Algebra and Trigonometry — Joysheet 10
MAT 150, Fall 2017 — D. Ivanšić

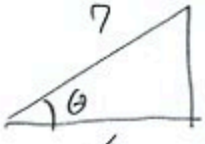
Name: Saul Ocean

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 $\sec\theta = \frac{7}{4}$.

$\sec\theta = \frac{7}{4}$ $\quad \sin\theta = \frac{\sqrt{33}}{7}$ $\quad \csc\theta = \frac{7}{\sqrt{33}}$

$\cos\theta = \frac{4}{7}$ $\quad \tan\theta = \frac{\sqrt{33}}{4}$ $\quad \cot\theta = \frac{4}{\sqrt{33}}$



$b = \sqrt{33}$

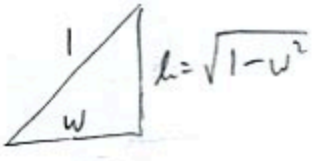
$4^2 + b^2 = 7^2$ $\quad |-4^2$

$b^2 = 33$

$b = \pm\sqrt{33}$

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

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



$a = \sqrt{1-w^2}$

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

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

$a^2 + w^2 = 1^2$

$a^2 = 1 - w^2$

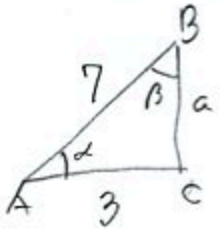
$a = \pm\sqrt{1-w^2}$

3. (10pts) Given that $\cos 18° = a$, $\sin 73° = b$, $\tan 22° = c$ and $\csc 61° = d$, use basic and cofunction identities to express the following quantities using a, b, c and d.

$\cos 17° = \sin 73° = b$ $\quad \csc 73° = \frac{1}{\sin 73°} = \frac{1}{b}$ $\quad \sin 61° = \frac{1}{\csc 61°} = \frac{1}{d}$ $\quad \sec 29° = \csc 61° = d$

$\sin 72° = \cos 18° = a$ $\quad \sec 18° = \frac{1}{\cos 18°} = \frac{1}{a}$ $\quad \cot 68° = \tan 22° = c$ $\quad \cot 22° = \frac{1}{\tan 22°} = \frac{1}{c}$

4. (10pts) Solve the right triangle (that is, find all sides and angles), if $b = 3$, $c = 7$.



$\cos\alpha = \frac{3}{7}$

$\alpha = \cos^{-1}\frac{3}{7} = 64.623066^\circ$

$\beta = 90 - 64.623066^\circ$

$= 25.376934$

$a^2 + 3^2 = 7^2$

$a^2 = 40$

$a = \pm\sqrt{40} = \pm 2\sqrt{10}$

$a = 2\sqrt{10}$

5. (8pts) A ladder leans against the wall and forms a 73° angle with the ground. If its bottom is 6 feet from the wall, how long is the ladder?

$\frac{6}{\ell} = \cos 73^\circ$

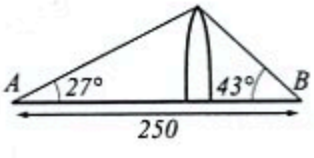
$6 = \ell \cos 73^\circ$

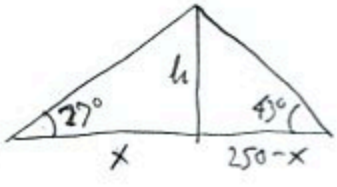
$\ell = \frac{6}{\cos 73^\circ} = 20.521822$

6. (16pts) Standing at point A, you observe the angle of elevation to the top of a building to be 27°. Then you walk in a straight line through the building, emerging on the other side at point B, and measuring the angle of elevation from this point to the top of the building to be 43°. A and B are known landmarks and the distance between them is 250 meters.

a) How tall is the building?

b) How far is point A from the building?





$\frac{h}{x} = \tan 27^\circ$ $\quad h = x \tan 27^\circ$

$\frac{h}{250-x} = \tan 43^\circ$ $\quad h = (250-x)\tan 43^\circ$

$x \tan 27^\circ = (250-x)\tan 43^\circ$

$x \tan 27^\circ = 250 \tan 43^\circ - x \tan 43^\circ$

$x \tan 27^\circ + x \tan 43^\circ = 250 \tan 43^\circ$

$x(\tan 27^\circ + \tan 43^\circ) = 250 \tan 43^\circ$

b) $x = \frac{250 \tan 43^\circ}{\tan 27^\circ + \tan 43^\circ} = 161.665893$

a) $h = 161.665893 \cdot \tan 27^\circ$

$= 82.372887$