Mathematical and scientific symbols

Common pronunciations (in British English - Gimson,1981) of mathematical and scientific symbols are given in the list below.

(all the pages in this section need a unicode font installed - e.g. Arial Unicode MS, Doulos SIL Unicode, Lucida Sans Unicode - see: The International Phonetic Alphabet in Unicode).

Symbols

+	plus	/'plʌs/
-	minus	/'maɪnəs/
±	plus or minus	/'plʌs ɔ: 'maɪnəs/
x	multiplied by	/'mʌltɪplaɪd baɪ/
/	over; divided by	/'əʊvə/ /dɪ'vaɪdəd/
÷	divided	/dɪ'vaɪdəd/
=	equals	/'ɪ:kwəlz/
≈	approximately, similar	/ə'prɒksɪmətlɪ/ /'sɪmɪlə tʊ/
≡	equivalent to; identical	/ɪk'wɪvələnt tʊ/ /aɪ'dentɪkl tʊ/
≠	not equal to	/'nɒt 'i:kwəl tʊ/
>	greater than	/'greɪtə ðən/
<	less than	/'les ðən/
≥	greater than or equal to	/'greɪtə ðən ər 'i:kwəl tʊ/
≤	less than or equal to	/'les ðən ər' i:kwəl tʊ/
≯	not greater than	/'nɒt 'greɪtə ðən/
≮	not less than	/'nɒt 'les ðən/
≫	much greater than	/'mʌʧ 'greɪtə ðən/
≪	much less than	/'mʌʧ 'les ðən/
⊥	perpendicular to	/pɜ:pən'dɪkjʊlə tʊ/
||	parallel to	/'pærəlel tʊ/
≢	not equivalent to, not identical to	/'nɒt ɪk'wɪvələnt tʊ/ /'nɒt aɪ'dentɪkl tʊ/
≠≈	not similar to	/'nɒt 'sɪmɪlə tʊ/
^{2}	squared	/'skweəd/
^{3}	cubed	/'kju:bd/
^{4}	to the fourth; to the power four	/tə ðə 'fɔ:θ/ /te ðə 'paʊə fɔ:/
^{n}	to the n; to the nth; to the power n	/tə ðɪ en; tə dɪ enθ; tə ðə paʊər en/
√	root; square root	/ru:t/ /skweə ru:t/
$\sqrt[3]{}$	cube root	/kju:b ru:t/

$\sqrt[4]{}$	fourth root	/fɔ:θ ru:t/
!	factorial	/fæk'tɔ:rɪəl/
%	percent	/pə'sent/
∞	infinity	/ɪn'fɪnətɪ/
∝	varies as; proportional to	/'vɛərɪz/ /prə'pɔ:ʃənəl/
˙	dot	/dɒt/
¨	double dot	/dʌbl dɒt/
:	is to, ratio of	/reɪʃɪəʊ/
f(x) fx	f; function	/ef/ /'fʌŋkʃən/
f'(x)	f dash; derivative	/dæʃ/ /dɪ'rɪvətɪv/
f''x	f double-dash; second derivative	/'dʌbl dæʃ/ /'sekənd dɪ'rɪvətɪv/
f'''(x)	f triple-dash; f treble-dash; third derivative	/'trɪpl dæʃ/ / trebl dæʃ/ /θɜ:d dɪ'rɪvətɪv/
$f^{(4)}$	f four; fourth derivative	/fɔ:θ dɪ'rɪvətɪv/
∂	partial derivative, delta	/pa:ʃəl dɪ'rɪvətɪv/ /deltə/
∫	integral	/'ɪntɪgrəl/
∑	sum	/sʌm/
w.r.t.	with respect to	/wɪð 'rɪspekt/
log	log	/lɒg/
$\log_2 x$	log to the base 2 of x	/lɒg tə ðə beɪs tu: əv eks/
∴	therefore	/'ðɛəfɔ:/
∵	because	/bɪ'kɒz/
→	gives, leads to, approaches	/gɪvz/ /li:dz tʊ/ /əprəʊʧəz/
/	per	/pɜ:/
∈	belongs to; a member of; an element of	/bɪ'lɒŋz/ /'membə/ /'elɪmənt/
∉	does not belong to; is not a member of; is not an element of	/nɒt bɪ'lɒŋ/ /nɒt ə 'membə/ /nɒt ən 'elɪmənt/
⊂	contained in; a proper subset of	/kən'teɪnd ɪn/ /'prɒpə 'sʌbset/
⊆	contained in; subset	/'sʌbset/
⋂	intersection	/'ɪntəsekʃən/
⋃	union	/'ju:nɪən/
∀	for all	/fə rɔ:l/
cos x	cos x; cosine x	/kɒz/
sin x	sine x	/saɪn/
tan x	tangent x	/tan/
cosec x	cosec x	/'kəʊsek/
sinh x	shine x	/'ʃaɪn/
cosh x	cosh x	/'kɒʃ/

