Review of New Features in Maple

Summary

Many of the highlighted new features in Maple 2021, as in previous releases, appear heavily correlated with earlier features of Mathematica. Furthermore, the Maple feature is often only a shallow implementation of the Mathematica functionality.

Only a small fraction of Mathematica's advances make it into Maple at all. Major feature areas of Mathematica that Maple has yet to significantly cover in a serious way include machine learning, video and image processing, audio computation, mesh geometry, finite element analysis, report generation, cloud computation, hardware connectivity, natural language processing and semantic interpretation, spatial statistics, quadratic optimization, real-world data sources and much more.

For those capabilities that Maple has implemented in the last nine Maple releases, the median time lag between features being introduced in Mathematica and basic implementation in Maple has been around nine years.

If you want access to deep implementations of the very latest in computation, you should be using Mathematica.

New Features in Maple 2021

Maple 2021	Mathematica	Notes
Language and programming		
Multilevel break statements	1988	Implemented in Mathematica as `Throw` and `Catch`.
Interfaces with an indeterminate number of input fields	2014	Implemented in Mathematica as part of `FormObject`.
Generate evenly spaced sequences	2015	Implemented in Mathematica as `Subdivide`.
IsMonotonicQ	1988	Implemented in Mathematica as `OrderedQ`.
DEQueue	2020	Efficient double queues are implemented in Mathematica as `DataStructure["Dequeue"]`. `DataStructure` supports more than 20 additional specialized data structures with optimized supporting operations.
PersistentTable	2017	Mathematica's `PersistentObject` is not limited to table–like structures and provides control over the duration of the persistence and supports both local and cloud–based storage.
DataFrame indices and entries	2014	Mathematica's `Dataset` is not limited to rectangular two–dimensional data and has always supported equivalent functionality using the commands `Keys` and `Values`.

Maple 2021	Mathematica	Notes
Units:–Split	2012	Implemented in Mathematica as `QuantityMagnitude` and `QuantityUnit`.
Limit information returned by Trace	1991	Mathematica's `Trace` command supports an arbitrary pattern for filtering returned information.
Math		
Multivariate limits		Examples given as newly solved in Maple are already solved in Mathematica.
Vectorized ODEs	1999	
Series expansion of log integral		`LogIntegral` was originally included in Mathematica in 1988 and is supported by `Series`.
GuessRecurrence	2008	Implemented in Mathematica as `FindSequenceFunction`.
MinimalRecurrence	2008	Implemented in Mathematica as `FindLinearRecurrence`.
Simplifications of LambertW	1996	The examples shown as new in the Maple 2021 announcement are already simplified in Mathematica. Implemented in Mathematica as `ProductLog`.
MatrixAdd, VectorAdd	1988	Because Mathematica automatically supports vectorized operations when appropriate, there is no need for such commands.
New differential equation solutions		Four of the five new examples shown in the release announcement produce solutions in Mathematica.
Multivariate CoefficientVector	2015	Implemented in Mathematica as `CoefficientList`.
EgoGraph	2010	Implemented in Mathematica as `NeighborhoodGraph`.
GraphDensity	2012	Implemented as `GraphDensity`.
Newick	2021	Available in Mathematica as `ResourceFunction["ExportNewickString"]`.
PrueferCode	2012	Implemented in Mathematica as `LabeledTreeToCode`.
SpanningForest	2014	Implemented in Mathematica as `FindSpanningTree`.
BipartiteMatch supports weighted graphs	2012	Implemented as `FindMaximumFlow`.
Additional special graphs	2007+	Mathematica's `GraphData` now supports 8349 special graphis compared to 113 supported by Maple, including the 16 added in this release of Maple.

