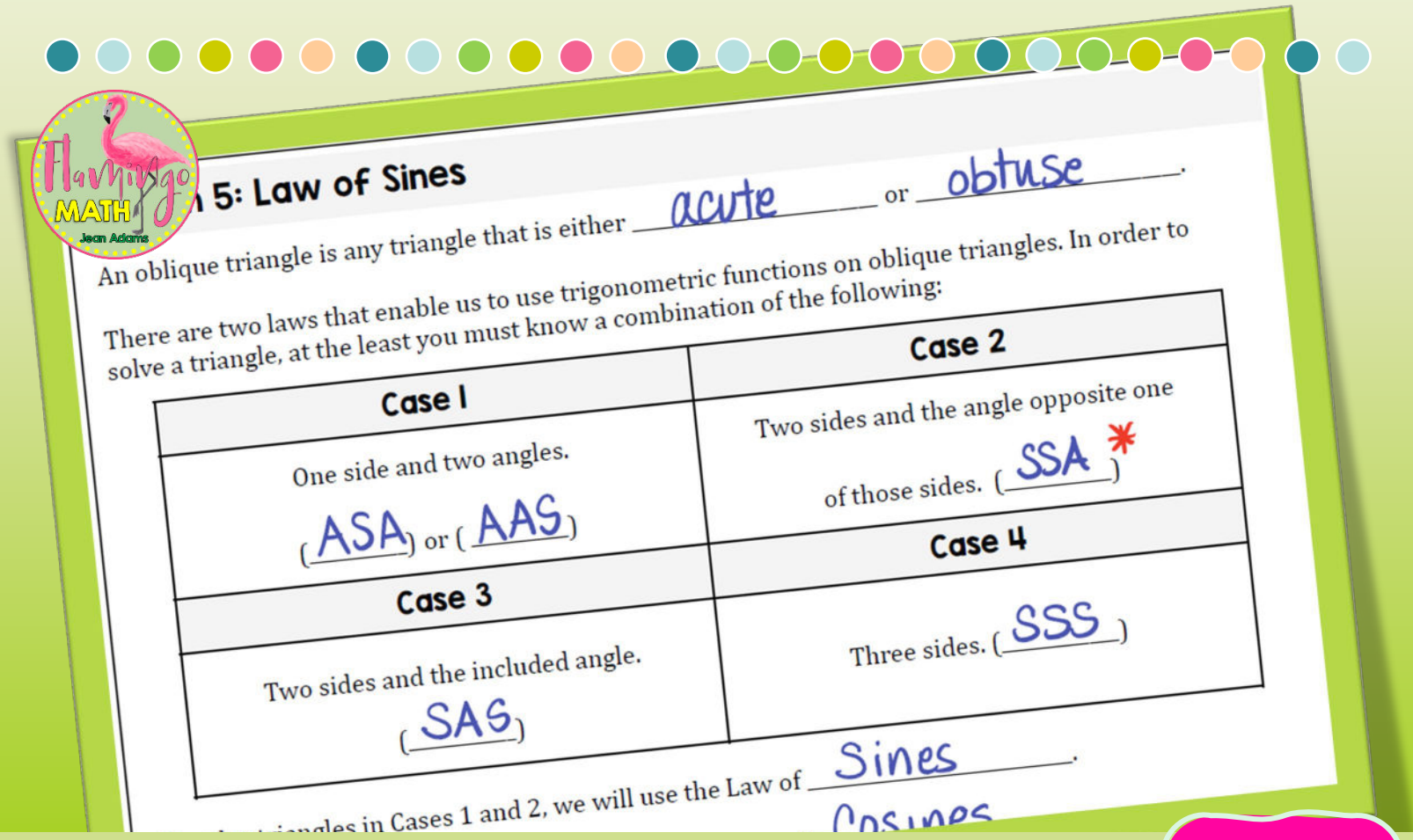
Precalculus Honors

Law of Sines



Completely Editable 5.5

Lesson 5: Law of Sines

An oblique triangle is any triangle that is either _____ or _____.

There are two laws that enable us to use trigonometric functions on oblique triangles. In order to solve a triangle, at the least you must know a combination of the following:

Case 1	Case 2
One side and two angles. (_____) or (_____)	Two sides and the angle opposite one of those sides. (_____)
Case 3	**Case 4**
Two sides and the included angle. (_____)	Three sides. (_____)

To solve triangles in Cases 1 and 2, we will use the Law of _____.

To solve triangles in Cases 3 and 4, we will use the Law of _____.

The Law of Sines

Given the following triangle with sides a, b, and c, and angles α, β, and γ, we can set up three equal ratios. These proportions are known as the Law of
of the sine of an angle to the length of the side opposite th
set up a proportion by equating any <u>two</u> of these ratios.

$$\frac{\sin\alpha}{a}=\frac{\sin\beta}{b}=\frac{\sin\gamma}{c}$$

Applying the Law of Sines Given AAS or ASA:

EX #1: Find the missing sides and angles given: $A = 64°$, $C = 82°$, and $c = 14$ inches

EX #2: Find the missing sides and angles given: $A = 40°$, $C = 22.5°$, $b = 12$ ft.

The Ambiguous Case: Using Law of Sines, Given SSA

When using the Law of Sines on a SSA triangle, you have to be careful about the number of solutions you should have. It is possible to have only **one solution**, **two different triangle solutions**, or **no solution**. This is why a triangle with SSA is called the "ambiguous case".

