

Warm-up:

Jan. 6, 2016

Example 3: In triangle ABC, side b = 15 cm, side c = 26 cm, and the angle B is 34° . Solve the triangle.

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$\frac{a}{\sin A} = \frac{15}{\sin 34^\circ}$$

$$\frac{a}{\sin A} = \frac{15}{0.55919} \quad (\sin 34^\circ)$$

$$a = 25.2 \text{ cm}$$

$$\frac{\sin B}{b} = \frac{\sin C}{c}$$

$$\frac{\sin 34^\circ}{15} = \frac{\sin C}{26}$$

$$\frac{0.55919}{15} = \frac{\sin C}{26}$$

$$\sin C = 0.96926 \dots$$

$$\angle C = \sin^{-1}(0.96926)$$

$$\angle C = 75.76^\circ$$

Nov 27-9:34 AM

SAS

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

Jan 6-8:56 AM

Proving The Cosine Law:

Nov. 30, 2012
Jan. 6, 2016

Let ABC be a triangle with sides a , b , c . We will show

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

(The trigonometric functions are defined in terms of a right-angled triangle. Therefore it is

$$\frac{x}{a} = \cos C,$$

$x = a \cos C \dots\dots (1)$

Now, in the right triangle BDC, according to the Pythagorean theorem,

$$h^2 + x^2 = a^2,$$
so that

$$h^2 = a^2 - x^2 \dots\dots (2)$$

In the right triangle BDA,

$$\begin{aligned} c^2 &= h^2 + (b - x)^2 \\ &= h^2 + b^2 - 2bx + x^2 \\ &\quad (\text{The square of a binomial}) \end{aligned}$$

For h^2 , let us substitute line (2):

$$\begin{aligned} &= a^2 - x^2 + b^2 - 2bx + x^2 \\ &= a^2 + b^2 - 2bx. \end{aligned}$$

Finally, for x , let us substitute line (1):

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

That is,

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

May 23-3:12 PM

The Cosine Law

Two conditions.

SAS - Angle-side

1. SAS - looking for a side (given a contained angle)

$$\begin{aligned} a^2 &= b^2 + c^2 - 2bc \cos A \\ 20^2 &= 25^2 + c^2 - 2(25)(c) \cos(60^\circ) \\ 400 &= 625 + c^2 - 25c \\ c^2 - 25c + 225 &= 0 \\ (c-25)(c-15) &= 0 \\ c &= 25 \text{ m} \end{aligned}$$

SSS - Side-side-side

2. SSS - looking for an angle

$$\begin{aligned} a^2 &= b^2 + c^2 - 2bc \cos A \\ 9.7^2 &= 7.9^2 + 12.2^2 - 2(7.9)(12.2) \cos A \\ 94.09 &= 62.41 + 148.84 - 19.76 \cos A \\ 19.76 \cos A &= 180.53 - 236.68 \\ \cos A &= \frac{180.53}{236.68} = 0.7687 \dots\dots \\ A &= \cos^{-1}(0.7687) \\ A &= 40.29^\circ \end{aligned}$$

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Attachments

PM11-3s2.gsp