Maple 2021	Mathematica	Notes
Visualization		
Automatic domain choice for plots	2010	Using Wolfram|Alpha's computational intelligence, Mathematica has been able to choose domains based on features such as asymptotes, roots, and maxima and minima. This feature was first trialled in Wolfram's CalculationCenter product in 2001.
Units in point plots and polygon plots	2012	Mathematica's units are supported in most plot types, not just the two that Maple now supports.
Arrow respects scale	2007	Mathematic's `Arrow` primitive has always taken scale into account for its head shape. The same is true for lines with beveled or round ends, neither of which are currently supported in Maple. Mathematica also gives full control over `ArrowHead` numbers, position, size and style.
Deep learning		Mathematica provides 56 neural network layer types compared to the nine now supported in Maple. Mathematica allows composition of layers in an arbitrary graph, not just through the linear chain supported by Maple.
EmbeddingLayer	2016	Implemented as `EmbeddingLayer`.
ConvolutionLayer	2016	Implemented as `ConvolutionLayer`.
DenseLayer	2016	Implemented as `LinearLayer`.
DropoutLayer	2016	Implemented as `DropoutLayer`.
EmbeddingLayer	2016	Implemented as `EmbeddingLayer`.
FlattenLayer	2016	Implemented as `FlattenLayer`.
GatedRecurrentUnitLayer	2017	Implemented as `GatedRecurrentLayer`.
LongShortTermMemory Layer	2017	Implemented as `LongShortTermMemoryLayer`.
MaxPoolLayer	2016	Implemented as `PoolingLayer`.
Sequential	2016	Implemented as `NetChain`.
Interface		
Non−executable math in text	1996	Mathematica has always assumed that math embedded in text should not be executable by default.
Display multiplication in scientific notation	1996	As well as automatically displaying the times symbol in scientific notation, Mathematica allows the user to decide the character to be used in this and other implied multiplication situations.
Warning messages for **e** and **d** can be suppressed	1988	All evalation warnings in Mathematica can be individually or collectively suppressed.
Copy selection as LaTeX	1996	

Maple 2021	Mathematica	Notes
Enter LaTeX	1996	Since 1996, it has been possible to paste LaTeX for automatic translation into Mathematica typesetting. Since 2020, Mathematica has held the original LaTeX in the notebook for later editing, rendering it in real time for display.
Export to LaTeX	1996	
latex command	1988	Implemented in Mathematica as `TeXForm`.
Student packages		
Step–by–step solutions: equation solving, factoring polynomials and long division	2009	All Wolfram|Alpha step–by–step solutions are available within Mathematica, including algebra. Mathematica supports step–by–step solutions for many problem types not supported by Maple, including linear algebra, discrete math, physics formulas, statistics, geometry, chemistry equations and proofs.
Step–by–step solutions: ODEs	2012	All Wolfram|Alpha step–by–step solutions are available within Mathematica, including differential equations.
Study guides in Maple		Wolfram doesn't put study materials inside Mathematica but provides them, free of charge, through Wolfram U.
Signal and image processing		
Short–time Fourier transforms	2019	Implemented as `ShortTimeFourier`.
BandPower, MeanFrequency and SpectralEntropy	2016	Implemented in Mathematica as `AudioMeasurements`.
ShortTimeBandPower, ShortTimeMean Frequency and Short TimeSpectralEntropy	2016	Implemented in Mathematica as `AudioLocalMeasurements`.
SampleImage	2007	Test images and other sample data are provided by the command `ExampleData`. In addition, Mathematica provides commands such as `WebImageSearch` and thousands of `Entity` objects that include an "`Image`" property.
Welch	2012	Implemented in Mathematica within `Periodogram`.
Hampel	2021	Available in Mathematica as `ResourceFunction["HampelFilter"]`.
PowerSpectrum accepts signals	2012	Mathematica's `PeriodogramArray` command accepts signal data and can also be applied to directly to `Audio` and `Image` data.
Thermophysical data		
Thermophysical data	2014	Implemented in Mathematica as `StandardAtmosphereData`.

