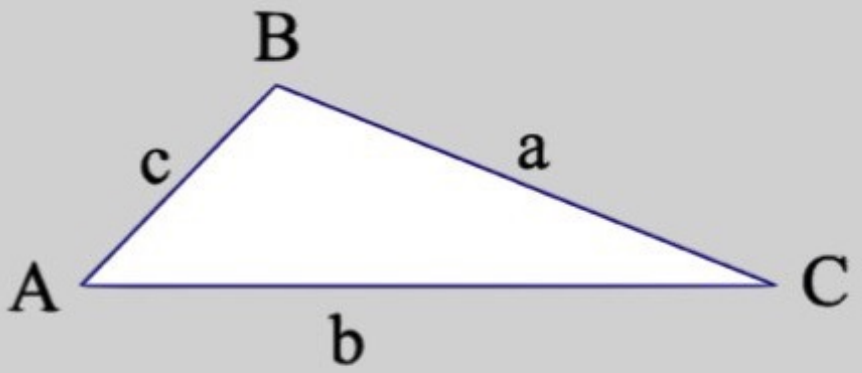
10.2 Law of Cosines

LAW OF COSINES

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



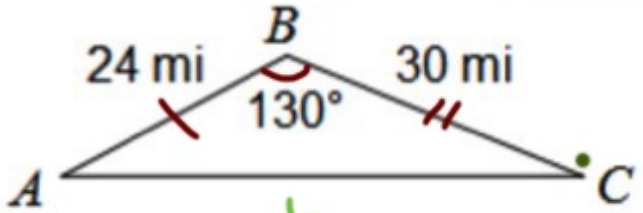
opposite side / angle

are on opposite sides of the equation

SAS → find a side "c"

SSS → find an angle "C"

N. Find *AC*. (SAS → cosines)



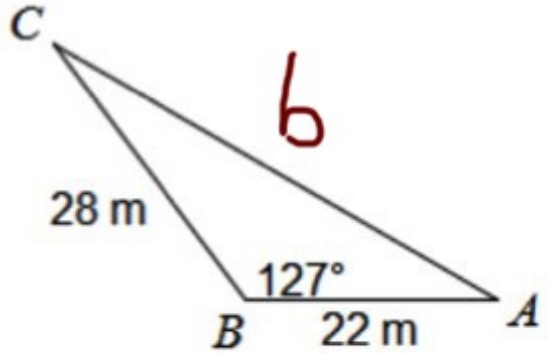
$b^2 = 24^2 + 30^2 - 2(24)(30)\cos 130°$

