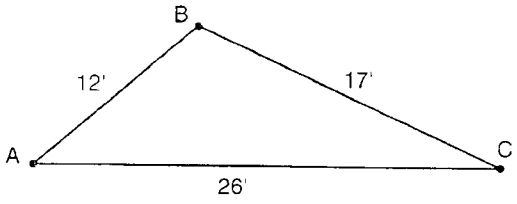
The Law of Sines and Cosines

Name_____

Find the missing part:

ROUND EVERYTHING TO 100THS



1. Find measure of angle B

SSS (LAW OF COSINES)

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

$26^2 = 17^2 + 12^2 - 2(17)(12)\cos \angle B$

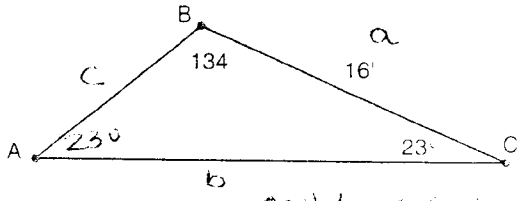
$676 = 144 + 289 - 408 \cos \angle B$

$243 = -408 \cos \angle B$

$\frac{243}{-408} = \cos \angle B$

$\cos^{-1}\left(\frac{243}{-408}\right) = m\angle B$

$\approx 126.56°$



TO GET $m\angle A$

$180 - 134 = 46$

$46 - 23 = 23$

OR ISOS $\triangle$ SO 16', $\overline{AC}$

2. Find the length of AC

ASA (LAW OF SINES)

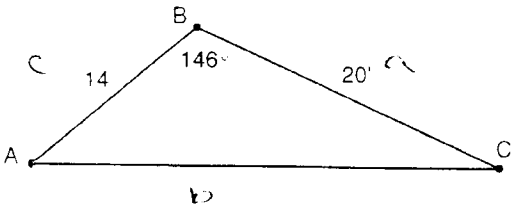
$\frac{\sin(23)}{c} = \frac{\sin(134)}{b} = \frac{\sin(23)}{16}$

NOT NEEDED

$16 \cdot \sin(134) = b \sin(23)$

$\frac{16 \cdot \sin(134)}{\sin(23)} = b$

$29.46' \approx m\overline{AC}$



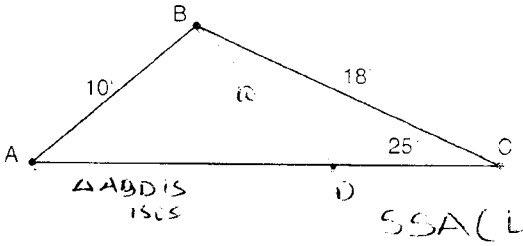
3. Find the length of AC

SAS (LAW OF COSINES)

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

$= 20^2 + 14^2 - 2(20)(14)\cos(146)$

$\approx 32.56'$

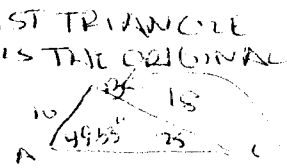


$\triangle ABD$ IS ISOS

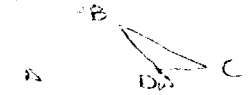
SSA (LAW OF SINES)

4. Draw the two possible triangles, and find the measure of angle B in each one

1ST TRIANGLE IS THE ORIGINAL



2ND TRIANGLE IS $\triangle BDC$.