Maple 2021	Mathematica	Notes
Quantum chemistry (additional purchase)		Mathematica provides chemistry functionality without the need for additional purchases.
MolecularDictionary	2007	Implemented in Mathematica as `ChemicalData`.
PlotMolecule	2007	Implemented in Mathematica as `MoleculePlot`.
MolecularGeometry	2019	Implemented in Mathematica as `Molecule`.

Developments in Maple 2021 that do not appear to be following Mathematica developments include work in algebraic physics.

New Features in Maple 2020

Maple 2020	Mathematica	Notes
Graph theory		
Betweenness centrality	2010	Implemented in Mathematica as `BetweennessCentrality`. Mathematica supports 12 different centrality measures while Maple now supports only 8.
Closeness centrality	2010	Implemented in Mathematica as `ClosenessCentrality`.
Degree centrality	2010	Implemented in Mathematica as `DegreeCentrality`.
Eigenvector centrality	2010	Implemented in Mathematica as `EigenvectorCentrality`.
Katz centrality	2010	Implemented in Mathematica as `KatzCentrality`.
Page–rank centrality	2010	Implemented in Mathematica as `PageRankCentrality`.
Graph styling control	2014	As well as controlling style choices for edges and vertices, Mathematica can use arbitrary shape functions for either of these, allowing any kind of visual representation.
Graph self loops	2010	Mathematica's `Graph` object has always supported self–loops. Finding and counting self–loops is just a special case of finding edges that match a given pattern and can be acheived with `EdgeList`[graph,(x_⟷x_)|(x_⟷x_)]. By changing this pattern, Mathematica can distinguish between directed and undirected self–loops, which Maple's commands do not.
Geometric graphs	2020	Mathematica's `MeshConnectivityGraph` command can generate graphs of the connectivity of any subdimension of any dimensional mesh geometry.
Contract subgraphs	2014	Implemented in Mathematica as `VertexContract`.
Special graphs	2007	Mathematica includes support for over 8000 special graphs, including all 18 recently added to Maple. Even now, Maple supports only 97.

Maple 2020	Mathematica	Notes
Nearest and farthest neighbor graphs	2015	Implemented in Mathematica as `NearestNeighborGraph`.
Sphere–of–influence graph	2015	Implemented in Mathematica as `NearestNeighborGraph`.
Math		
Assumptions can include Or	2007	
Quantified elimination over reals	2003	Implemented in Mathematica as `Reduce`, `ForAll` and `Exists`.
Series of WhittakerM, WhittakerW	2007	
Series of KummerM, KummerU	1988	Implemented in Mathematica as `Hypergeometric1F1`.
PointInPolygon	2014	Mathematica's function `RegionMember` tests whether a point in any–dimensional space is within regions defined by a collection of region primitives and derived regions. It is not limited to polygon primitives in 2D space as Maple is.
MinPoly	2007	Implemented in Mathematica as `MinimalPolynomial`.
JacobiP with negative arguments	1988	
JordanTotient	2008	This is a trivial combination of the Mathematica commands `DivisorSum` and `MoebiusMu`.
Simplification		Most new examples of simplificaton from Maple 2020 marketing materials were already simplified in Mathematica.
Integral transforms		
Numerical evaluation of integral transforms	1999	In general, all Mathematica functions are designed to work with numerical values as well as symbolic.
Simpler definition of Hankel transform	2017	Mathematica has always used this more useful definition of `HankelTransform` that Maple has switched to in this release.
New user experience		
Warnings on misuse of e and d	2007	While Mathematica does not need to highlight the use of "e" and "d", since it uses visually different symbols for those symbols in typeset notation, it does support a wide range of automated syntax coloring to highlight user errors as they are typed. Even for this, more limited error detection, Maple does not warn as the error is typed but later when the input is evaluated.
Reactivation of time–limited licenses	1996	Mathematica does not need the new "Reactivate License" button that has been added to Maple, because it silently reactivates time–limited licenses without user intervention (unless blocked by an administrator at the user's organization).

