Abbreviations for Mathematics
General Rules

#6 of Gottschalk's Gestalts

A Series Illustrating Innovative Forms
of the Organization & Exposition
of Mathematics
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Infinite Vistas Press
PVD RI
2000

GG6-1 (44)

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GG6-2

☐ comment
the following rules of abbreviation
of words and phrases for mathematical use
fall into two categories,
general rules and special rules;
a general rule is a guideline
that seems to be helpful
most if not all of the time
when seeking how to abbreviate
in a given instance,
assuming the general rule is relevant at all;
special rules apply to
particular classes of words or phrases
and usually provide specific abbreviations
if relevant;
it is possible, indeed usual, that several rules
can apply to a single word or phrase
with perhaps different results;
it will happen that certain different words or phrases
receive the same abbreviation
according to the rules;
what rule is to be applied to what word or phrase
and
what any abbreviation means
depend on
consensual agreement & usage, personal choice, and context;

an abbreviation should likely and usually be read as
the word or phrase it stands for;
exceptions in the form of reading
letter by letter or phonetically
appear to be relatively rare in mathematical practice;
for exceptional examples think of
AMS, mks system, NP complete, info, trig;
I see no sensible universal algorithm in the abbreviation of
words and phrases for mathematical use;
as has been remarked,
usage is the law of language, not logic;
and the natural language used in mathematics
is no exception;
necessarily & obviously,
examples of abbreviations given here
are samples only

• How can I abbreviate? Let me count the ways. (iho EBB)

☐ general rule
use the standard
logical/mathematical symbols
to serve as abbreviations of the words and phrases
that constitute their readings;
sometimes the job of abbreviation
can be taken over by denotation

examples:

- and.....&
- there exists.....∃
- six.....6
- logarithm.....log
- plus.....+
- infinity.....∞
- is less than.....<
- is perpendicular to.....⊥

☐ general rule
use standard Latin abbreviations

examples:

• circa.....ca
= lit: about

• et alii (masc)
et aliae (fem)
et alia (neut) .....et al
= lit: and others

• et cetera.....etc
= lit: and others
= and so on

• exempli gratia.....eg
= lit: for sake of example
= for example

• id est.....ie
= lit: that is

• quod erat demonstrandum.....qed/QED
= lit: which was to be proved

• versus.....vs
= lit: against

• videlicet.....viz
= lit: it is permitted to see
= namely
(note: the z in viz
is from Medieval Latin
shorthand for ‘et’)

☐ general rule
usually 2-letter words & 3-letter words
are not to be abbreviated

examples:

- by, in, of, on, to, up

- arc, box, for, let, map, set

exceptions:

at..... @

is / are..... ∈

no, not.....¬

or..... ∨

add..... +

and..... &

☐ comment
the elementhood sign ∈
is a stylized lowercase Greek letter epsilon;
it comes from the initial letter
of the Greek word εστι
which means ‘is’;
note the resemblance to the Latin word ‘est’ for ‘is’;
our elementhood sign then originally meant ‘is’;
¿ how is that related to the present-day meaning of
‘is an element of’ ?
let ‘x is prime’ be symbolized by ‘x ∈ prime’;
if we think of ‘prime’ as denoting the set of all prime numbers,
then ‘x ∈ prime’ can be read equivalently as
‘x is an element of the set of all prime numbers’
which is what we now see in ∈ ;
again, let ‘x is an integer’ be symbolized by ‘x ∈ integer’;
if we think of ‘integer’ as denoting the set of all integers, then
‘x ∈ integer’ can be read equivalently as
‘x is an element of the set of all integers’
which is what we now see in ∈

☐ general rule
4-letter compound prepositions such as

• into, onto, upon

and some other 4-letter words such as

• form, game, knot, ring, than, then, over

may escape abbreviation;
the operator

• curl

is not to be abbreviated

☐ general rule
usually
the indefinite article ‘a/an’
&
the definite article ‘the’
are to be omittted from indication
in the abbreviation of a phrase

examples:

• there exists a sequence such that.....∃ seq st

• the mean value theorem.....MVT

• x is the abscissa
and y is the ordinate.....x ∈ abs & y ∈ ord

☐ general rule
to pluralize an abbreviation,
suffix s rather than apostrophe s

examples:

• line, lines.....ln,lns

• point, points.....pt, pts

• mean value theorem,
mean value theorems.....MVT, MVTs

note: if possible,
use the singular form also for the plural form,
depending on context to clarify

note: in traditional scholarly usage
doubling the last letter of the abbreviation pluralizes
eg
page, pages.....p, pp
manuscript, manuscripts.....MS, MSS

☐ general rule
usually punctuation marks
should not be used in an abbreviation

examples:

• Rolle's theorem.....RT

• Fermat's last theorem.....FLT

• principal-valued inverse function.....pv inv fcn

exceptions:

• section headings
as T. for Theorem.
use periods

• the slash / may appear
in abbreviations
as for instance
6 m/h for six miles per hour

☐ general rule
in word abbreviations it may be possible
to fail to distinguish among parts of speech as
noun (singular/plural), verb. adjective, adverb
belonging to the same root
and
to depend on the context to clarify the meaning
eg
abbreviate

maximum
maxima
maximize
maximizes
maximizing
maximized
maximal
maximally

each as

max

☐ general rule
usually an abbreviation is written
all in lowercase letters or all in capital letters

examples:

- mathematics.....math

- the prime number theorem.....PNT

- necessary and sufficient condition.....nasc/NASC

note: whether an abbreviation is written
all in lower case letters or all in upper case letters
is often a case of personal taste

☐ general rule
an abbreviation of a word
should begin with the first letter of the word

examples:

- page.....p
- axis.....ax
- cardinal.....crd
- perpendicular.....perp
- homeomorphism.....homeo
- interpretation.....interp

exception:
- inflection.....flex

☐ general rule
usually in an abbreviation
consonants are to be preferred to vowels
because
consonants carry more information than vowels;
in the English alphabet of 26 letters
there are 20 consonants
&
there are 6 vowel letters,
a ratio of better than three to one

☐ general rule
some abbreviations may serve as
function signs and operators & vice versa

examples:

- differential.....d
- derivative.....D
- gudermannian.....gd
- identity.....id
- injection.....in
- projection.....pr
- divergence.....div
- laplacian.....lap
- signum.....sgn

- exponential.....exp
- logarithm.....log
- sine.....sin

etc

- inverse sine.....$\sin^{-1}$

etc

- principal-valued inverse sine.....Sin^{-1}

etc

- hyperbolic sine.....sinh

etc

- inverse hyperbolic sine.....$\sinh^{-1}$

etc

- principal-valued inverse hyperbolic sine.....Sinh^{-1}

etc

☐ general rule
use the slash /
to stand for a conjunction or a preposition
from the following list,
its meaning depending on the context:
and, or, and/or, xor,
by, for, from, in, of, on, over, per, etc

examples:

• probability and statistics.....prob/stat

• positive or negative.....pos/neg

• pearls of Sluze.....pearls/Sluze

• roses of Grandi.....roses/Grandi

• miles per hour.....m/h

• Calculus was discovered/invented by
Newton/England & Leibniz/Germany.

☐ general rule
to abbreviate the names of theorems,
use the capitalized first letters of the principal words

examples:

• the Pythagorean theorem.....PT

• the fundamental theorem of calculus.....FTC

• Rolle's theorem.....RT

• the intermediate value theorem.....IVT

• the mean value theorem.....MVT

• the mean value theorem
for derivatives.....MVTD

• the mean value theorem
for integrals.....MVTI

• the Cauchy integral theorem.....CIT

• the fundamental theorem of algebra.....FTA

• the fundamental theorem
of Galois theory.....FTGT

• the fundamental lemma
of the calculus of variations.....FLCV

• the Chinese remainder theorem.....CRT

• the prime number theorem.....PNT

• Fermat's last theorem.....FLT

• Hilbert's Nullstellensatz.....HN (HNSS)

☐ general rule
to abbreviate a phrase,
use the first letters of all the words

examples:

- left hand.....LH
- right hand.....RH
- left-hand side.....LHS
- right-hand side.....RHS
- quadratic formula.....QF
- arithmetic mean.....AM
- geometric mean.....GM
- harmonic mean.....HM
- arithmetic-geometric mean.....AGM
- law of sines.....LOS
- law of cosines.....LOC

- chain rule.....CR
- differential equation(s).....DE
- ordinary differential equation(s).....ODE
- partial differential equation(s).....PDE
- center of curvature.....COC
- center of gravity.....COG
- center of mass.....COM
- center of pressure.....COP
- center of symmetry.....COS
- absolutely continuous.....AC
- bounded variation.....BV
- Cauchy ratio test.....CRT
- Cauchy-Riemann equations.....CRE
- Cauchy-Schwartz inequality.....CSI

- Laurent series expansion.....LSE
- power series expansion.....PSE
- Fourier series.....FS
- Fourier transform.....FT
- fast Fourier transform.....FFT
- cosine series.....CS
- sine series.....SS
- harmonic series.....HS
- boundary value problem(s).....BVP
- finite intersection property.....FIP
- finite union property.....FUP
- Euler characteristic.....EC
- root mean square.....RMS
- right ascension.....RA

- ascending chain condition.....ACC
- descending chain condition.....DCC
- euclidean domain.....ED
- principal ideal domain.....PID
- unique factorization domain.....UFD
- domain of individuals.....DOI
- lower predicate calculus.....LPC
- higher predicate calculus.....HPC
- first-order logic.....FOL
- nondeterministic polynomial.....NP
- theory of everything.....TOE
- Common Era.....CE
- point of view.....POV
- exceedingly simple proof.....ESP
- the proof is completed.....TPIC

- angle side angle.....asa
- side angle side.....sas
- side side angle.....ssa
- side side side.....sss
- almost everywhere.....ae
- also known as.....aka
- finite linear combination.....flc
- if it exists.....iie
- if they exist.....ite
- in other symbols.....ios
- in other words.....iow
- in terms of.....ito
- it is enuf to prove.....iietp
- necessary and sufficient.....nas
- necessary and sufficient condition.....nasc

- prime factorization.....pf
- reflexive symmetric transitive.....rst
- revolutions per minute.....rpm
- standard deviation.....sd
- standard error.....se
- such that.....st
- that are.....ta
- that is.....ti
- the following statements are equivalent.....tfsae
- the following statements are pairwise equivalent.....tfsape
- which are.....wa
- which is.....wi
- without loss of generality.....wlog
- with respect to.....wrt

☐ general rule
to abbreviate a phrase,
abbreviate all/some words of the phrase individually

examples:

- absolute value.....abs val

- noneuclidean geometry.....noneuc geom

- principal-valued inverse function.....pv inv fcn

- the indefinite integral.....indef int

- take the second derivative.....take 2nd der

- apply the method
of Lagrange multipliers.....apply MLM

- before the Common Era.....BCE

☐ general rule
to form an abbreviated one-word heading,
use the capitalized first letter with period

examples:

- Definition. = D.
- Theorem. = T.
- Proof. = P.
- Remark. = R.
- Lemma. = L.
- Example. = E.
- Notation. = N.
- Comment. = C.
- Question. = Q.
- Bibliography. = B.
- etc

(a Remark is something that is worth saying
but which requires little or no explicit proof;
it is understood that
Notation includes terminology,
words being symbols too)

also

- Corollary. = Cor.

- Historical Note. = HN.

- Geometric Interpretation. = GI.

- Little Lemma. = LL.
(a little lemma is a lemma
that requires little or no proof)

- Standing Hypothesis. = SH.