SINCE $\triangle ABD$ IS ISOS

$m\angle BDA \cong m\angle DBA \cong 49.53$

$m\angle BDC + m\angle BDA$ (LINEAR PAIR)

SO $180 - 49.53$

$m\angle BDC \approx 130.47$

$m\angle B$ HERE IS

$180 - 130.47 - 25$

$\approx 24.53°$

$\frac{\sin 25}{10} = \frac{\sin A}{18}$

$\sin A = \frac{18 \cdot \sin 25}{10}$

$A = \sin^{-1}\left(\frac{18 \cdot \sin 25}{10}\right)$

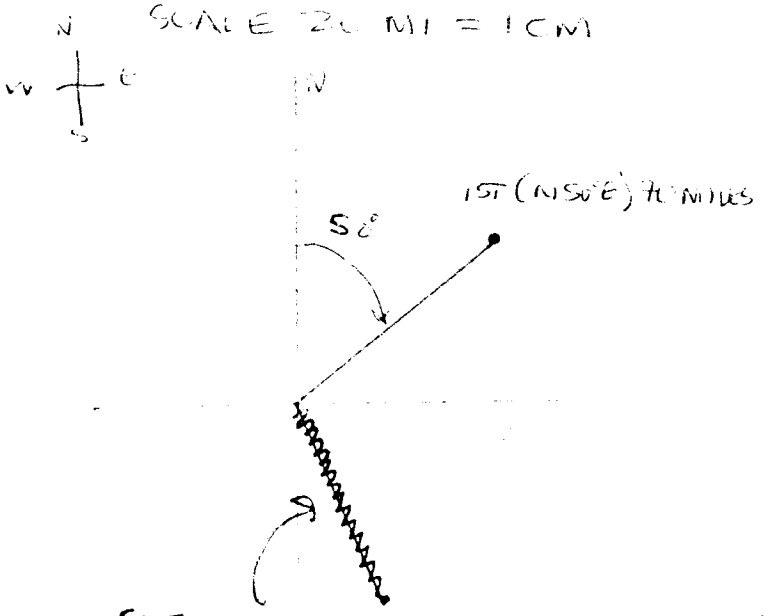
$\approx 49.53°$

$\therefore m\angle B = 180 - 25 - 49.53$

$\approx 105.47°$

5. Make a careful drawing using a protractor and ruler. Use a red pencil for the second leg of the trip. SCALE 20 mi = 1 cm

Super Duck decided to go on a trip. Super Duck started out on a heading N 50° E for 70 miles. After traveling the 70 miles, the scenery seemed to be more interesting at a heading of S 20° W so Super Duck changed her direction for the next 100 miles. How far was Super Duck from her starting position? What heading should she take to get back to where she started from? Make a careful drawing using a protractor and ruler. SCALE 20 mi = 1 cm. Estimate your answer and then PROVE MATHEMATICALLY THAT YOU ARE CORRECT!



≈ 2.6 cm
OR 52 miles

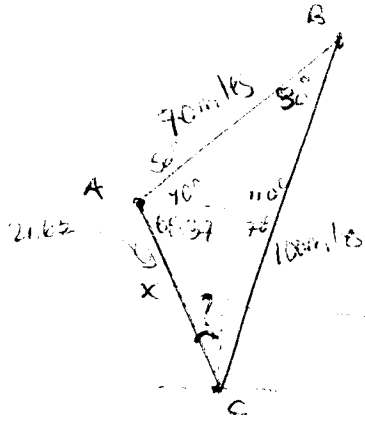
MATHEMATICALLY PROVE?
LAW OF COSINE (SAS)
m∠B = 30° (ALT. INT ∠s ≅ when lines are ||)

$x^2 = 70^2 + 100^2 - 2(70)(100)\cos 30$

$x^2 \approx 2775.64431$

$x \approx 52.68$ miles

PRETTY CLOSE!



USE LAW OF COSINES TO FIND ∠C

$52.68^2 = 2775.64431 + 100^2 - 2(52.68)(100)\cos\angle C$

$-2775.64 = -10536.9\cos\angle C$

$\frac{-2775.64}{-10536.9} = \cos\angle C$

$\cos\left(\frac{2775.64}{10536.9}\right) = \angle C \approx 41.63°$

PART 2 HEADINGS TO GET BACK TO POINT A

N ? W FOR 52.68 miles

≈ 21.63°