Maple 2020	Mathematica	Notes
Help on error messages	1996	Many common error messages are documented amongst more than 10,000 pages of thorough documentation available in Mathematica or online at http://reference.wolfram.com.
Learning tools for linear algebra		
Step–by–step Gaussian elimnation	1996	Wolfram|Alpha's powerful step–by–step tools are accessible in the Mathematca notebook environment.
Eigenvector plot		Available to Mathematica as `ResourceFunction["EigenvectorPlot"]`.
Least squares plot		Available to Mathematica as `ResourceFunction["LeastSquaresPlot"]`.
Math apps		
New math apps	2007	Maple's MathApps guide currently lists fewer than 400 math apps. This compares to over 12,000 in the Wolfram Demonstrations Project.
Visualization		
Image size control for 3D plots	1996	All Mathematica visualizations support custom size control throught the option `ImageSize`.
Legends on contour plots	2012	Mathematica can label any values on its `ContourPlot` legends, not just the contour values used, as Maple does. It also supports `LineLegend`, `PointLegend` and `SwatchLegend` styles, not just the line legend that Maple supports.
Adaptive mesh for plot3D	2012	Mathematica extends support for adaptive meshes to all 3D function visualizations, such as `ContourPlot3D` and `ParametricPlot2D`, not just `Plot3D`.
CVD simulation	2012	Mathematica can simulate color vision deficiency using `ImageEffect`. The Maple CVDSimulation command can be applied only to colors, but the Mathematica `ImageEffect` command can als be applied directly images, video, graphics and documents.
Physics		
Feynman diagrams	1990	Feynman diagrams are available in Mathematica through an open source package at https://feyncalc.github.io.
Signal and image processing		
2D cross correlation	2008	Implemented in Mathematica as `ImageCorrelate`. Mathematica supports seven different distance measurements including the Dot product used in Maple.
Convolution with complex signals	1999	Mathematica's `ListConvolve` command can work with floating–point real and complex values, as Maple now can, but also with symbolic, exact and high–precision values.
HoughLine and ProbabalisticHoughLine	2010	Both of these commands are implemented in Mathematica in `ImageLines`.

Maple 2020	Mathematica	Notes
2D Haar wavelet transform	2010	Mathematica's `DiscreteWaveletTransform` function can apply 16 different wavelet families, not just `HaarWavelet`. Furthermore, it can apply them to arrays and sounds, not just images. Mathematica also supprts `ContinuousWaveletTransform`.
Hilbert transform	2012	Implemented in Mathematica as `HilbertFilter`.
Root mean square (RMS)	2007	Implemented in Mathematica as `RootMeanSquare`.
Audio tools		
Read part of an audio file	2016	Implemented in Mathematica as `AudioTrim`. Mathematica can import from `AIFF`, `AU`, `FLAC`, `MPD`, `M4A`, `OggVorbis`, `SND`, `WAV` and Wave64 files while Maple supports only `WAV`.
High sample rate audio	2016	Mathematica `Audio` functionality can process audio at sample rates of 2^62 Hz and export to `WAV` at 2^31−1 Hz.
White noise generator	2016	Mathematica's `AudioGenerator` command can generate test audio using 13 different models including `"White"` noise.
Data import & export		
BSON	2018	Mathematica supports over 240 import and export formats from files, streams or URLs, including the two formats newly supported in Maple.
UBJSON	2018	
Import matrices	1999	Most of Mathematica's 240 import and export filters support multiple options to control the details of data transfer. For tabular data, Mathematica's `Import` gives controls such as `CharacterEncoding`, `"CurrencyTokens"`, `"DateStringFormat"`, `"FieldSeperators"`, `"HeaderLines"`, `"IgnoreEmptyLines"`, `"LineSeperators"` and `"NumberPoint"`, as well as the two options`"Numeric"` and `"RepeatedSeperators"` for which there are now Maple equivalents.
Data conversion to and from Python	2017	Data format conversion is handled automatically when calling to or from Python via Mathematica's `ExternalEvaluate` command or using the Wolfram Client Library for Python.
Programming		
URL download with authentication	2016	Implemented in Mathematica as `Authentication` and with full OAuth support using `SecuredAuthenticationKey`.
Worksheets tools: RemoveSection, TableOfContents		Because Mathematica provides a full symbolic representation of notebooks that can be operated on by the Wolfram Language, it is possible to perform essentially any transformation, analysis or generation of Wolfram `Notebooks`. For example, Maple's RemoveSection command can be implemented as `NotebookPut[DeleteCases[NotebookGet[EvaluationNotebook[]],Cell[_,"Section",___],Infinity]]`.

