# How to read mathematical expressions

Addition

| | |
|---|---|
| $1 + 3 = 4$ | One plus three equals four;<br>One and three make(s) four;<br>The sum of one and three is four;<br>One and three total four;<br>One and three amount to three. |

Subtraction

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|---|---|
| $10 - 5 = 5$ | Ten minus five equals five;<br>Five from ten leaves five;<br>Taking five from ten gives five;<br>Subtracting five from ten gives five. |

Multiplication

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| $4 \times 2 = 8$ | Four times two equals eight;<br>Four multiplied by two equals eight;<br>The product of four and two is eight;<br>Twice four is eight. |

Division

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|---|---|
| $9 \div 3 = 3$ | Nine divided by three equals three. |
| $520 \div 37 = 14\frac{5}{37}$ | Divide five hundred twenty by thirty-seven gives the quotient fourteen and five thirty-sevenths. |

Decimal numbers

| | |
|---|---|
| 0.145 | Zero point one four five |
| 102.335 | One hundred two point three three five |
| $3.\dot{3} \equiv 3.333\ldots$ | Three point three recurring |
| $1.0\dot{3}6\dot{3}$ | One point zero three six three recurring |

Note: When decimal numbers are repeating, they are called recurring, circulating, or repeating decimals.

Fractions

| | |
|---|---|
| $\frac{1}{2}$ | One half |
| $\frac{1}{4}$ | One fourth / a quarter |
| $\frac{3}{4}$ | Three fourths / three quarters |
| $3\frac{1}{2}$ | Three and a half |
| $\frac{120}{511}$ | One hundred twenty over five hundred eleven / one hundred twenty divided by five hundred eleven / one twenty divided by five eleven |

Powers and roots

| | |
|---|---|
| $a^2$ | $a$ squared |
| $b^3$ | $b$ cubed |
| $a^4$ | $a$ to the fourth power |
| $a^{-5}$ | $a$ to the negative fifth |
| $a^{n-b}$ | $a$ to the $n$ minus $b$ |
| $\frac{a^6}{b^3}$ | $a$ to the six divided by $b$ cubed |
| $\sqrt{x}$ | The square root of $x$ |
| $\sqrt[n]{x}$ | The $n$ th root of $x$ |

Note: In $\sqrt[n]{x}$, $\sqrt{}$ is called radical (sign). The inside radical is radicand. $n$ is named the index of the root.

Proportion

| | |
|---|---|
| 3 : 9 = 1 : 3 | Three is to nine as one is to three;<br>The ratio of three to nine equals that of one to three;<br>The two ratios between three to nine and one to three are equal. |

Equations with parentheses and brackets

| | |
|---|---|
| $\left(1-\frac{4}{5}\right)\cdot 2\frac{1}{3}$ | One minus four fifths, and all multiplied by 2 and one third |
| $x=c\left\{a\left[\frac{z}{Z}\left(d-\frac{1}{y-Y^2}\right)\right]\right\}$ | $x$ equals $c$ (open) curly bracket $a$ (open) bracket small $z$ over large $Z$ (open) parenthesis d minus one over the quantity of small $y$ minus large $Y$ squared, (close) parenthesis (close) bracket and curly bracket |
| $x=ab^{n-1}+a^2b^{n-2}+\cdots+a$ | $x$ equals $a$ times $b$ to the n minus one (power) plus $a$ squared times $b$ to the $n$ minus two (power) down to a to the $n$(th) (power) |

Note: A pair of “large” and “small” correspond to a pair of “big” and “little”, respectively, when you describe the cases of variables.

Mathematical symbols and other expressions

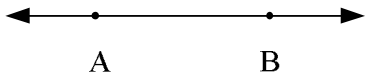
| | |
|---|---|
| ~ | Similar |
| ≅ | is congruent to |
| ≡ | is identical to |
| ≈ | is approximately equal to |
| ≠ | is not equal to |
| > | is greater than |
| < | is less than |
| ∞ | Infinity |
| ∴ | Therefore |
| ∵ | Because |
| $a \propto b$ | $a$ is proportional to $b$;<br>$a$ varies as $b$ |
| $i$ | Imaginary unit |
| $\vec{A}$ | Vector $A$ |
| $\overline{A}$ | $A$ bar |
| $\lvert x\rvert$ | Absolute value of $x$ |
| $\Delta y$ | Delta $y$;<br>An increment of $y$ |
| $f(x)$ | Function of $x$; |

| | |
|---|---|
| | *f* of *x* |
| $dx$ | The differential of *x*;<br>$dx$ |
| $\frac{dx}{dt}$ | dx dt;<br>derivative of *x* with respect to time |
| $x'$, $x''$, $x'''$ | *x* prime, *x* double prime, and *x* triple prime<br>(Note that in Britain it is called dash.) |
| $\sum_{n=1}^{k} y_n$ | The sum from *n* equals one to *k* of *x* sub(script) *n* |
| $\int_a^b g(x)dx$ | The integral from *a* to *b* of the function g of *x* |

Definitions of line, ray, and segment

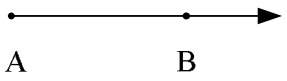
Line: Both directions without end

$\overleftrightarrow{AB}$



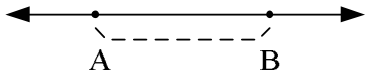

Ray: One end point with one direction of line

$\overrightarrow{AB}$




Segment: The part of a line with two end points

$\overline{AB}$




| | |
|---|---|
| $\overrightarrow{AB} \parallel \overrightarrow{CD}$ | The ray AB is parallel to the ray CD |
| $\overline{AB} \perp \overline{CD}$ | The segment AB is perpendicular to the segment CD |