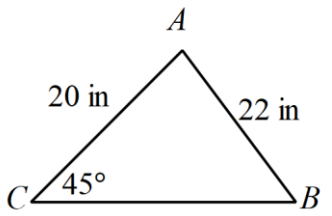
7.4

Date: 1/29/24

Objective: I can use law of cosines to find angles and sides of triangles.

Starter: (Round answers to the nearest tenth.)

1. Use law of Sines to find $m\angle B$



2. Solve for x.

$5 = 4 + 10 - 9x$

$5 = 14 - 9x$

$-14 \quad -14$

$-9 = -9x$

$x = 1$

3. Solve for *x*.

$10 = 8 + 9 - 3x$

$-8 \quad -8 \quad -9$

-9

$-7 = -3x$

$x = \frac{7}{3}$

4. Solve for *x*.

$12^2 = 3^2 + 5^2 - 2(3)(5)x$

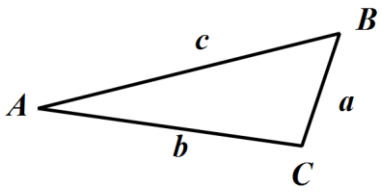
$-3^2 \quad -3^2 - 5^2$

-5^2

$110 = -30x$

$x = \frac{11}{-3}$

A. Law of Cosines



★ When do you use Law of Cosines?

- SSS
- SAS

Law of Cosines:

Solve for the *largest* side or angle first.

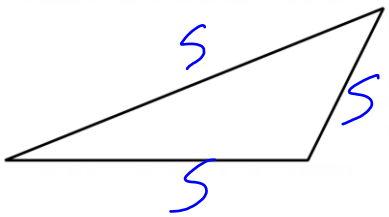
$$c^2 = a^2 + b^2 - 2ab\cos C$$

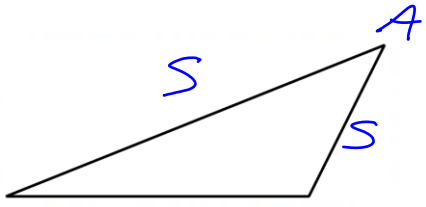
or

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

or

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

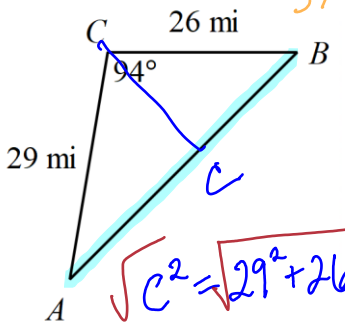




Examples: Find each measurement indicated. Round your answers to the nearest tenth.

5. Find AB

SAS



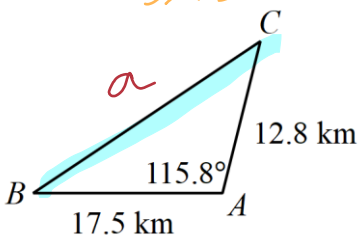
c

$\sqrt{c^2} = \sqrt{29^2 + 26^2 - 2(29)(26)\cos 94^\circ}$

$c \approx 40.3$ mi

6. Find BC

SAS

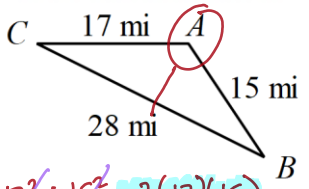


$a = \sqrt{17.5^2 + 12.8^2 - 2(17.5)(12.8)\cos 115.8^\circ}$

$a \approx 25.8$ km

7. Find $m\angle A$

SSS



$28^2 = 17^2 + 15^2 - 2(17)(15)\cos A$

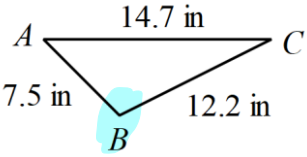
$-17^2 \quad -17^2 \quad -15^2$

$\frac{270}{-510} = \frac{-510\cos A}{-510}$

$\cos^{-1}\left(\frac{270}{-510}\right) = A \approx 122.0^\circ$

8. Find $m\angle B$

SSS



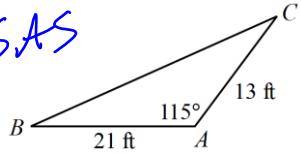
$14.7^2 = 7.5^2 + 12.2^2 - 2(7.5)(12.2)\cos B$

$11 = -183\cos B$

$\cos^{-1}\left(\frac{11}{-183}\right) = B \approx 93.4^\circ$

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

1. SAS



$m\angle A =$ 115° $\quad a =$ 29.0 ft

$m\angle B =$ 24.0° $\quad b =$ 13ft

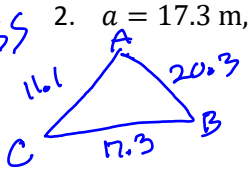
$m\angle C =$ 41.0° $\quad c =$ 21ft

$a = \sqrt{13^2 + 21^2 - 2(13)(21)\cos 115^\circ}$

$\left(\frac{\sin B}{13} = \frac{\sin 115^\circ}{29.0}\right)13$ $\quad \sin^{-1}\left(\frac{13\sin 115^\circ}{29}\right) = B$

2. $a = 17.3$ m, $b = 11.1$ m, $c = 20.3$ m

SSS



★ ALWAYS do big side 1st

$m\angle A =$ 58.4° $\quad a =$ 17.3m

$m\angle B =$ 33.1° $\quad b =$ 11.1 m

$m\angle C =$ 88.5° $\quad c =$ 20.3 m

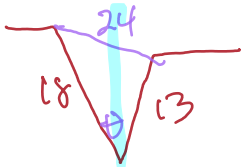
$\left(\frac{\sin B}{11.1} = \frac{\sin 88.5^\circ}{20.3}\right)11.1$ $\quad \sin^{-1}\left(\frac{11.1\sin 88.5^\circ}{20.3}\right)$

$20.3^2 = 17.3^2 + 11.1^2 - 2(17.3)(11.1)\cos C$

$-10.4 = -384.1\cos C$

$\cos^{-1}\left(\frac{-10.4}{-384.1}\right) = C$

One side of a ravine is 18 feet long. The other side is 13 feet long. A 24 foot zipline runs from the top of one side of the ravine to the other. To the nearest tenth, at what angle do the sides of the ravine meet?



θ = angle at bottom of ravine

$24^2 = 18^2 + 13^2 - 2(18)(13)\cos\theta$

$83 = -468\cos\theta$

$\cos^{-1}\left(\frac{83}{-468}\right) = \theta$

$\theta \approx 100.2^\circ$