Spherical trigonometry formulas

1. Spherical Pythagorean theorem:

$$\cos\left(\frac{c}{R}\right) = \cos\left(\frac{a}{R}\right) \cdot \cos\left(\frac{b}{R}\right)$$

2. Formulas in a spherical right triangle

$$\sin A = \frac{\sin\left(\frac{a}{R}\right)}{\sin\left(\frac{c}{R}\right)} \quad \text{and} \quad \cos A = \frac{\tan\left(\frac{b}{R}\right)}{\tan\left(\frac{c}{R}\right)}$$

3. Spherical law of sines:

$$\frac{\sin\left(\frac{a}{R}\right)}{\sin(A)} = \frac{\sin\left(\frac{b}{R}\right)}{\sin(B)} = \frac{\sin\left(\frac{c}{R}\right)}{\sin(C)}$$

4. Spherical law of cosines for sides:

$$\cos\left(\frac{c}{R}\right) = \cos\left(\frac{a}{R}\right) \cdot \cos\left(\frac{b}{R}\right) + \sin\left(\frac{a}{R}\right) \cdot \sin\left(\frac{b}{R}\right) \cos(C)$$

5. Spherical law of cosines for angles:

$$\cos(C) = -\cos(A)\cos(B) + \sin(A)\sin(B)\cos\left(\frac{c}{R}\right)$$