Cheat Sheet 2: Sine Rule and Cosine Rule

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1 The Sine Rule

For any triangle, given the sides a, b and c and their corresponding opposite angles A, B and C:

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

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

So, given two sides and a corresponding angle, or two angles and a corresponding side, the triangle can be solved.

2 The Cosine Rule

Given two sides plus the angle between them:[1]

$$a^2 = b^2 + c^2 - 2bc\ cos\ A$$
$$b^2 = c^2 + a^2 - 2ca\ cos\ B$$
$$c^2 = a^2 + b^2 - 2ab\ cos\ C$$

Given 3 sides but no angle, this form is more convenient:

$$cos\ A = \frac{b^2 + c^2 - a^2}{2bc},\ cos\ B = \frac{c^2 + a^2 - b^2}{2ca},\ cos\ C = \frac{a^2 + b^2 - c^2}{2ab}$$

3 The General Component Form

For converting a vector from geometric to component form:

$$\mathbf{a} = |\mathbf{a}|\ cos\ \theta\mathbf{i} + |\mathbf{a}|\ sin\ \theta\mathbf{j}$$

[1]This is a generalisation of Pythagoras' Theorem, to which it reduces if the angle is 90°