

Math Notes

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November 27, 2025

Canine-Table

Github

POSIX Nexus serves as a comprehensive cross-language reference hub that explores the implementation and behavior of POSIX-compliant functionality across a diverse set of programming environments. Built atop the foundational IEEE Portable Operating System Interface (POSIX) standards, this project emphasizes compatibility, portability, and interoperability between operating systems.

Abstract

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I Linear Equations

$$(x + 4 = 7)$$

$$\begin{aligned}x + 4 &= 7 \\x + 4 - 4 &= 7 - 4 \\x + 0 &= 3\end{aligned}$$

$$(x + 9 = 15)$$

$$\begin{aligned}x + 9 &= 15 \\x + 9 - 9 &= 15 - 9 \\x + 0 &= 6\end{aligned}$$

$$(x + 9 = 15)$$

$$\begin{aligned}6 + x &= 13 \\6 + x - 6 &= 15 - 9 \\0 + x - 0 &= 7\end{aligned}$$



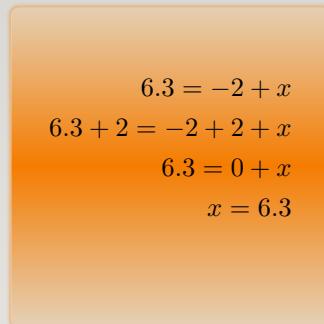
$$(x - 3 = 9)$$

$$\begin{aligned}x - 3 &= 9 \\x - 3 + 3 &= 9 - 3 \\x - 0 &= 6 \\x &= 6\end{aligned}$$

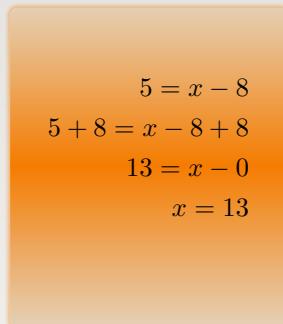
$$(x + 8 = 7)$$

$$\begin{aligned}x - 8 &= 7 \\x + 8 - 8 &= 7 + 8 \\x - 0 &= 15 \\x &= 15\end{aligned}$$

$$6.3 = -2 + x$$



$$5 = x - 8$$



Math Nodes



$$5 - x = 12$$

$$\begin{aligned} 5 - x &= 12 \\ 5 - 12 - x + x &= 12 - 12 + x \\ -7 &= 0 + x \\ x &= -7 \end{aligned}$$

$$-8 = 5 - x$$

$$\begin{aligned} -8 &= 5 - x \\ -8 + 8 &= 5 + 8 - x \\ 0 + x &= 13 - x + x \\ x &= 13 \end{aligned}$$

$$3x = 12$$

$$\begin{aligned}3x &= 12 \\ \frac{3x}{3} &= \frac{12}{3} \\ \frac{1}{1} &= 4 \\ x &= 4\end{aligned}$$

$$7x = 14$$

$$\begin{aligned}7x &= 14 \\ \frac{7x}{7} &= \frac{12}{7} \\ \frac{x}{1} &= 2 \\ x &= 2\end{aligned}$$



$$-6x = -30$$

$$\begin{aligned} -6x &= -30 \\ \frac{-6x}{-6} &= \frac{-30}{-6} \\ \frac{-x}{-1} &= 5 \\ x &= 5 \end{aligned}$$

$$-6x = -30$$

$$\begin{aligned} -8x &= 48 \\ \frac{-8x}{-8} &= \frac{48}{-8} \\ \frac{-x}{-1} &= -6 \\ x &= -6 \end{aligned}$$

$$7x = -56$$

$$\begin{aligned} 7x &= -56 \\ \frac{7x}{7} &= \frac{-56}{7} \\ \frac{x}{1} &= -8 \\ x &= -8 \end{aligned}$$

$$-8x = -72$$

$$\begin{aligned} -8x &= -72 \\ \frac{-8x}{-8} &= \frac{-72}{-8} \\ \frac{x}{1} &= 9 \\ x &= 9 \end{aligned}$$



II Definitions

II Pairs

Factorial ($n!$)

Concept	Factorial ($n!$)
Definition	The product of all positive integers up to n . Defined as $n! = n \times (n - 1) \times \dots \times 1$.
Core Idea	Factorial counts permutations and combinations – it grows extremely fast.
Example	$5! = 120$.
Applications	Used in combinatorics, probability, and series expansions.
Pair	Inverse gamma function (not elementary).



Logarithm Base 2 (\log_2)

Concept	Logarithm Base 2 ($\log_2(x)$)
Definition	The inverse of the power of 2. Defined as the exponent y such that $2^y = x$.
Core Idea	$\log_2(x)$ measures how many times you multiply 2 to reach x .
Example	$\log_2(8) = 3$.
Applications	Widely used in computer science, information theory, and binary systems.
Pair	Power of 2 function (2^x).



Natural Logarithm (ln)

Concept	Natural Logarithm ($\ln(x)$)
Definition	The inverse of the exponential function. Defined as the power to which e must be raised to equal x .
Core Idea	$\ln(x)$ undoes exponentiation with base e .
Example	$\ln(e^3) = 3$.
Applications	Used in calculus, growth/decay models, and solving exponential equations.
Pair	Exponential function (e^x).



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Tangent and Cotangent

Concept	Tangent ($\tan(x)$) and Cotangent ($\cot(x)$)
Definition	$\tan(x) = \frac{\sin(x)}{\cos(x)}$, while $\cot(x) = \frac{\cos(x)}{\sin(x)}$. They are reciprocals: $\cot(x) = \frac{1}{\tan(x)}$.
Core Idea	Tangent measures slope (rise/run). Cotangent flips that slope (run/rise).
Example	At 45° , $\tan(45^\circ) = 1$ and $\cot(45^\circ) = 1$.
Applications	Used in trigonometry, calculus, and geometry – especially for slope and angle analysis.
Pair	Reciprocal functions: $\tan(x) \leftrightarrow \cot(x)$.



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