

## Math Formulas

This document was created by the *Guide to IJSO* team — a student-led initiative dedicated to supporting Junior Science Olympiad aspirants around the world. It contains a carefully curated and organized collection of essential formulas commonly used in math, covering key topics relevant to the IJSO level preparation.

## 1. Algebra and Arithmetic

Quadratic Equation  $: x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Sum of an Arithmetic Series  $: S_n = \frac{n}{2}(2a + (n - 1)d)$

where a is the 1st term, d is the common difference, and n is the number of terms.

Sum of a Geometric Series  $: S_n = \frac{a(1 - r^n)}{(1 - r)}, \text{ if } |r| < 1$

where r is the common ratio

## 2. Geometry and Trigonometry

$\sin \theta = \frac{\text{opposite}}{\text{hypotenuse}}, \cos \theta = \frac{\text{adjacent}}{\text{hypotenuse}}, \tan \theta = \frac{\text{opposite}}{\text{adjacent}}$

$\operatorname{cosec} \theta = \frac{1}{\sin \theta}, \sec \theta = \frac{1}{\cos \theta}, \cot \theta = \frac{1}{\tan \theta}$

$\sin^2 \theta + \cos^2 \theta = 1$   
 $\tan^2 \theta + 1 = \sec^2 \theta$

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

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

Area of a triangle  $: A = \frac{1}{2} ab \sin C$

## 3. Logarithms

$\log(ab) = \log a + \log b$

$\log\left(\frac{a}{b}\right) = \log a - \log b$