tanh x	than x	/θæn/
|x|	mod x; modulus x	/mɒd/ /'mɒdjʊləs/
℃	degrees Centigrade	/dɪ'gri:z 'sentɪgreɪd/
℉	degrees Fahrenheit	/dɪ'gri:z 'færənhaɪt/
°K	degrees Kelvin	/dɪ'gri:z 'kelvɪn/
0°K, –273.15 °C	absolute zero	/absəlu:t zi:rəʊ/
mm	millimetre	/'mɪlɪmi:tə/
cm	centimetre	/'sentɪmi:tə/
cc, cm³	cubic centimetre, centimetre cubed	/'kju:bɪk 'sentɪmi:tə/ /'sentɪmi:tə 'ju:bd/
m	metre	/'mi:tə/
km	kilometre	/kɪ'lɒmɪtə/
mg	milligram	/'mɪlɪgræm/
g	gram	/græm/
kg	kilogram	/'kɪləgræm/
AC	A.C.	/eɪ si:/
DC	D.C.	/di: si:/

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Examples

x + 1	x plus one
x -1	x minus one
x ± 1	x plus or minus one
xy	x y; x times y; x multiplied by y
(x — y)(x + y)	x minus y, x plus y
x/y	x over y; x divided by y;
x ÷ y	x divided by y
x = 5	x equals 5; x is equal to 5
x ≈ y	x is approximately equal to y
x ≡ y	x is equivalent to y; x is identical with y
x ≠ y	x is not equal to y
x > y	x is greater than y
x < y	x is less than y
x ≥ y	x is greater than or equal to y

$x \leq y$	x is less than or equal to y
$0 < x < 1$	zero is less than x is less than 1; x is greater than zero and less than 1
$0 \leq x \leq 1$	zero is less than or equal to x is less than or equal to 1; x is greater than or equal to zero and less than or equal to 1
x^2	x squared
x^3	x cubed
x^4	x to the fourth; x to the power four
x^n	x to the n; x to the nth; x to the power n
x^{-n}	x to the minus n; x to the power of minus n
$\sqrt{}$	root x; square root x; the square root of x
$\sqrt[3]{}$	the cube root of x
$\sqrt[4]{}$	the fourth root of x
$\sqrt[n]{}$	the nth root of x
$(x + y)^2$	x plus y all squared
$(x/y)^2$	x over y all squared
n!	n factorial; factorial n
x%	x percent
∞	infinity
$x \propto y$	x varies as y; x is (directly) proportional to y
$x \propto 1/y$	x varies as one over y; x is indirectly proportional to y
$\dot{x}$	x dot
$\ddot{x}$	x double dot
f(x) fx	f of x; the function of x
f'(x)	f dash x; the (first) derivative of with respect to x
f''x	f double-dash x; the second derivative of f with respect to x
f'''(x)	f triple-dash x; f treble-dash x; the third derivative of f with respect to x
$f^{(4)}$	f four x; the fourth derivative of f with respect to x
∂v	the partial derivative of v
$\frac{\partial v}{\partial \theta}$	delta v by delta theta, the partial derivative of v with respect to θ
$\frac{\partial^2 v}{\partial \theta^2}$	delta two v by delta theta squared; the second partial derivative of v with respect to θ
dv	the derivative of v
$\frac{dv}{d\theta}$	d v by d theta, the derivative of v with respect to theta
$\frac{d^2 v}{d\theta^2}$	d 2 v by d theta squared, the second derivative of v with respect to theta,