AMBIGUOUS CASE TEST:

1. Solve first triangle, if possible.
2. 180° — first angle found =
3. Add the given angle.
4. Compare sum to 180°

Case #1: One Solution Only

EX #3: Solve the given triangle $A = 123°$, $a = 47$, and $c = 23$

Case #2: Two Solutions

EX #4: Solve th

Case #3: No solution

EX #5: Solve the given trian

Area of an Oblique T

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

EX #6: Find the area of a triangle having two sides of leng
included angle of 135°.

Application

EX #7: Two fire-lookout stations are 13 miles apart, with station B directly east of station A.

Both stations spot a fire. The bearing of the fire from station A is N35°E, and the bearing of the fire from station B is N49°W. How far, to the nearest mile, is the fire from station B?

NOTES

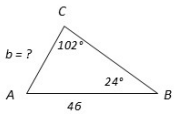
5.5 **Law of Sines Homework**

Name _____

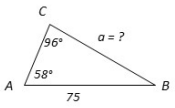
Date _____ Period _____

Problems 1 – 8, Solve each triangle for the indicated side. Express your answer to nearest hundredth.

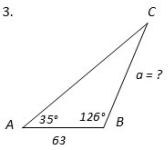
1.



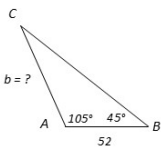
2.



3.



4.



5. $\angle A = 42°, \angle B = 39°, c = 48$; find a.

6. $\angle B = 72°, \angle C = 31°, a = 103$; find b.

7. $\angle A = 128°, \angle B = 19°, a = 46$; find c.

8. $\angle A = 47.6°, \angle B = 40.3°, b = 29$; find a.

Problems 9 – 12, Solve each triangle PQR. Express lengths to nearest tenth and angle measures to nearest degree.

9. $\angle P = 40°, \angle Q = 20°, p = 3$

10. $\angle P = 63°, \angle R = 51°, q = 48$

11. $\angle P = 54.2°, \angle Q = 45.9°, r = 75.3$

12. $\angle P = 23.8°, \angle Q = 129.7°, p = 112$

Problems 13 – 16, Two sides and an angle are given. Determine whether the information results in one triangle, two triangles or no triangle at all. Solve any triangle(s) that results.

13. $\angle A = 67.8°, a = 74.5, b = 21.3$

14. $\angle A = 114°, a = 49, b = 54$

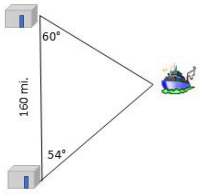
15. $\angle A = 29.8°, a = 28.6, b = 35.8$

16. $\angle C = 47.1°, b = 15.3, c = 11.9$

Problems 17 – 20, Solve each problem.

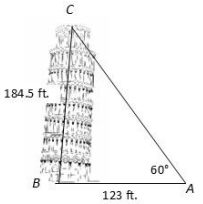
17. Medical Emergency. Two Coast Guard stations are 160 miles apart. A cruise ship sends an SOS call to dispatch an emergency medical helicopter for a sick passenger that each station receives. Station Sable reads that the ship is N 54°E, while Station Norma finds the ship is located at S 60°E, see diagram at right.

A) How far is the ship from each station?



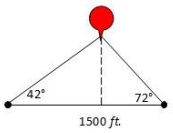
18. The Leaning Tower of Pisa originally stood 184.5 feet tall. In September 1995, the famous bell tower suddenly shifted 0.07 inch in one night. Engineers reinforced the base and the tower was reopened to tourists in December 2001. Suppose you are standing at a distance of 123 feet from the base of the tower. The angle of elevation to the top of the tower is 60°.

A) How many degrees is the tower leaning?



B) What is the height of the tower at this angle?

19. A used car lot has a large SALE balloon tied down to stakes 1500 feet apart. The angle of elevation from the stake at the west end of the lot to the balloon is 42°, and the angle of elevation from the stake at the east end of the lot to the balloon is 72°. What is the altitude of the balloon?



1800 ft.

Practice Sets

Lesson Warm-Ups

$A = 42°\ B = 38°\ a = 30.2$

$B = 62°\ b = 12\ c = 8$

3. Find the area of the triangle to the nearest square unit.
$A = 83°\ b = 9ft\ c = 6ft$

Name _____ Date _____ Period _____

Lesson 5.5: Law of Sines **Warm-Up # 2**

1. Solve the triangle, round lengths to the nearest tenths, angles to the nearest degree.
$A = 31°\ B = 72°\ a = 17.3$

2. How many triangles can be formed given the following meas
$B =$

3. Find the area of the triangle to the nearest square unit.
$A = 58°\ b = 8ft\ c = 10ft$

Daily Lesson Quiz

5.5 Law of Sines **Form A**

Name _____

Date _____ Period _____

1. Solve the triangle, round lengths to nearest tenth, angles to nearest degree.
$A = 48°, B = 32°\ a = 32.4$

2. How many triangles can be formed given the following measurements.
B= $78°, b = 18, c = 15$ [***zero, one, or two***]

3. Find the area of the triangle to the nearest square unit. $A = 96°, c = 5ft., b = 8ft.$

Grade:

5.5 Law of Sines **Form B**

Name _____

Date _____ Period _____

1. Solve the triangle, round lengths to nearest tenth, angles to nearest degree.
$A = 31°, B = 49°\ a = 28.6$

2. How many triangles can be formed given the following measurements.
B= $67°, b = 13, c = 17$ [***zero, one, or two***]

3. Find the area of the triangle to the nearest square unit. $A = 68°, c = 4in., b = 6in.$

Grade: