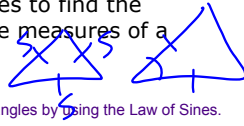


13.6 LAW OF COSINES.....page #

Objectives

Use the Law of Cosines to find the side lengths and angle measures of a triangle.



In the previous lesson, you learned to solve triangles by using the Law of Sines.

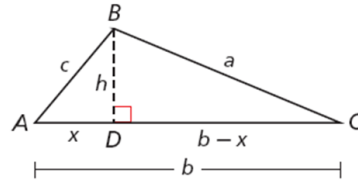
However, the Law of Sines cannot be used in triangles in which the following is given:

1. Side-Angle-Side (SAS)
2. Side-Side-Side (SSS)

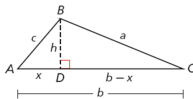
Instead, you must use the Law of Cosines.

Apr 23-8:58 AM

To derive the Law of Cosines, draw $\triangle ABC$ with altitude \overline{BD} . If x represents the length of \overline{AD} , the length of \overline{DC} is $b - x$.



Apr 23-9:00 AM



Write an equation that relates the side lengths of $\triangle BDC$.

$$a^2 = (b - x)^2 + h^2 \quad \text{Pythagorean Theorem}$$

$$a^2 = b^2 - 2bx + x^2 + h^2 \quad \text{Expand } (b - x)^2$$

$$a^2 = b^2 - 2bx + c^2 \quad \text{In } \triangle ABD, c^2 = x^2 + h^2.$$

$$a^2 = b^2 - 2b(c \cos A) + c^2 \quad \text{Substitute } c^2 \text{ for } x^2 + h^2.$$

$$a^2 = b^2 + c^2 - 2bccos A \quad \text{In } \triangle ABD, \cos A = \frac{x}{c} \text{ or } x = c \cos A. \text{ Substitute } c \cos A \text{ for } x.$$

Apr 23-9:03 AM

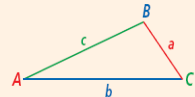
Law of Cosines

For $\triangle ABC$, the Law of Cosines states that

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

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

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



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

Apr 23-9:05 AM

What information do you know?
Which Law can you use?

1. Find c on triangle ABC.

Handwritten work:

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

$$c^2 = 8^2 + 5^2 - 2 \cdot 8 \cdot 5 \cdot \cos 32.2^\circ$$

$$\sqrt{c^2} = \sqrt{21.3}$$

$$c = 4.6$$

Apr 23-9:05 AM

What information do you know?
Which Law can you use?

2. Find $\angle C$ on triangle ABC.

Handwritten work:

$$7^2 = 8^2 + 9^2 - 2 \cdot 8 \cdot 9 \cdot \cos C$$

$$49 = 145 - 144 \cos C$$

$$-96 = -144 \cos C$$

$$\frac{-96}{-144} = \frac{-144 \cos C}{-144}$$

$$\cos^{-1}(\frac{2}{3}) = \cos^{-1}(\cos C)$$

$$\angle C = 48.2^\circ$$

Apr 23-9:07 AM

Try to get this one started by yourself!

Find ALL missing measures on triangle ABC.

3. $b = 23, c = 18, m\angle A = 173^\circ$

$a^2 = 18^2 + 23^2 - 2 \cdot 18 \cdot 23 \cdot \cos 173$
 $a^2 = \sqrt{1674.8}$
 $a = 40.9$

$\frac{\sin 173}{40.9} = \frac{\sin C}{18}$
 $\sin C \cdot 40.9 = \sin 173 \cdot 18$
 $\sin^{-1} \frac{18 \cdot \sin 173}{40.9}$
 $\sin C = .05 \dots$
 $\angle C = 3.1^\circ$

Apr 23-9:08 AM

Try to get this one started by yourself!

4. Solve the triangle. Round to the nearest tenth.

$35^2 = 42^2 + 50.3^2 - 2 \cdot 42 \cdot 50.3 \cdot \cos A$
 $\angle A$

Apr 23-9:09 AM

Assignment:

13.6 Practice B worksheet

omit problems 2,5,and 8

Apr 23-9:10 AM

$m =$

$m^2 = 8^2 + 14^2 - 2 \cdot 8 \cdot 14 \cdot \cos M$
 $\sqrt{m^2} = \sqrt{\dots}$
 $m =$

Apr 2-1:50 PM