Maple 2020	Mathematica	Notes
de Bruijin sequences	2018	Implemented in Mathematica as `DeBruijnSequence`.
Interface		
Performance		
Log expansion	1991	The Maple announcement blog claims to have reduced the computation `PowerExpand[Log[2^(10^5 NextPrime[10^4])]]` to around 15 seconds. Mathematica performs this computation in around 0.1 seconds.

Developments in Maple 2020 that do not appear to be following Mathematica developments include work in group theory, Lie algebras and PDE solving.

New Features in Maple 2019

Maple 2019	Mathematica	Notes
Graph theory		
FindVertexCover	2010	Mathematica's `FindVertexCover` command supports undirected graphs, directed graphs, multigraphs and mixed graphs.
FindHamiltonianCycle	2010	Mathematica's `FindHamiltonianCycle` command supports undirected graphs, directed graphs, multigraphs and mixed graphs.
FindHamiltonianPath	2015	Mathematica's `FindHamiltonianPath` command supports undirected graphs, weighted graphs and optionally allows selection of minimum and maximum path lengths including support for arbitrary distance functions.
MaximumClique	2010	Mathematica's `FindClique` command supports undirected graphs, directed graphs, weighted graphs, multigraphs and mixed graphs. It can be directed to select cliques of specified size or intervals of sizes.
MaximumIndependentSet	2010	Mathematica's `FindIndependentVertexSet` command supports undirected graphs, directed graphs, weighted graphs, multigraphs and mixed graphs. Specific or intervals of vertex set sizes can be found.
Random graphs: BarabasiAlbertGraph	2010	Implemented in Mathematica as `BarabasiAlbertGraphDistribution`.
Random graphs: WattsStrogatzGraph	2010	Implemented in Mathematica as `WattsStrogatzGraphDistribution`.
New special graphs	2007	Mathematica includes a database of 7852 special graphs, which includes all 11 that are newly added to Maple.
TransitiveReduction	2014	Mathematica's `TransitiveReductionGraph` supports undirected graphs, directed graphs and multigraphs.

