Trigonometry — Joysheet 6 MAT 145, Spring 2025 — D. Ivanšić	Name: Saul Ocean *Covers: 8.1, 8.2* *Show all your work!*

1. (7pts) Solve the triangle: $a = 5$, $C = 28°$, $A = 50°$.

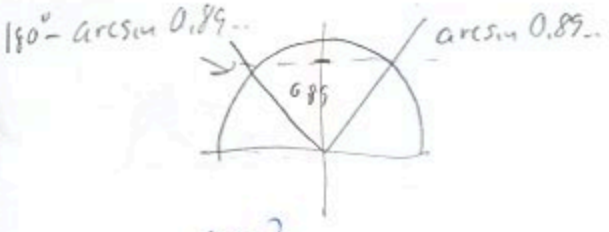
$\frac{5}{\sin 50°} = \frac{c}{\sin 28°}$ $\quad B = 180° - (28° + 50°) = 102°$ $\quad \frac{5}{\sin 50°} = \frac{b}{\sin 102°}$

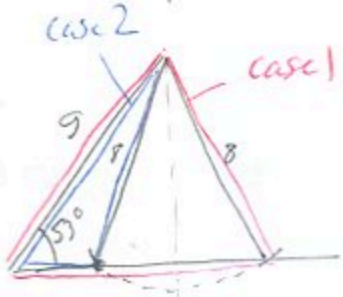
$c = \frac{5 \sin 28°}{\sin 50°} = 3.064258$ $\quad b = \frac{5 \sin 102°}{\sin 50°} = 6,384405$

2. (12pts) Solve the triangle: $c = 9$, $a = 8$, $A = 53°$

$\frac{8}{\sin 53°} = \frac{9}{\sin C}$

$\sin C = \frac{9 \sin 53°}{8} = 0.898465$





case 1

$C = \arcsin 0,89...$
$= 63,95702$

$B = 180° - (53° + 63,95...)$
$= 63.042981$

$\frac{b}{\sin 63,04...} = \frac{8}{\sin 53°}$

$b = \frac{8 \sin 63,04...}{\sin 53°} = 8.928697$

case 2

$C = 180° - \arcsin 0,89...$
$= 116.042981$

$B = 180° - (53° + 116,04...)$
$= 10,95702$

$\frac{b}{\sin 10,95...} = \frac{8}{\sin 53°}$

$b = \frac{8 \sin 10,95...}{\sin 53°} = 1,903973$

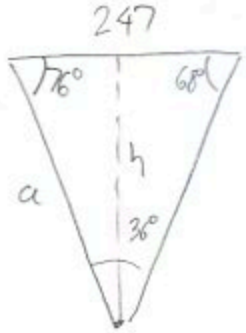
3. (7pts) Solve the triangle: $a = 5$, $b = 3$, $c = 6$.

$\cos C = \frac{5^2 + 3^2 - 6^2}{2 \cdot 3 \cdot 5} = -\frac{2}{2 \cdot 15} = -\frac{1}{15}$ $\quad C = \arccos\left(-\frac{1}{15}\right) = 93,822554°$

$\cos A = \frac{3^2 + 6^2 - 5^2}{2 \cdot 3 \cdot 6} = \frac{20}{36} = \frac{5}{9}$ $\quad A = \arccos \frac{5}{9} = 56,251011$

$B = 180° - (93,82° + 56,25...) = 29,926435$

4. (10pts) A straight bridge over a canyon is 247 meters long. Observed from the ends of the bridge, the bottom of the canyon has angles of depression 76° and 68°. How high above the bottom of the canyon is the bridge? (Draw a picture.)



$h = ?$

$180° - (76° + 68°) = 36°$

$\frac{247}{\sin 36°} = \frac{a}{\sin 68°}$

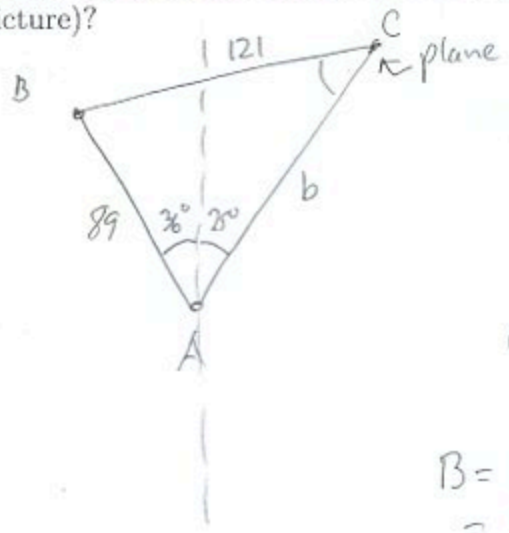
$a = \frac{247}{\sin 36°} \cdot \sin 68° = 389.62759$

$\frac{h}{a} = \sin 76°$

$h = a \sin 76° = 389.62.. \sin 76°$

$= 378.049134$ meters

5. (14pts) Airport B is located 89 miles N36°W from airport A. A plane is 121 miles from airport B and has position N25°E of airport A. How far is the plane from airport A (draw a picture)?



$\frac{121}{\sin 61°} = \frac{89}{\sin C}$

$\sin C = \frac{89 \sin 61°}{121} = 0.643315$

$C = \arcsin 0.64..$

$= 40.039481$

or $C = 180° - \arcsin 0.64$

$= 139.96..$

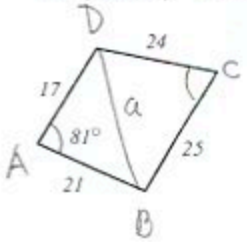
too big, $139.96 + 61 > 180°$

$B = 180° - (61° + 40.03..)$

$= 78.960519$

$\frac{121}{\sin 61°} = \frac{b}{\sin 78.96°}$ $\quad b = \frac{121 \sin 78.96°}{\sin 61} = 135.785817$ miles

6. (10pts) Determine the area of the pictured quadrangle.



$a^2 = 17^2 + 21^2 - 2 \cdot 17 \cdot 21 \cdot \cos 81°$

$= 618.30..$

$a = \sqrt{618.30..} = 24.865755$

$\cos C = \frac{24^2 + 25^2 - 24.86..^2}{2 \cdot 24 \cdot 25} = 0.485579$

$C = \arccos 0.485.. = 60.949618$

$\text{Area} = \frac{1}{2} 17 \cdot 21 \cdot \sin 81° + \frac{1}{2} 24 \cdot 25 \sin 60.94.. = 438.560288 \text{ unit}^2$