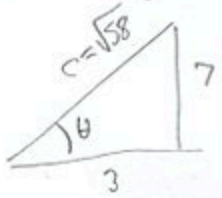
Trigonometry — Joysheet 1
MAT 145, Spring 2025 — D. Ivanšić

Name: Saul Ocean

Covers: 6.1, 6.2 *Show all your work!*

1. (8pts) If θ is an acute angle, find the values of all the trigonometric functions of θ given that $\tan\theta = \frac{7}{3}$.



$\tan\theta = \frac{7}{3} = \frac{opp}{adj}$

$c^2 = 3^2 + 7^2$

$c^2 = 58$

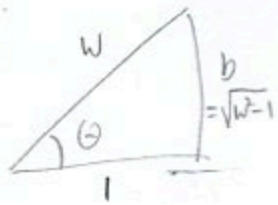
$c = \pm\sqrt{58} = \sqrt{58}$ since $c > 0$

$\sin\theta = \frac{7}{\sqrt{58}}$ $\quad \csc\theta = \frac{\sqrt{58}}{7}$

$\cos\theta = \frac{3}{\sqrt{58}}$ $\quad \sec\theta = \frac{\sqrt{58}}{3}$

$\tan\theta = \frac{7}{3}$ $\quad \cot\theta = \frac{3}{7}$

2. (8pts) If θ is an acute angle, find the values of all the trigonometric functions of θ given that $\sec\theta = w$, where w is some number.



$\sec\theta = w$

$\frac{1}{\cos\theta} = w$

$\cos\theta = \frac{1}{w} = \frac{adj}{hyp}$

$b^2 + 1^2 = w^2$

$b^2 = w^2 - 1$

$b = \pm\sqrt{w^2-1} = \sqrt{w^2-1}$ since $b > 0$

$\sin\theta = \frac{\sqrt{w^2-1}}{w}$ $\quad \csc\theta = \frac{w}{\sqrt{w^2-1}}$

$\cos\theta = \frac{1}{w}$ $\quad \sec\theta = w$

$\tan\theta = \frac{\sqrt{w^2-1}}{1} = \sqrt{w^2-1}$ $\quad \cot\theta = \frac{1}{\sqrt{w^2-1}}$

3. (10pts) Given that $\sin 22° = a$, $\tan 15° = b$, $\csc 4° = c$ and $\cot 70° = d$, use basic and cofunction identities to express the following quantities using a, b, c and d.

$\cot 75° = \tan 15° = b$

$\sin 4° = \frac{1}{\csc 4°} = \frac{1}{c}$

$\cos 68° = \sin 22° = a$

$\tan 70° = \frac{1}{\cot 70°} = \frac{1}{d}$

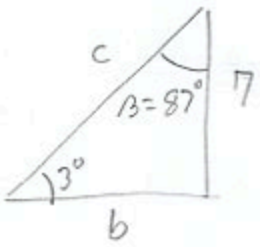
$\sec 86° = \csc 4° = c$

$\sec 68° = \frac{1}{\cos 68°} = \frac{1}{\sin 22°} = \frac{1}{a}$

$\cot 20° = \tan 70° = \frac{1}{\cot 70°} = \frac{1}{d}$

$\cot 15° = \frac{1}{\tan 15°} = \frac{1}{b}$

4. (10pts) Solve the right triangle (that is, find all sides and angles), if $a = 7$, $\alpha = 3^\circ$.



$\frac{7}{c} = \sin 3^\circ$

$7 = c \sin 3^\circ$

$c = \frac{7}{\sin 3^\circ} =$

$= 133.751258$

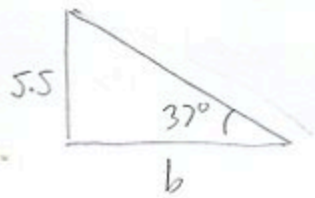
$\frac{7}{b} = \tan 3^\circ$

$7 = b \tan 3^\circ$

$b = \frac{7}{\tan 3^\circ} = 133.567957$

$B = 90^\circ - 3^\circ = 87^\circ$

5. (10pts) If the angle of elevation to the sun is 37°, how long is the shadow of a 5.5 ft tall woman?

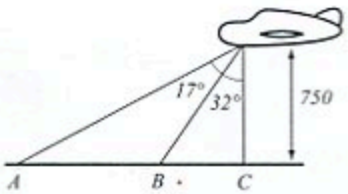


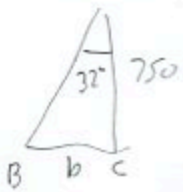
$\frac{5.5}{b} = \tan 37^\circ$

$5.5 = b \tan 37^\circ$

$b = \frac{5.5}{\tan 37^\circ} = 7.298747 \text{ ft}$

6. (14pts) An airplane flying over a straight road passes directly over point C at altitude 750 meters and observes that the angles subtending segments AB and BC are 17° and 32°. How long are the segments AB and AC?

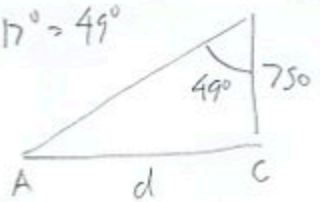




$\frac{b}{750} = \tan 32^\circ$

$b = 750 \tan 32^\circ = 468.652014 = BC$

$32^\circ + 17^\circ = 49^\circ$



$\frac{d}{750} = \tan 49^\circ$

$d = 750 \tan 49^\circ = 862.776305 = AC$

$\Delta B = AC - BC = d - b = 394.124292$