Maple 2019	Mathematica	Notes
IsStronglyRegular	2007	`"StronglyRegular"` is one of the 516 properties available through the Mathematica function `GraphData`.
IsTriangleFree	2007	`"TriangleFree"` is one of the 516 properties available through the Mathematica function `GraphData`.
Vertex display shapes	2010	As well as providing many named shapes, as Maple now does, Mathematica also supports arbitrary graphics for vertex shapes.
Mouseover tooltip on vertices	2010	All Mathematica graphics can support tooltips, including graph vertices, which has now been added to Maple. Furthermore, tooltips in Mathematica can contain graphics, tables, typeset math and formatted text, not just the plain text supported by Maple.
Computational geometry		
PointInCircle	2014	Whether a point is in a circle is just a special case of Mathematica's much more general `RegionMember` function that can test for whether a point is in much more complex regions than circles. The circle specification used by Maple is computed in Mathematica using `CircleThrough`.
PointOnSegment	2014	Whether a point lies on a specific line segment is also just a special case of testing for region membership. In Mathematica, that is also handled by `RegionMember` without having to create another function.
SegmentIntersect	2014	This is just the simplest case of Mathematica's much more general `RegionIntersection`. `RegionIntersection` finds points, lines, areas and volumes of intersection of many region primitives and derived regions.
MultiSegmentIntersect	2014	Implemented in Mathematica with the much more general `RegionIntersection` command.
3D Delaunay mesh	2014	While Mathematica does not support higher–dimension Delaunay triangulation, the important 3D case has been supported since 2014.
Statistics and data analysis		
LeastTrimmedSquares regression	2019	Available in Mathematica as `ResourceFunction["TrimmedLinearFit"]`.
Correlogram	2019	Available in Mathematica as `ResourceFunction["Correlogram"]`.
detrend	2014	Implemented in Mathematica as `EstimatedBackground`.
difference	2007	Implemeneted in Mathematica as `Differences`.
Dataseries and Dataframe support remove, select and selectremove	2014	Mathematica's `Association` and `Dataset` supported operations to select or remove elements from their inception. Maple's Dataframe remains limited to two–dimensional tables of data while Mathematica's `Dataset` can support any dimensionality of data.

Maple 2019	Mathematica	Notes
Signal processing		
FindPeakPoints	2014	Implemented in Mathematica as `FindPeaks`.
Spectrogram overlap control	2012	As well as allowing control of overlap size, Mathematica's `Spectrogram` command supports user control of offsets, padding and smoothing.
Cepstrum	2017	
FFTShift	1988	While Maple has labeled this function FFT`Shift`, that is a specific application of a more general list and matrix rearrangement implemented in Mathematica as `RotateLeft` and `RotateRight`.
EdgeDetect	2010	The Mathematica function `EdgeDetect` allows you to find edges of different separation levels and different thresholds of detection and by sharpness or straightness. Mathematica also supports edge detection on 3D image data.
Dates and times		
Format dates	2007	Implemented in Mathematica as `DateString`.
Parse date strings	2014	Implemented in Mathematica as `DateObject`.
Language		
Increment, decrement and assignment	1988	Implemented in Mathematica as `Increment`, `Decrement`, `AddTo` and `SubtractFrom`. Mathematica also supports similar functions `PreIncrement`, `PreDecrement`, `TimesBy` and `DivideBy`.
Local scoping within expressions	1988	In Mathematica functions, procedures and expressions are the same thing, so local scoping has always been available within any kind of expression.
Operator precedures can have local variables	1988	Mathematica has never suffered from this limitation.
Using assignment, if, try and loops in expressions	1988	Mathematica has never suffered from this limitation.
Two variable for loops	1991	Mathematica's `MapIndexed` command serves this purpose but is more general in its ability to apply at any or all depths of any expressions, not just on matrices.
Remove	1991	Implemented in Mathematica as `Delete`.
Reverse supports Matrix, Vector and Array	1988	Mathematica's `Reverse` command has always supported any kind of expression.
convert/english	2014	Implemented in Mathematica as `IntegerName` and `Interpreter`.
tablereverse	2014	Implemented in Mathematica as `GroupBy`.

