The Application of Trigonometry

1   The Law of Sine

The Law of Sine: For any triangle with sides a,b,and c, and respective opposite angles α, β, and γ,

$$\frac{\sin\alpha}{a} = \frac{\sin\beta}{b} = \frac{\sin\gamma}{c}$$

The Area of an Oblique Triangle: For any oblique triangle with side lengths a, b, and c, and angles α, β, and γ, the area of the triangle is given by $A = \frac{cb\sin\alpha}{2} = \frac{ca\sin\beta}{2} = \frac{ab\sin\gamma}{2}$.

2   The Law of Cosine

The Law of Cosine: For any triangle with sides a,b,and c, and respective opposite angles α, β, and γ,

$$a^2 = b^2 + c^2 - 2bc\cos\alpha$$

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

$$c^2 = b^2 + a^2 - 2ba\cos\gamma$$

Heron's Formula for the Area of a Triangle: The area of any triangle with side lengths a, b, and c, is given by

$$A = \sqrt{s(s-a)(s-b)(s-c)}$$

where s is the semiperimeter, $s = \frac{1}{2}(a + b + c)$.