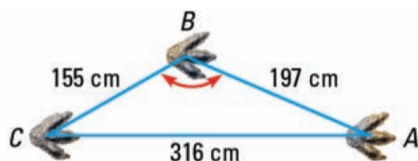


12.2 Law of Cosines

Brustasaurus: Nacho Average Dinosaur

Mr. Bean is an avid dinosaur hunter. In fact, he has his entire bedroom decked out in dino-sheets and posters. He decides to pursue his life passion: the Brustasaurus.

Bean can learn more about the Brustasaurus by examining its step angle. The closer the angle is to 180° , the more efficiently the dinosaur walked. The following BrustPrints were found by an ancient Nacho-stand:



Bean can use the **Law of Cosines** to find the step angle.

Law of Cosines

Let $\triangle ABC$ be any triangle with a , b , and c representing the measures of the sides opposite the angles with measurements A , B and C respectively. Then the following is true:

$$a^2 = b^2 + c^2 - 2bc \cos A \quad \text{or} \quad \cos A = \frac{b^2 + c^2 - a^2}{2bc}$$

$$b^2 = a^2 + c^2 - 2ac \cos B \quad \text{or} \quad \cos B = \frac{a^2 + c^2 - b^2}{2ac}$$

$$c^2 = b^2 + a^2 - 2ba \cos C \quad \text{or} \quad \cos C = \frac{b^2 + a^2 - c^2}{2ba}$$

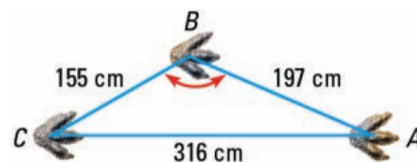
(for finding side lengths)

(for finding angle measures)

You can use the Law of Cosines to solve a triangle when you are given the following information:

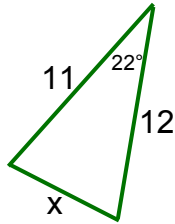
1. Two side measures and the angle between them. (SAS information)
2. Three side measures (SSS information)

Use the **Law of Cosines** to find the step angle.

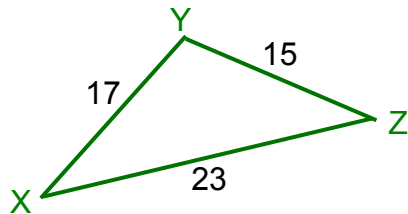


12.2 Law of Cosines

Example 1. Solve for x.



Example 2. Solve $\triangle XYZ$



You try! Solve $\triangle ABC$ with $A = 66^\circ$, $b = 16$, and $c = 21$.

Now summarize what you learned!

Skillz Review

Important Note: $(\sin x)(\sin x) = (\sin x)^2 = \sin^2 x$

$$\frac{5}{6} + \frac{1}{2} =$$

$$\frac{5x}{6} + \frac{x}{2} =$$

$$\frac{5 \sin x}{6} + \frac{\sin x}{2} =$$

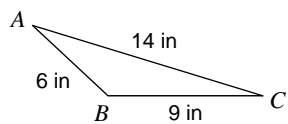
$$\left(\frac{3}{7}\right)^2 =$$

$$\left(\frac{3x}{7}\right)^2 =$$

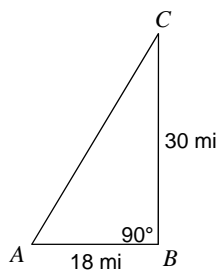
$$\left(\frac{3 \sin x}{7}\right)^2 =$$

Solve each triangle. Round your answers to the nearest tenth.

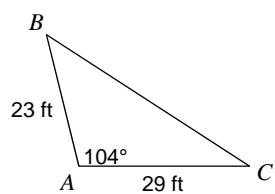
1)



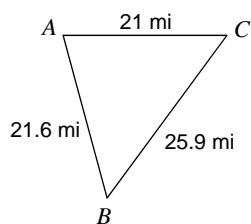
2)



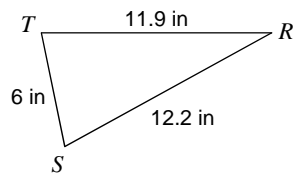
3)



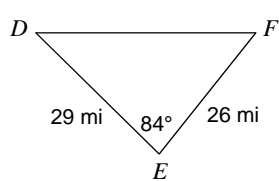
4)



5)



6)



7) $b = 15 \text{ km}$, $c = 17 \text{ km}$, $a = 28 \text{ km}$

8) In $\triangle ZXY$, $y = 68 \text{ yd}$, $m\angle Z = 144^\circ$, $x = 55 \text{ yd}$

9) In $\triangle QRP$, $p = 24 \text{ in}$, $m\angle Q = 102^\circ$, $r = 12 \text{ in}$

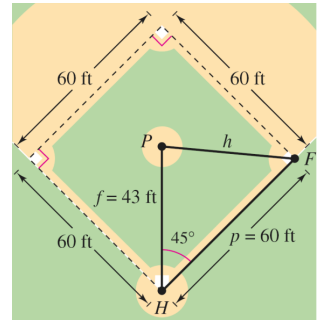
10) In $\triangle XYZ$, $z = 41 \text{ mi}$, $y = 48 \text{ mi}$, $x = 55 \text{ mi}$



APPLICATION 12.2

1. Solve $\triangle ABC$ if $b = 15$, $c = 13$ and $A = 50^\circ$
2. The Vietnam Veterans' Memorial in Washington, D.C. is in the shape of an unenclosed isosceles triangle (that is, V-shaped) with equal sides of length 246.75 feet and the angle between these sides measuring 125° . Find the distance between the ends of the two equal sides.
3. A parallelogram has a side of length 40 and a diagonal of length 75. If the angle between these two is 37° , find the length of the other side of the parallelogram.

4. The pitcher's mound on a women's softball field is 43 feet from home plate and the distance between the bases is 60 feet, as shown below. (The pitcher's mound is not halfway between home plate and second base.) How far is the pitcher's mound from first base?



5. A rhombus has side lengths of 25 inches. The diagonal opposite the obtuse angles is 45 inches. What is the measure of the obtuse angle to the nearest degree?