Maple 2019	Mathematica	Notes
Download	2016	Implemented in Mathematica as `URLDownload`. Mathematica also supports asynchronous downloads of data using `URLDownloadSubmit`.
Interface		
Supress startup screen	2007	
Short forms of matrices		Mathematica has long supported techniques for providing compact representations of all large expressions, not just matrices. `Manual` methods such as `Short` were introduced as early as 1988 and applied automatically as early as 2007.
Short forms of audio	1991	Some specialized data formats such as sampled sound have had compact representations since 1991, but the concept was made much more general in 2016.
New Units by Dimensionality palette		While Mathematica supports too many units to sensibly put them in a palette, since 1996, it has been possible to create your own palettes organized how you wish.
Customizable favorites palette	1996	You can create any custom palette in Mathematica.
SVG export	2003	Mathematica supports 226 import and export formats, including `SVG` export.
echoFile	1988	Logging of inputs and outputs can be acheived using `$Pre` and `$Post`.
11 new apps		Mathematica interactive apps are collected at the Wolfram Demonstrations Project, where there are now over 11,000 available.
Advanced math		
Improvements to integration	1988–2019	All of the new single–value integral examples given as "newly solved" in the Maple marketing are already solved by Mathematica's `Integrate` command.
Improvements to solve	1988–2019	All of the new solve examples given as "newly solved" in the Maple marketing are already solved by Mathematica's `Reduce` command.
Improvements to Fourier transforms	1988–2019	Some of the Fourier transform examples given as "newly solved" in the Maple marketing are already solved by Mathematica's `FourierTransform` command.
Improvements to PDE solvers	1988–2019	While both Maple and Mathematica have developed their symbolic PDE solvers over recent releases, Maple still lacks any FEA methods for solving numerical PDEs.
Improvement to limits	1988–2019	While both Mathematica and Maple have supported simple limits from their earliest versions, Maple still lacks support equivalent to Mathematica's `MaxLimit`, `MinLimit`, `DiscreteLimit`, `DiscreteMaxLimit` and `DiscreteMinLimit` functions.
Root finding	1988–2019	Mathematica automates root finding behind the higher–level functions `Reduce` and `NSolve`, removing the need for low–level operations like Maple's isolate. For example, the main demonstration of improvements in the Maple 2019 marketing material finds the intersection of two curves. In Maple, this example takes 40 separate inputs to explore two cases. In both cases, Mathematica's `Reduce` finds the roots in a single line of input.

Developments in Maple 2019 that do not appear to be following Mathematica developments are work in tensors, group theory and quantum physics.

New Features in Maple 2018

Maple 2018	Mathematica	Notes
Units		
Units supported by fsolve, solve, int, etc.	2012	The Mathematica `Quantity` object supported a wide range of computations from its initial release. Mathematica also supports unit–based data for its data visualization functions, which Maple still does not.
Greek letters in unit display	2012	
Computational geometry		
VoronoiDiagram	1992	Revised in 2014, this is implemented in Mathematica as `VoronoiMesh`.
ConvexHull	1992	Revised in 2014, this is implemented in Mathematica as `ConvexHullMesh`.
DelaunayTriangulation	1992	Revised in 2014, this is implemented in Mathematica as `DelaunayMesh`.
PolygonTriangulation	2014	Implemented in Mathematica within `DiscretizeRegion`.
Graph theory		
CliquePolynomial	2007	Implemented in Mathematica within `GraphData`.
DistancePolynomial	2007	Implemented in Mathematica within `GraphData`.
FindClique	2010	Implemented in Mathematica as `FindClique`.
GraphIntersection	2010	Implemented in Mathematica as `GraphIntersection`.
IndependencePolynomial	2007	Implemented in Mathematica within `GraphData`.
IsReachable	2016	Implemented in Mathematica using `ConnectedGraphComponents`.
Reachable	2016	Implemented in Mathematica using `ConnectedGraphComponents`.
Special graphs	2007	In Mathematica, `GraphData` provides information on 7,429 special graphs, including all of the eight recently added to Maple.

