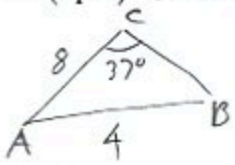
Trigonometry — Joysheet 6
MAT 145, Spring 2017 — D. Ivanšić

Name: Saul Ocean

Covers: 8.1, 8.2 *Show all your work!*

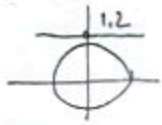
1. (4pts) Solve the triangle: $c = 4$, $C = 37°$, $b = 8$.



$\frac{8}{\sin B} = \frac{4}{\sin 37°}$

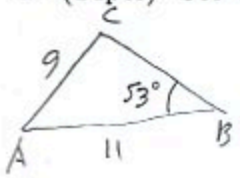
$8\sin 37° = 4\sin B$

$\sin B = \frac{8\sin 37°}{4} = \underbrace{1.20363}_{>1}$



no solution to this equation

2. (14pts) Solve the triangle: $b = 9$, $c = 11$, $B = 53°$



$\frac{9}{\sin 53°} = \frac{11}{\sin C}$

$9\sin C = 11\sin 53°$

$\sin C = \frac{11\sin 53°}{9} = 0.9761$

$C = \arcsin 0.97611$

$C = 77.450873$

OR $C = 180° - \arcsin 0.97611$

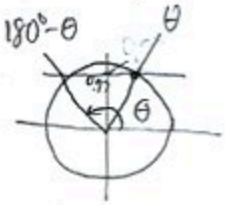
$C = 102.549127°$

$A = 180° - (53° + 77.45..°)$

$= 49,549127$

$A = 180° - (53° + 102,54..°)$

$= 24.450873$



$\frac{a}{\sin 49.45..} = \frac{9}{\sin 53°}$

$a\sin 53° = 9\sin 49.45..$

$a = \frac{9\sin 49.45..}{\sin 53°}$

$a = 8.575455$

$\frac{a}{\sin 24.45..} = \frac{9}{\sin 53°}$

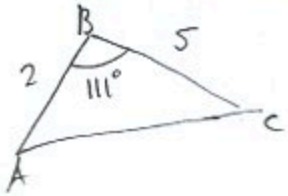
$a\sin 53° = 9\sin 24.45..$

$a = \frac{9\sin 24.45..}{\sin 53°}$

$a = 4.664476$

(two solutions)

3. (9pts) Solve the triangle: $a = 5$, $c = 2$, $B = 111°$.



$b^2 = 5^2 + 2^2 - 2\cdot 5\cdot 2\cdot\cos 111°$

$b^2 = 29 - 20\cos 111° = 36.167..$

$b = 6.01393$

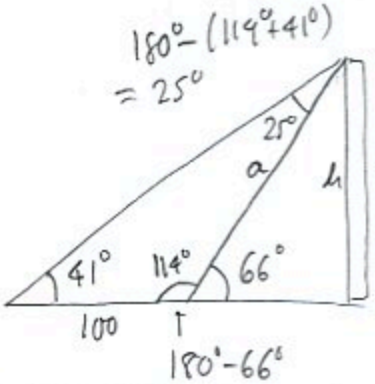
$\cos C = \frac{5^2 + 6.013..^2 - 2^2}{2\cdot 5\cdot 6.01393..} = 0.950582$

$C = \arccos 0.95.. = 18.087716°$

$A = 180° - (111° + 18.087..°)$

$= 50.912284$

4. (10pts) Observing a building, you find that the angle of elevation to its top is 41°. Then you move toward the building 100 feet and get an angle of elevation of 66° to the top of the building. How tall is the building? (Draw a picture.)



$\frac{h}{a} = \sin 66°$ need a

$h = a \sin 66°$

$= 155.23\ldots \cdot \sin 66°$

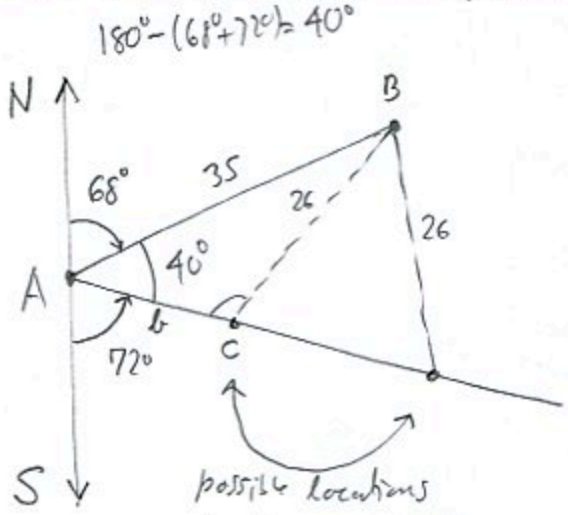
$= 141.915866$ ft

$\frac{a}{\sin 41°} = \frac{100}{\sin 25°}$

$a \sin 25° = 100 \sin 41°$

$a = \frac{100 \sin 41°}{\sin 25°} = 155.236\ldots$

5. (14pts) Naval rescue base B is located 35 kilometers N68°E from naval rescue base A. A ship in distress has position S72°E of base A and is 26 kilometers from base B. This allows for two possibilities for the ship's position (draw the picture). Assuming the position that is closer to base A, how far is the ship from base A?



$\frac{26}{\sin 40°} = \frac{35}{\sin C}$

$26 \sin C = 35 \sin 40°$

$\sin C = \frac{35 \sin 40°}{26} = 0.865291$

Angle at C is obtuse, so take $C = 180° - \arcsin 08\ldots$

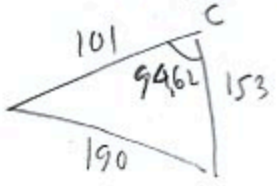
$C = 120°.084648$

So $B = 180° - (120.08\ldots° + 40°) = 19.915552\ldots°$

$\frac{b}{\sin 19.91\ldots°} = \frac{26}{\sin 40°}$ $\quad b = \frac{26 \sin 19.91\ldots}{\sin 40°} = 13.778539$

distance from ship to A is 13.778539 km

6. (9pts) A triangular plot of land with side lengths 101, 153 and 190 meters is being considered for purchase. What is its area?



$\text{Area} = \frac{1}{2} \cdot 101 \cdot 153 \cdot \sin C = \frac{1}{2} \cdot 101 \cdot 153 \cdot \sin 94.62\ldots = 7701.382733$ square meters

$\cos C = \frac{101^2 + 153^2 - 190^2}{2 \cdot 101 \cdot 153} = -0.080567$

$C = \arccos(-0.08\ldots) = 94.621151°$