$\int$	integral
$\int_0^\infty$	integral from zero to infinity
$\sum$	sum
$\sum_{i=1}^{n}$	the sum from i equals 1 to n
w.r.t.	with respect to
$\log_e y$	log to the base e of y; log y to the base e; natural log (of) y
$\therefore$	therefore
$\because$	because
$\rightarrow$	gives, approaches
$\Delta x \rightarrow 0$	delta x approaches zero
$\lim_{\Delta x \rightarrow 0}$	the limit as delta x approaches zero, the limit as delta x tends to zero
$\mathrm{Lt}_{\Delta x \rightarrow 0}$	the limit as delta x approaches zero, the limit as delta x tends to zero
m/sec	metres per second
$x \in A$	x belongs to A; x is a member of A; x is an element of A
$x \notin A$	x does not belong to A; x is not a member of A; x is not an element of A
$A \subset B$	A is contained in B; A is a proper subset of B
$A \subseteq B$	A is contained in B; A is a subset of B
$A \cap B$	A intersection B
$A \cup B$	A union B
cos x	cos x; cosine x
sin x	sine x
tan x	tangent x, tan x
cosec x	cosec x
sinh x	shine x
cosh x	cosh x
tanh x	than x
$\lvert x \rvert$	mod x; modulus x
18 ℃	eighteen degrees Centigrade
70 ℉	seventy degrees Fahrenheit

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Greek alphabet

A	α	alpha	/'ælfə/
B	β	beta	/'bi:tə/
Γ	γ	gamma	/'gæmə/
Δ	δ	delta	/'deltə/
E	ε	epsilon	/'epsilən/
Z	ζ	zeta	/'zi:tə/
H	η	eta	/'i:tə/
Θ	θ	theta	/'θi:tə/
I	ι	iota	/aɪ'əʊtə/
K	κ	kappa	/'kæpə/
Λ	λ	lamda	/'læmdə/
M	μ	mu	/'mju:/
N	ν	nu	/'nju:/
Ξ	ξ	xi	/'ksaɪ/
O	o	omicron	/'əʊmɪkrən/
Π	π	pi	/'paɪ/
P	ρς	rho	/'rəʊ/
Σ	σ	sigma	/'sɪgmə/
T	τ	tau	/'tɑʊ/
Y	υ	upsilon	/'jʊpsɪlən/
Φ	φ	phi	/'faɪ/
X	χ	chi	/'kaɪ/
Ψ	ψ	psi	/'psaɪ/
Ω	ω	omega	/'əʊmɪgə/

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Roman alphabet

A	a	/'eɪ/
B	b	/'bi:/
C	c	/'si:/
D	d	/'di:/
E	e	/'i:/
F	f	/'ef/
G	g	/'ʤi:/
H	h	/'eɪʧ/

I	i	/'aɪ/
J	j	/'ʤeɪ/
K	k	/'keɪ/
L	l	/'el/
M	m	/'em/
N	n	/'en/
O	o	/'əʊ/
P	p	/'piː/
Q	q	/'kjuː/
R	r	/'ɑː/
S	s	/'es/
T	t	/'tiː/
U	u	/'juː/
V	v	/'viː/
W	w	/'dʌbljuː/
X	x	/'eks/
Y	y	/'waɪ/
Z	z	/'zed/

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Fractions

½	a half	/ə 'hɑːf/
¼	a quarter	/ə 'kwɔːtə/
¾	three quarters	/θriː 'kwɔːtəz/
⅓	a third	/ə 'θɜːd/
⅔	two thirds	/tuː 'θɜːdz/
⅕	a fifth	/ə 'fɪfθ/
⅖	two fifths	/tuː 'fɪfθs/
⅗	three fifths	/θriː 'fɪfθs/
⅘	four fifths	/fɔː 'fɪfθs/
⅙	a sixth	/ə 'sɪksθ/
⅚	five sixths	/faɪv 'sɪksθs/
⅛	an eighth	/ən 'eɪtθ/
⅜	three eighths	/θriː 'eɪtθs/
⅝	five eighths	/faɪv 'eɪtθs/

