Math Calculator User Guide

This calculator supports various mathematical operations through the MathJS library. Below is a comprehensive list of commonly used operations and examples to help you get started.

Basic Arithmetic

Operation	Syntax	Example
Addition	+	`2 + 3 = 5`
Subtraction	-	`7 - 4 = 3`
Multiplication	*	`5 * 6 = 30`
Division	/	`20 / 4 = 5`
Exponentiation	^ or **	`2^3 = 8` or `2**3 = 8`
Modulo (remainder)	%	`7 % 3 = 1`

Order of Operations

Calculations follow the standard mathematical order of operations (PEMDAS):

1. **P**arentheses
2. **E**xponents
3. **M**ultiplication and **D**ivision (from left to right)
4. **A**ddition and **S**ubtraction (from left to right)

Example: `2 + 3 * 4 = 14` (not 20) Example with parentheses: `(2 + 3) * 4 = 20`

Mathematical Constants

Constant	Symbol	Approximate Value
Pi	`pi`	3.14159...
Euler's number	`e`	2.71828...
Golden ratio	`phi`	1.61803...

Common Functions

Power and Roots

- Square root: `sqrt(25) = 5`
- Cube root: `cbrt(27) = 3`
- nth root: `nthRoot(16, 4) = 2` (4th root of 16)
- Power: `pow(2, 3) = 8`

Trigonometric Functions

- Sine: `sin(30 deg) = 0.5`
- Cosine: `cos(60 deg) = 0.5`
- Tangent: `tan(45 deg) = 1`
- Arc sine: `asin(0.5) = 30 deg`
- Arc cosine: `acos(0.5) = 60 deg`
- Arc tangent: `atan(1) = 45 deg`

> Note: For angles in degrees, add "deg" after the value. Without "deg", angles are in radians.

Logarithmic Functions

- Natural logarithm: `ln(10) = 2.302...`
- Base-10 logarithm: `log10(100) = 2`

- Base-2 logarithm: `log2(8) = 3`
- Custom base logarithm: `log(8, 2) = 3` (log base 2 of 8)

Rounding Functions

- Round: `round(3.75) = 4`
- Floor (round down): `floor(3.75) = 3`
- Ceiling (round up): `ceil(3.75) = 4`
- Fixed decimals: `toFixed(3.14159, 2) = 3.14`

Other Common Functions

- Absolute value: `abs(-5) = 5`
- Sign of number: `sign(-3) = -1`
- Maximum value: `max(2, 4, 6) = 6`
- Minimum value: `min(2, 4, 6) = 2`
- Random number: `random() = 0.5` (random between 0-1)
- Random integer: `randomInt(1, 10)` (random integer between 1-10)

Unit Conversions

Conversion	Syntax	Example
Length	[value][unit1] to [unit2]	`5 inch to cm = 12.7 cm`
Weight	[value][unit1] to [unit2]	`1 kg to lb = 2.20462 lb`
Temperature	[value][unit1] to [unit2]	`30 celsius to fahrenheit = 86 F`
Time	[value][unit1] to [unit2]	`2 hour to minute = 120 min`
Volume	[value][unit1] to [unit2]	`1 gallon to liter = 3.78541 L`

Statistical Functions

- Mean (average): `mean(2, 4, 6, 8) = 5`
- Median: `median(3, 1, 5, 9) = 4`
- Standard deviation: `std(2, 4, 6, 8) = 2.58`
- Sum: `sum(1, 2, 3, 4) = 10`
- Product: `prod(2, 3, 4) = 24`

Percentages

- Percentage calculation: `15% * 50 = 7.5`
- Increase by percentage: `100 * (1 + 20%) = 120`
- Decrease by percentage: `100 * (1 - 20%) = 80`
- Percentage change: `((150 - 100) / 100) * 100 = 50%`

Tips for Using the Calculator

1. **Use parentheses for clarity**: `(2+3)*4` instead of `2+3*4`
2. **Be explicit with multiplication**: Use `2*x` instead of `2x`
3. **Chain operations efficiently**: `2 + 3 * 4 / 2 = 8`
4. **Use scientific notation for large numbers**: `1.2e3 = 1200`
5. **Check unit compatibility**: Conversion only works between compatible units
6. **Angle measurements**: Add "deg" for degrees or "rad" for radians

Examples of Complex Calculations

1. **Compound Interest**: `1000 * (1 + 5%)^5 = 1276.28` (5% interest compounded annually for 5 years)
2. **Distance Formula**: `sqrt((x2-x1)^2 + (y2-y1)^2)` (example: `sqrt((3-1)^2 + (4-2)^2) = 2.83`)
3. **Temperature Conversion**: `(32 fahrenheit - 32) * 5/9 = 0 celsius`
4. **BMI Calculation**: `weight(kg) / height(m)^2` (example: `70 / 1.75^2 = 22.86`)
5. **Area of Circle**: `pi * radius^2` (example: `pi * 5^2 = 78.54`)