Math 20-2

Unit Two



Geometry: Part 2

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**3.1 Exploring Side-Angle Relationships**

***Learning Outcome:***

*To explore the relationship between each side in an acute triangle and the sine of its opposite angle.*

***Vocabulary:***

Acute Triangle: ­\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Oblique Triangle: ­\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

***Primary Trigonometric Ratios Review:***

When we calculate the measures of all the angles and all the lengths in a right triangle, we solve the triangle. We can use any of the three primary trigonometric ratios to do this.

The basic strategy to solve triangle is:

1. Notice where the acute angle is and label the sides opposite, adjacent and hypotenuse.

 2. Notice what is given and what you need to solve.

 3. Decide on a trigonometric ratio that can be used to solve

The following acronym can be helpful in remembering the ratios:

**SOH CAH TOA**

***Examples:***

1. Solve the following triangle:

 C

B

A

5 cm

12 cm

1. Solve the following triangle:

A

22cm

C

B

42˚

1. Given the following triangle and its measurements, what are two equivalent expressions that represent the height of ΔABC. (***Hint:*** *use the sine ratio*)

50.4˚

46.5˚

83.3˚

37.3cm

51.2cm

39.7cm

h

C

B

A

1. What can we conclude from our two equivalent expressions?

*.*

The ratios of are equivalent for the side-angle pairs in an acute triangle.

**Assignment:** Textbook Page 131 #1-4

**3.2 Proving and Applying the Sine Law**

***Learning Outcome:***

*Learn to explain the steps to prove the sine law. Use the sine law to solve triangles.*

***Investigation:***

Work with a partner to complete the following:

Given the triangle:

C

B

A

1. Draw in the height of the triangle (or altitude), and label it AD.
2. Using your triangle from step 1, label the hypotenuse sides of the two right angle triangles (using lower case *b* and *c*) , then use the sine ratio to solve for the height of the triangle (AD) using ∠C and ∠B:
3. What would you expect the values of two ratios to be?
4. Solve each expression for AD then set the expressions for AD equal to each other:
5. can be rewritten as , what steps did we need to do to get the simplified expression?

***The Sine Law***

If we draw in a different altitude for the original triangle:

C

A

B

and repeat the steps 1-6 we will get: .

If we put both equations together we get the complete sine law:

C

A

B

b

c

a

When would we need to use the sine law?

In order to use the sine law, what information do we need to know?

***Examples:***

1. Solve for side a:

 B

 

 c a

 A  C

 b = 15 cm

1. Solve Triangle DEF.

 E

 f d

D   F

 e = 54 cm

(***Hint:*** *To use the Law of Sines, you must first find the measure of Angle E*)

1. Solve for *d*:
2. Solve for *f*:

***Key Ideas:***

The sine law can be used to determine unknown side lengths or angle measures in acute triangles.

You can use the sine law to solve a problem modeled by an acute triangle when you know:

* Two sides and the angle opposite a known side

x

y

* Two angles and any side

x

If you know the measures of two angles in a triangle, you can determine the third angle because the angles must add to 180˚.

**Assignment:** Textbook Page 138 #1-5, 7, 8, 10, 12, 15, 17

**3.3 Proving and Applying the Cosine Law**

***Learning Outcome:***

*Learn to explain the steps used to prove the cosine law. Use the cosine law to solve triangles.*

***Investigation:***

Consider the two triangles given:

F

Q

f=3.6m

e=2.6m

d=2.5m

?

D

E

66˚

q=?

r=3.1m

s=3.2m

R

S

Can you solve for either of the triangles?

If not, what other information do you need to know?

***The Cosine Law***

In order to solve for either triangle another relationship is needed. This relationship is called the cosine law, and is derived from the Pythagorean theorem.

The cosine law describes the relationship between the cosine of an angle and the lengths of the three sides of any triangle.





***Using the Cosine Law to Solve for a Side***

Some oblique triangle cannot be solved using the Sine Law. Therefore when you are not given a side and its angle, you can use the Cosine Law.

***Examples:***

1. Solve for a:

 B

 c = 13.1cm a

 

 A C

 b = 12.6 cm

***Using the Cosine Law to Solve for an Angle***

There are times when the triangle we are trying to solve does not provide any angles of the triangle, but only sides. When this happens, we use the cosine law, but we need to solve for the angle in order to get the measure of the angle inside the triangle.

Use the cosine law: c² = a² + b² - 2abCosC and try to isolate CosC:

Whichever angle you are solving for, be sure to use its side as the *c* value.

***Examples:***

1. In triangle DEF, solve for angle D.

 E

 3.1

 6.4

 D

 4.2

 F

1. In ABC, a = 9, b = 7, and ∠C = 33.6˚. Sketch a diagram and determine the length of the unknown side and the measures of the unknown angles, to the nearest tenth.
2. With a partner, discuss the difference between the sine law and the cosine law. What information do you need in order to use each law?

**Assignment:** Textbook Page 150 #1-6, 8, 9, 13, 14

**3.4 Solving Problems Using Acute Triangles**

***Learning Outcome:***

*Learn to solve problems using the primary trigonometric ratios and the sine and cosine laws.*

***Investigation:***

With a partner, solve the following problem:

Determine the angles in the following scenario.

4.8m

θ

α

6 m

4.5 m

A

B

12 m

***Examples:***

1. Given the following dimensions:

5˚

40˚

42 m

A

D

B

C

h

How can you find the height (h)?

1. Given: (think in three-dimensions)

A

h

76˚

60˚

50˚

60m

C

B

D

Determine h:

1. To decide whether you need to use the sine or cosine law, you need to consider the given information of the triangle. With a partner, using the triangles below, create 4 different situations of given measurements (make these up) where you would need to use the sine and cosine law each twice.

**Assignment:** Textbook Page 161 #1-7, 11, 14