⅞	seven eighths	/sevən 'eɪtθs/

Decimal Fractions

0.1	nought point one	/nɔ:t pɔɪnt wʌn/
0.01	nought point oh one	/nɔ:t pɔɪnt əʊ wʌn/
0.0001	nought point oh oh oh one	/ten pɔɪnt əʊ əʊ əʊ wʌn/
1.1	one point one	/wʌn pɔɪnt wʌn/
1.2	one point two	/wʌn pɔɪnt tu:/
1.23	one point two three	/wʌn pɔɪnt tu: θri:/
1.0123	one point oh one two three	/wʌn pɔɪnt əʊ wʌn tu: θri:/
10.01	ten point oh one	/ten pɔɪnt əʊ wʌn/
21.57	twenty-one point five seven	/'twentɪ wʌn pɔɪnt faɪv 'sevən/
2.6666666666....	two point six recurring	/tu: pɔɪnt sɪks rɪ'kɜ:rɪŋ/
2.612361236123...	two point six one two three recurring	/tu: pɔɪnt sɪks wʌn tu: θri: rɪ'kɜ:rɪŋ/
2.5 million	two point five million	/tu: pɔɪnt faɪv 'mɪljən/

SI Units: Prefixes

10^{-24}	yocto	y	/'jɒktəʊ/
10^{-21}	zepto	z	/'zeptəʊ/
10^{-18}	atto	a	/'atəʊ/
10^{-15}	femto	f	/'femtəʊ/
10^{-12}	pico	p	/'pi:kəʊ/
10^{-9}	nano	n	/'nanəʊ/
10^{-6}	micro	µ	/'maɪkrəʊ/
10^{-3}	milli	m	/'mɪlɪ/
10^{-2}	centi	c	/'sentɪ/
10^{-1}	deci	d	/'desɪ/
10^{3}	kilo	k	/'kɪləʊ/

10^{6}	mega	M	/'megə/
10^{9}	giga	G	/'gɪgə/
10^{12}	tera	T	/'terə/
10^{15}	peta	P	/'petə/
10^{18}	exa	E	/'eksə/
10^{21}	zetta	Z	/'zetə/
10^{24}	yotta	Y	/'jɒtə/
10^{27}	xona	X	/'zəʊnə/
10^{30}	weka	W	/'wekə/
10^{33}	vunda	V	/'vʊndə/

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Cardinal Numbers

1	one	/wʌn/
2	two	/tu:/
3	three	/θri:/
4	four	/fɔ:/
5	five	/faɪv/
6	six	/sɪks/
7	seven	/'sevən/
8	eight	/eɪt/
9	nine	/naɪn/
10	ten	/ten/
11	eleven	/ɪ'levən/
12	twelve	/twelv/
13	thirteen	/θɜ:'ti:n/
14	fourteen	/fɔ:'ti:n/
15	fifteen	/fɪf'ti:n/
16	sixteen	/sɪkst'i:n/
17	seventeen	/seven'ti:n/
18	eighteen	/eɪ'ti:n/
19	nineteen	/naɪn'ti:n/
20	twenty	/'twentɪ/

21	twenty-one	/twentɪ'wʌn/
22	twenty-two	/twentɪ'tu:/
23	twenty-three	/twentɪ'θri:/
24	twenty-four	/twentɪ'fɔ:/
25	twenty-five	/twentɪ'faɪv/
26	twenty-six	/twentɪ'sɪks/
27	twenty-seven	/twentɪ'sevən/
28	twenty-eight	/twentɪ'eɪt/
29	twenty-nine	/twentɪ'naɪn/
30	thirty	/'θɜ:tɪ/
40	forty	/'fɔ:tɪ/
50	fifty	/'fɪftɪ/
60	sixty	/'sɪkstɪ/
70	seventy	/'sevəntɪ/
80	eighty	/'eɪtɪ/
90	ninety	/'naɪntɪ/
100	a hundred; one hundred	/ə 'hʌndrəd/ /wʌn 'hʌndrəd/
101	a hundred and one	/ə 'hʌndrəd ən wʌn/
102	a hundred and two	/ə 'hʌndrəd ən tu:/
110	a hundred and ten	/ə 'hʌndrəd ən ten/
120	a hundred and twenty	/ə 'hʌndrəd ən 'twentɪ/
200	two hundred	/tu: 'hʌndrəd/
300	three hundred	/θri: 'hʌndrəd/
400	four hundred	/fɔ: 'hʌndrəd/
500	five hundred	/faɪv 'hʌndrəd/
600	six hundred	/sɪks 'hʌndrəd/
700	seven hundred	/'sevən 'hʌndrəd/
800	eight hundred	/eɪt 'hʌndrəd/
900	nine hundred	/naɪn 'hʌndrəd/
1 000	a thousand, one thousand	/ə θ'ɑʊzənd/ /wʌn 'θɑʊzənd/
1 001	a thousand and one	/ə 'θɑʊzənd ən wʌn/
1 010	a thousand and ten	/ə 'θɑʊzənd ən ten/
1 020	a thousand and twenty	/ə 'θɑʊzənd ən 'twentɪ/
1 100	one thousand, one hunded	/wʌn 'θɑʊzənd wʌn 'hʌndrəd/
1 101	one thousand, one hundred and one	/wʌn 'θɑʊzənd wʌn 'hʌndrəd ən wʌn/
1 110	one thousand, one hundred and ten	/wʌn 'θɑʊzənd wʌn 'hʌndrəd ən ten/

