

Lesson 79 Objective: SWBAT solve triangles using the law of cosines.

Kickoff

1) Find BC

2) Find the area of a triangle with two sides that measure 6 yd and 2 yd with an included angle of 40° .

Handwritten notes:

$$x^2 = 15^2 + 20^2 - 2(15)(20)\cos(120)$$

$$x^2 = 225 + 400 - 600(-\frac{1}{2})$$

$$x^2 = 625 + 300 = 925$$

$$x = \sqrt{925} \approx 30.41$$

Area calculation:

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

$$A = \frac{1}{2}(6)(2)\sin(40)$$

$$A = 6\sin(40) \approx 3.86$$

Trig table:

	30	45	60	
sin	$\frac{1}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{2}$	opp/hyp
cos	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{1}{2}$	adj/hyp
tan	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	opp/adj

① $a=12, b=?$
 $12 = ab$
 $12 = 2b$
 $6 = b$

② $\cos C = \frac{1}{2}$
 $\cos^{-1}(\frac{1}{2}) = C$
 $C = 60^\circ$

Area: $A = \frac{1}{2}ab\sin C$
 $A = \frac{1}{2}(4)(5)\sin(60)$
 $A = 4(5)(\frac{\sqrt{3}}{2})$

Law of Cosines

Law of Cosines:
 $a^2 = b^2 + c^2 - 2bc\cos A$
 A is the included angle

USE LAW OF COSINES WHEN THE PROBLEM INCLUDES...
 3 sides and an angle

Example #1: In $\triangle ABC$, $b = 12$, $c = 20$, and $m\angle A = 40^\circ$. Find side a to the nearest integer.

Handwritten solution:

$$a^2 = 12^2 + 20^2 - 2(12)(20)\cos 40$$

$$\sqrt{a^2} = \sqrt{76.2986673}$$

$$a = 13$$

1) In $\triangle ABC$, $a = 3$, $b = 5$, and $c = 7$. What is $m\angle C$? *

Handwritten solution:

$$7^2 = 5^2 + 3^2 - 2(5)(3)\cos C$$

$$49 = 25 + 9 - 30\cos C$$

$$49 = 34 - 30\cos C$$

$$-34 - 34 = -30\cos C$$

$$\frac{15}{-30} = \frac{-30\cos C}{-30}$$

$$-\frac{1}{2} = \cos C$$

Reference angles:

- I $\theta = 60$
- II $\theta = 120$
- III $\theta = 180 - 60 = 120$
- IV $\theta = 240$

2) In $\triangle DEF$, if $d = \sqrt{3}$, $e = 4$, and $m\angle F = 30$. What is the length of f ?

Handwritten solution:

$$f^2 = 4^2 + (\sqrt{3})^2 - 2(4)(\sqrt{3})\cos 30$$

$$\sqrt{f^2} = \sqrt{7}$$

$$f = \sqrt{7} = 2.6$$

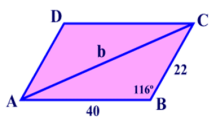
#2 $\angle B = 117.3$

#3 $b = 53$

#4 $a = 70\text{yd}$

Example #2: Find the largest angle, to the nearest tenth of a degree, of a triangle whose sides are 9, 12, and 18.

Example #3: In a parallelogram, the adjacent sides measure 40cm and 22cm. If the larger angle of the parallelogram measures 116° , find the diagonal, to the nearest integer



Example #4: Al is standing 50 yards from a maple tree and 30 yards from an oak tree in the park. His position is shown in the accompanying diagram. If he is looking at the maple tree, he needs to turn his head 120° to look at the oak tree. How many yards apart are the two trees?