plug into calc on same line

$\sqrt{b^2} = \sqrt{2401.61}$

$b = 49.01$ mi

O. Find *AC*.

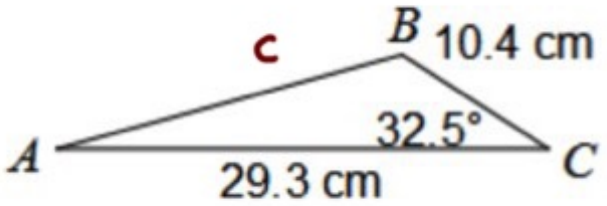


$b^2 = 28^2 + 22^2 - 2(28)(22)\cos 127°$

$\sqrt{b^2} = \sqrt{2009.44}$

$b = 44.83$ cm

P. Find *AB*.

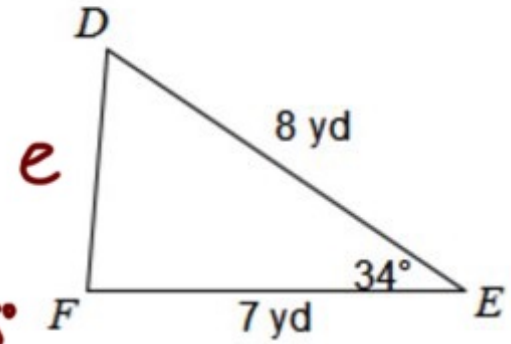


$c^2 = 10.4^2 - 29.3^2 - 2(29.3)(10.4)\cos 32.5°$

$c^2 = 452.65$

$c = 21.28$ cm

Q. Find *DF*.

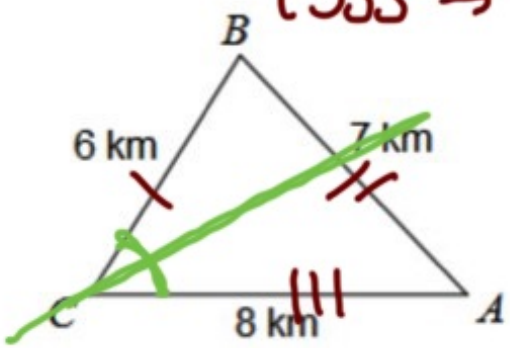


$e^2 = 7^2 + 8^2 - 2(7)(8)\cos 34°$

$e^2 = 20.15$

$e = 4.49$ yd

R. Find $m\angle C$. (SSS → cosines)



$7^2 = 6^2 + 8^2 - 2(6)(8)\cos C$

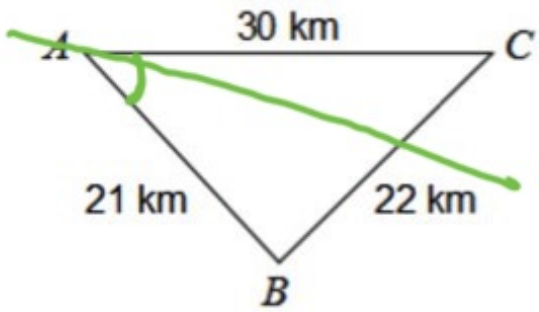
$49 = 100 - 96\cos C$

$-100 \quad -100$

$\frac{-51}{-96} = \frac{-96\cos C}{-96}$

$\cos^{-1}(\cos C) = \cos^{-1}(0.531)$ → $C = 58°$

S. Find $m\angle A$.



$22^2 = 21^2 + 30^2 - 2(21)(30)\cos A$

$484 = 1341 - 1260\cos A$

$-1341 \quad -1341$

$\frac{-857}{-1260} = \frac{-1260\cos A}{-1260}$

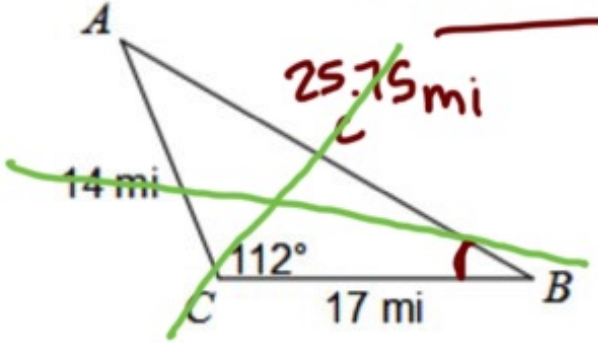
$\cos^{-1}(\cos A) = \cos^{-1}(0.68)$

$A = 47°$

EXAMPLE

Use the Law of Sines AND the Law of Cosines to find each measure indicated. If there is not enough information, write NEI.

T. Find $m\angle B$.



SAS → use cosines to find c

$c^2 = 14^2 + 17^2 - 2(14)(17)\cos 112°$

$\sqrt{c^2} = \sqrt{663.31}$

$c = 25.75$ mi

Use law of sines to find B

$\frac{14}{1} \cdot \frac{\sin B}{14} = \frac{\sin 112°}{25.75} \cdot \frac{14}{1}$ → $\sin^{-1}(\sin B) = \sin^{-1}(0.504)$

$B = 30°$

LAW OF SINES

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C} \quad \left| \quad \frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c} \right.$$

Use when:

AAS
ASA
> find side

SSA → find angle

LAW OF COSINES

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

Use when:

SAS → find side

SSS → find angle