9 999	nine thousand, nine hundred and ninety-nine	/naɪn 'θaʊzənd naɪn 'hʌndrəd ən 'naɪntɪ 'naɪn/
10 000	ten thousand	/ten 'θaʊzənd/
15 356	fifteen thousand, three hundred and fifty six	/'fɪfti:n 'θaʊzənd θri: 'hʌndrəd ən 'fɪftɪ sɪks/
100 000	a hundred thousand	/ə 'hʌndrəd 'θaʊzənd/
1 000 000	a million	/ə 'mɪljən/
100 000 000	a hundred million	/ə 'hʌndrəd 'mɪljən/
1 000 000 000	a billion	/ə 'bɪljən/
100 000 000 000	a hundred billion	/ə 'hʌndrəd 'bɪljən/
1 000 000 000 000	a trillion	/ə 'trɪljən/
1 000 000 000 000 000	a quadrillion	/ə kwɒdrɪljən/
1 000 000 000 000 000 000	a quintillian	/ə kwɪn'tɪljən/
1 000 000 000 000 000 000 000	a sextillion	/ə seks'tɪljən/
1 000 000 000 000 000 000 000 000	a septillion	/ə sep'tɪljən/
1 000 000 000 000 000 000 000 000 000	an ocillion	/ən ɒkt'tɪljən/
1 000 000 000 000 000 000 000 000 000 000	a nonillion	/ə nɒn'ɪljən/
1 000 000 000 000 000 000 000 000 000 000 000	a decillion	/ə de'sɪljən/

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Ordinal Numbers

1st	first	/fɜ:st/
2nd	second	/'sekənd/
3rd	third	/θɜ:d/
4th	fourth	/fɔ:θ/
5th	fifth	/fɪfθ/
6th	sixth	/sɪksθ/
7th	seventh	/'sevənθ/
8th	eighth	/eɪtθ/
9th	ninth	/naɪnθ/
10th	tenth	/tenθ/
11th	eleventh	/ɪ'levənθ/
12th	twelfth	/'twelfθ/
13th	thirteenth	/θɜ:'ti:nθ/

14th	fourtheenth	/fɔː'tiːnθ/
15th	fidteenth	/fɪf'tiːnθ/
16th	sixteenth	/sɪks'tiːnθ/
17th	seventeenth	/seven'tiːnθ/
18th	eighteenth	/eɪ'tiːnθ/
19th	nineteenth	/naɪn'tiːnθ/
20th	twentieth	/'twentɪəθ/
21st	twenty-first	/twentɪ'fɜːst/
22nd	twenty-second	/twentɪ'sekənd/
23rd	twenty-third	/twentɪ'θɜːd/
24th	twenty-fourth	/twentɪ'fɔːθ/
25th	twenty-fifth	/twentɪ'fɪfθ/
26th	twenty-sixth	/twentɪ'sɪksθ/
27th	twenty-seventh	/twentɪ'sevənθ/
28th	twenty-eighth	/twentɪ'eɪtθ/
29th	twenty-ninth	/twentɪ'naɪnθ/
30th	thirtieth	/'θɜːtɪəθ/
31st	thirty-first	/θɜːtɪ'fɜːst/
40th	fortieth	/'fɔːtɪəθ/
50th	fiftieth	/'fɪftɪəθ/
100th	hundredth	/'hʌndrədθ/
1 000th	thousandth	/'θaʊzəndθ/
1 000 000th	miilionth	/'mɪljənθ/

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Chemicals

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