- etc

☐ general rule
use equaters
where an equater is a linguistic object
consisting of a combination
of the equality sign =
and
of a few lower case letters as suffix or subscript;
an equater stands for a standard phrase
that suggests some kind of equality
or close connection
eg

• the (specific) definer
= df
is defined to be/mean

• the recursive definer
= dr
is defined recursively as follows

• the conditional definer
= dfc
is defined by the following condition(s)

• the implicit definer
= di
is defined implicitly as follows

• the announcing definer
= daf
is defined as follows

• the denoter
= dn
is denoted (by)

• the caller
= cl
is called

• the reader
= rd
is read (as)

• the writer
= wr
is written (as)

• the abbreviater
= ab
is abbreviated (as/by)

• the pronouncer
= pr
is pronounced (as)

• the translater
= tr
is translated (as)

• the existential isomorpher
= is
is isomorphic to/with

• the canonical isomorpher
= ci
is canonically isomorphic to/with

• the measurer
= m
is measured (as)
has measure

• the degree measurer
= dm
has degree meassure

• the radian measurer
= rm
has radian measure

• the estimater
= es
is estimated (about/as/at/to be)

• etc

note: plural LHS require plural verbs ‘are’ and ‘have’

☐ comment
the manufactured word ‘equater’
was suggested by the idea of
that which equates = that which makes equal;
these linguistic objects, the equaters,
seem to represent various kinds of ‘equality’;
the uniform ending -er of ‘equater’
and the names of the equaters
has been deliberately chosen
for the sake of ready unification and identification
altho dictionary spellings have variously -er or -or;
there is also the pun with ‘equator’;
sometimes when it is clear which equater is to be used,
the affix or subscript letters may be omitted
and the equality sign alone may be used;
this has been a frequent practice anyway
before equaters made the scene

□ general rule
use the questioner
ie
place a question mark
above the relation sign R in a relationship aRb
to denote the question
¿ is it the case that a bears the relation R to b ?
eg

$$a \overset{?}{=} b$$

means
¿ is a equal to b? = ¿ does a equal b ?

a sometimes alternative interpretation of $a \overset{?}{=} b$
would be:
there is some evidence that a = b
but it is not conclusive

☐ general rule
use
the assignment/evaluation/replacement/substitution operator
= the assigner/evaluator/replacer/substituter
:=

x := a means all of these synonymous commands:

x is assigned the value a

assign x the value a

x is given the value a

give x the value a

x is replaced by a

replace x by a

a replaces x

a is substituted for x

substitute a for x

☐ one-letter denotations
of powers of ten

• C
= one hundred
= 100
$= 10^2$
wh
C is the capitalized initial letter
of the Latin word ‘centum’
meaning ‘hundred’

• K
= one thousand
= 1000
$= 10^3$
wh
K is the capitalized initial letter
of the French prefix ‘kilo-’
meaning ‘thousand’
which comes from the Greek word χιλιοι
meaning ‘thousand’

• M
= one million
= 1,000,000
$= 10^6$
wh
M is the capitalized initial letter
of the word ‘million’

• B
= one billion
= 1,000,000,000
$= 10^9$
wh
B is the capitalized initial letter
of the word ‘billion’

• T
= one trillion
= 1,000,000,000,000
$= 10^{12}$
wh
T is the capitalized initial letter
of the word ‘trillion’

• Q

= one quadrillion

= 1,000,000,000,000,000

$= 10^{15}$

wh

Q is the capitalized initial letter of the word ‘quadrillion’

• Q′

= one quintillion

= 1,000,000,000,000,000,000

$= 10^{18}$

wh

Q′ is the primed capitalized initial letter of the word ‘quintillion’

☐ abbreviations of ordinal number words

- first.....1st
- second.....2nd
- third.....3rd
- fourth.....4th
- fifth.....5th
- etc

also

- zeroth.....0th
- minus first.....-1st
- minus second.....-2nd
- minus third.....-3rd
- minus fourth.....-4th
- minus fifth.....-5th
- etc

☐ some simplified/phonetic spellings

column.....colm
row.....ro

enough..... ..... enuf
rough.....ruf
tough.....tuf

flow.....flo
grow.....gro
low.....lo
row.....ro
show.....sho
slow.....slo
throw.....thro

flow.....flo
inflow.....inflo
outflow.....outflo

high.....hi
low.....lo
high-low.....hilo
low-high.....lohi

low.....lo
below.....belo

though.....tho
although.....altho

thought.....thot
thoughtful.....thotful
thoughtless.....thotless

through.....thru
view.....vu
review.....revu