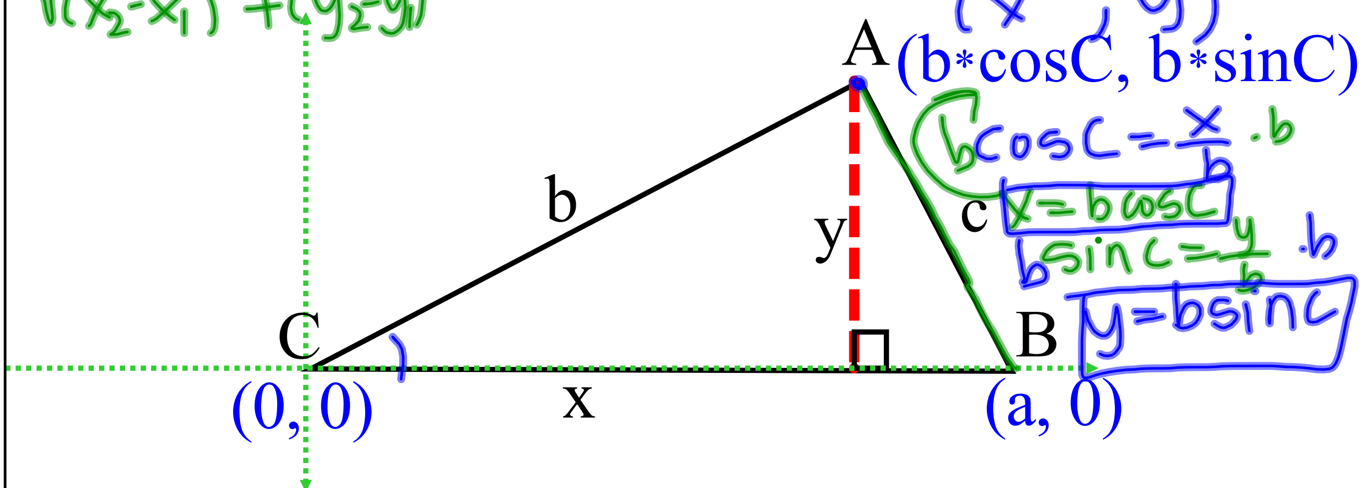
$\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$

5.6 Law of Cosines



$b\cos C = \frac{x}{b} \cdot b$

$\boxed{x = b\cos C}$

$b\sin C = \frac{y}{b} \cdot b$

$\boxed{y = b\sin C}$

using the distance formula, find c.

$$c^2 = (b\cos C - a)^2 + (b\sin C - 0)^2$$

$$= (b\cos C - a)(b\cos C - a) + b^2\sin^2 C$$

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

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

$$= b^2(\cos^2 C + \sin^2 C) + a^2 - 2ab\cos C$$

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

Law of Cosines

#48

$$c^2 = b^2 + a^2 - 2ab\cos C$$
$$b^2 = a^2 + c^2 - 2ac\cos B$$
$$a^2 = b^2 + c^2 - 2bc\cos A$$

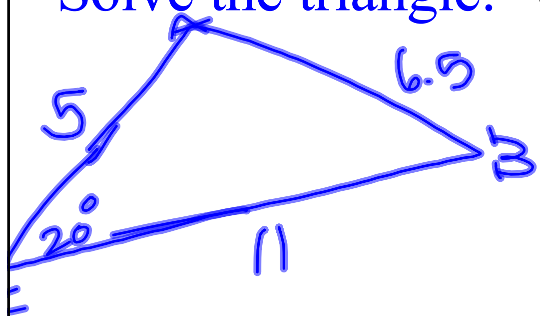
$$(side\ opp\ \measuredangle)^2 = (adj\ side)^2 + (adj\ side)^2 - 2(adj\ side)(adj\ side)\cos\measuredangle$$

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

use w/ SSS or SAS

or w/ SSA using quad formula

Solve the triangle: a = 11   b = 5   C = 20°



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

$c^2 = 11^2+5^2-2(11)(5)\cos 20°$

$c^2 = 42.6338$

$c = \boxed{6.5}$

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

$11^2 = 5^2+6.5^2 - \boxed{2(5)(6.5)\cos A}$

$\frac{\cancel{2(5)(6.5)}\cos A}{\cancel{2(5)(6.5)}} = \frac{5^2+6.5^2-11^2}{2(5)(6.5)}$

$A = \cos^{-1}\left(\frac{5^2+6.5^2-11^2}{2(5)(6.5)}\right) \approx \boxed{144.8°}$

$A = \cos^{-1}\left(\frac{b^2+c^2-a^2}{2bc}\right)$

$\angle 180-144.8-20 = \boxed{15.2°}$

Solve the triangle:

a = 19
b = 24
c = 27

$$A = \cos^{-1}\left(\frac{b^2+c^2-a^2}{2bc}\right) = \cos^{-1}\left(\frac{24^2+27^2-19^2}{2(24)(27)}\right)$$

$$\boxed{\approx 43.248^\circ}$$

$$\cos^{-1}\left(\frac{19^2+27^2-24^2}{2(19)(27)}\right) \boxed{\approx 59.935^\circ}$$

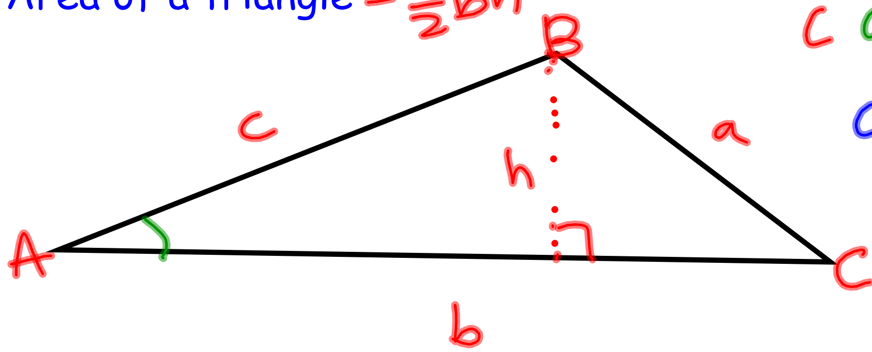
$$\angle C = 180 - 59.935 - 43.248$$

$$\approx \boxed{76.817^\circ}$$

$$\measuredangle = \cos^{-1}\left(\frac{opp^2 - adj^2 - adj^2}{-2(adj)(adj)}\right)$$

$$\measuredangle = \cos^{-1}\left(\frac{adj^2 + adj^2 - opp^2}{2(adj)(adj)}\right)$$

Area of a triangle $= \frac{1}{2}bh$



$$c \sin A = \frac{h}{c} \cdot c$$

$$c \sin A = h$$

$$\frac{1}{2}bh = \boxed{\begin{aligned} &\tfrac{1}{2}bc\sin A \\ &\tfrac{1}{2}ac\sin B \\ &\tfrac{1}{2}ab\sin C \end{aligned}}$$

Heron's Formula

For any triangle ABC with sides a, b, c the semi~~peremter~~ perimeter is:

$$s = \boxed{\frac{a+b+c}{2}}$$

The area of that triangle can be found using heron's formula:

$$area : \boxed{\sqrt{s(s-a)(s-b)(s-c)}}$$

$a, \quad b, \quad c$

$a=3 \quad b=5$

$c=8$

no triangle

$a+b>c$

$c+b>a$

$a+c>b$

There is a triangle!

Find the area of the triangle with side lengths $a = 13$, $b = 15$, $c = 18$

Is it a triangle?

a = 8.2, b = 12.5, c = 28