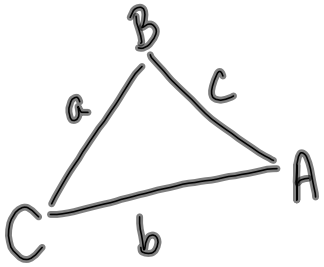
Trig Applications

Basic Right Angle Trig: SOH|CAH|TOA

$$\sin\theta = \frac{opp}{hyp} \quad \cos\theta = \frac{adj}{hyp} \quad \tan\theta = \frac{opp}{adj}$$

Pythagorean Theorem: $c^2 = a^2 + b^2$

Area of a triangle:



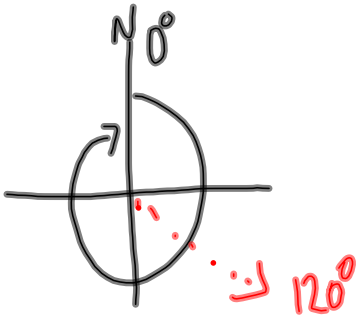
$$\text{area} = \frac{1}{2}ab\sin C$$

Law of Sines: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

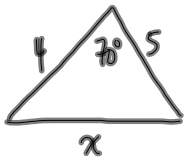
Law of Cosines: $c^2 = a^2 + b^2 - 2ab\cos C$

$$\cos C = \frac{c^2 - a^2 - b^2}{-2ab}$$

Bearings/Azimuths:



Example 1



$c^2 = a^2 + b^2 - 2ab\cos C$

$x^2 = 4^2 + 5^2 - 2(4)(5)\cos 70^\circ$

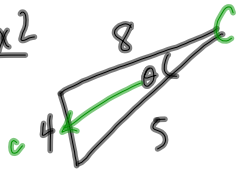
$x^2 = 16 + 25 - 40\cos 70^\circ$

$x^2 = 41 - 40\cos 70^\circ$

$x^2 = 27.3$

$x = 5.23$

Ex 2



$\cos C = \dfrac{c^2 - a^2 - b^2}{-2ab}$

$\cos\theta = \dfrac{4^2 - 8^2 - 5^2}{-2(8)(5)}$

$\cos\theta = \dfrac{16 - 64 - 25}{-80}$

$\cos\theta = \dfrac{-73}{-80}$

$\theta = \cos^{-1}\left(\dfrac{73}{80}\right)$

$\theta = 24.1^\circ$

Ex 3

$\tan\theta = \dfrac{opp}{adj}$

$\tan\theta = \dfrac{5}{3}$

$\theta = \tan^{-1}\left(\dfrac{5}{3}\right)$

$\theta = 59.0^\circ$

$c^2 = a^2 + b^2$

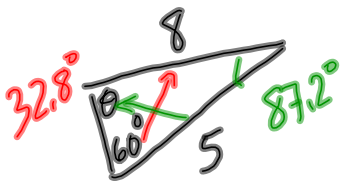
$c^2 = 3^2 + 5^2$

$c^2 = 9 + 25$

$c^2 = 34$

$c = 5.83$

Ex 4



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

$$\frac{5}{\sin\theta} = \frac{8}{\sin 60^\circ}$$

$$8\sin\theta = 5\sin 60^\circ$$

$$\sin\theta = \frac{5\sin 60^\circ}{8}$$

$$\theta = \sin^{-1}\left(\frac{5\sin 60^\circ}{8}\right)$$

$$\theta = 32.8^\circ$$

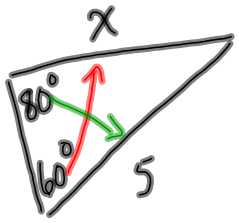
Area:

$$\text{Area} = \frac{1}{2}ab\sin C$$

$$\text{Area} = \frac{1}{2}(8)(5)\sin 87.2^\circ$$

$$\text{Area} = 19.98 \text{ units}^2$$

Ex 5



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

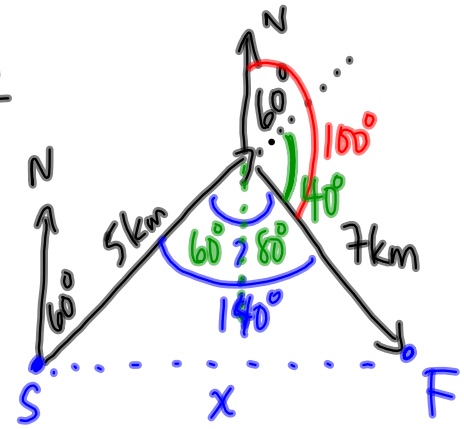
$$\frac{5}{\sin 80^\circ} = \frac{x}{\sin 60^\circ}$$

$$x\sin 80^\circ = 5\sin 60^\circ$$

$$x = \frac{5\sin 60^\circ}{\sin 80^\circ}$$

$$x = 4.4$$

Ex 6



5km @ 60°

7km @ 100°

$c^2 = a^2 + b^2 - 2ab\cos C$

$c^2 = 5^2 + 7^2 - 2(5)(7)\cos 140^\circ$

$c^2 = 25 + 49 - 70\cos 140^\circ$

$c^2 = 74 - 70\cos 140^\circ$

$c^2 = 127.6$

$c = 11.3$