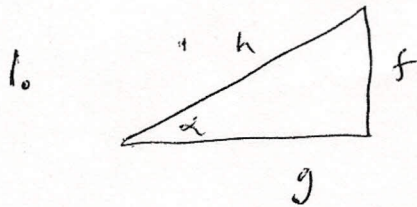


TRIGONOMETRY SUMMARY

DEFINITIONS



$$\sin \alpha = \frac{f}{h}$$

$$\cos \alpha = \frac{g}{h}$$

$$\tan \alpha = \frac{f}{g}$$

$$\text{and } \frac{\sin \alpha}{\cos \alpha} = \tan \alpha.$$

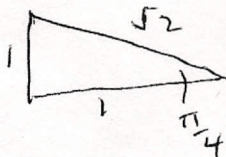
2.

$$\operatorname{cosec} \alpha = \frac{1}{\sin \alpha} = \frac{h}{f}$$

$$\sec \alpha = \frac{1}{\cos \alpha} = \frac{h}{g}$$

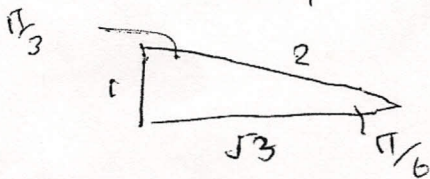
$$\operatorname{cot} \alpha = \frac{1}{\tan \alpha} = \frac{g}{f}$$

3. Using $\pi = 180^\circ$ we have special Δ s



$$\sin \frac{\pi}{4} = \cos \frac{\pi}{4} = \frac{1}{\sqrt{2}}$$

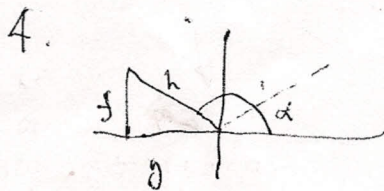
$$\tan \frac{\pi}{4} = 1$$



$$\sin \frac{\pi}{6} = \frac{1}{2} = \cos \frac{\pi}{3}$$

$$\sin \frac{\pi}{3} = \frac{\sqrt{3}}{2} = \cos \frac{\pi}{6}$$

$$\tan \frac{\pi}{6} = \frac{1}{\sqrt{3}} \quad \tan \frac{\pi}{3} = \sqrt{3}$$



$$\sin(\pi - \alpha) = \frac{f}{h}$$

$$\cos(\pi - \alpha) = -\frac{g}{h}$$

$$\tan(\pi - \alpha) = -\frac{f}{g}$$

Similarly we get the following signs for each quadrant

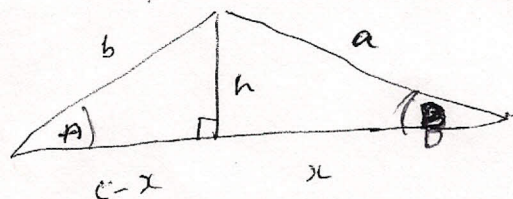
2 nd Q		1 st Q	
sin +	tan -	sin +	tan +
cos -		cos +	
3 rd Q		4 th Q	
sin -	tan +	sin -	tan -
cos -		cos +	

RELATIONSHIPS

1. $\sin^2 \alpha + \cos^2 \alpha = \frac{y^2 + x^2}{h^2} = \frac{h^2}{h^2} = 1$ by Pythagoras

Divide by $\cos^2 \alpha$ to get $\tan^2 \alpha + 1 = \sec^2 \alpha$ ($= \frac{1}{\cos^2 \alpha}$)

2. Sin rule and cosine rule



i) $h = b \sin A = a \sin B$

So $\frac{b}{\sin B} = \frac{a}{\sin A}$

ii) $b^2 = (c-x)^2 + h^2$
 $a^2 = x^2 + h^2$

Hence $b^2 - a^2 = c^2 - 2cx + x^2 + h^2 - x^2 - h^2$

$= c^2 - 2cx = c^2 - 2ac \cos B$ ($\cos B = \frac{x}{a}$)

So $b^2 = a^2 + c^2 - 2ac \cos B$

3. $\sin(\alpha + \beta) = \sin \alpha \cos \beta + \cos \alpha \sin \beta$

$\cos(\alpha + \beta) = \cos \alpha \cos \beta - \sin \alpha \sin \beta$

$\sin(\alpha - \beta) = \sin \alpha \cos \beta - \cos \alpha \sin \beta$

$\cos(\alpha - \beta) = \cos \alpha \cos \beta + \sin \alpha \sin \beta$

If $\alpha = \beta$ then * give

$\sin 2\alpha = 2 \sin \alpha \cos \alpha$

$\cos 2\alpha = \cos^2 \alpha - \sin^2 \alpha$

$= (1 - \sin^2 \alpha) - \sin^2 \alpha = 1 - 2 \sin^2 \alpha$

$= \cos^2 \alpha - (1 - \cos^2 \alpha) = 2 \cos^2 \alpha - 1$