Maple 2018	Mathematica	Notes
Advanced mathematics		
Improvements to integrate	1988–2014	Examples of improvements to int given in the "What's New in Maple 2018" pages are already solved by the Mathematica command `Integrate`.
Improvements to Sum	1988–2008	Examples of improvements to Sum given in the "What's New in Maple 2018" pages are already solved by the Mathematica command `Sum`.
Sturm supports algebraic coefficients	2007	The Mathematica equivalent, `CountRoots`, has always accepted algebraic coefficients.
Satisfiable	2008	Implemented in Mathematica as `SatisfiableQ`.
Satisfy	2003	Implemented in Mathematica as `FindInstance`.
Generalized Polylog	1999	
Interpolation		
Interpolation returns an object	1988	The Mathematica function `Interpolation` has always returned an object that behaves like a built–in function and is integrated into the wider system. For example, `NDSolve` returns `InterpolatingFunction` answers, making them easy to use in other computations, such as integrating them. Maple's dsolve 'numeric' still returns procedures that must be sampled at specific points.
Support irregular data	2008	
Krigging	2014	Implemented in `Interpolation` as a method for `Predict`.
Dates & times		
Date object	2014	Implemented in Mathematica as `DateObject` with support for all the capabilities of the Maple date function. Mathematica date calculations support a range of national holiday schedules, including key financial markets, and supports the notion of date granularity, which Maple does not. The Mathematica `DateObject` supports Gregorian, Julian, Islamic and Jewish calendar types; Maple supports only Gregorian.
Now	2014	Implemented in Mathematica as `Now`.
DayOfWeek, DayOfYear, etc.	2014	Implemented in Mathematica as a single function `DateValue`, which gives access to both numerical and name values of fields.
HostTimeZone	2007	Implemented in Mathematica as `$TimeZone`.
IsLeapYear	2012	Implemented in Mathematica as `LeapYearQ`.
DateDifference	2007	Implemented in Mathematica as `DateDifference`.

Maple 2018	Mathematica	Notes
Thermophysical data & scientific constants		
Thermophysical data and scientific constants	2007	The addition of data on 2,000 chemicals still leaves Maple far behind Mathematica's `ChemicalData` database, which currently provides up to 100 properties for over 44,000 chemicals. Knowledge of chemicals is just one of many databases of real–world knowledge built into Mathematica. For example, Maple provides none of the data on astronomical bodies, human physiology, subatomic particles, weather, proteins, geo–elevation or the human genome that Mathematica does.
Visualization		
Rotatable text	2007	Any visual content can be displayed rotated in Mathematica, including typeset math, images and graphics—not just text.
ParetoChart	2002	Implemented as `ParetoPlot`.
Borderless arrow	2007	Mathematica supports arbitrary shapes for `Arrowheads`, including full border control, but does not support arrow–stem borders.
Image tools	1988	Surprisingly, Maple has lacked user tools for describing diagrams up to now, and the new Line, Poly, circle and text primitives fall far short of the equivalent Mathematica tools. Maple's tools support only 2D images, and require a prior decision about the output image resolution. Mathematica supports many more graphics primitives (`BSplineCurve`, `Ellipsoid`, `Sphere`, etc.), rasterizes them in real time according to the viewing size (unless you choose to fix the resolution) and can be combined with all of the built–in visualizations.
Connectivity		
Execute Python	2017	Implemented as `ExternalEvaluate`.
Link to TensorFlow	2014	Rather than provide only a link to an external library, Mathematica contains a fully automated machine learning framework that integrates deeply with other parts of the system and is backed transparently by MXNet for low–level computations.
Programming		
Code editor improvements		Maple uses a different editor for code inside interactive elements than it does for general input. Error highlighting, function autocompletion and filename completion are not available in the rest of the Maple Worksheet. In Mathematica, they are supported in general input.
Until	1988	In Mathematica, `While[body;test]` is equivalent to an Until statement.
Inline assignments	1988	Any expression can be evaluated inside any other expression in Mathematica, including assignments.
Random variable names	1988	This need is addressed in Mathematica as `Unique`.
SameStructure	1988	Implemented in Mathematica as `SameQ`.
Encrypted procedures	1988	Implemented in Mathematica as `ReadProtected`.

Maple 2018	Mathematica	Notes
Uneditable content	1996	The Wolfram Notebook has long supported the notion of uneditable content, but this can be controlled at the character level, not just at the whole–document level. It also supports control over whether content is selectable or copyable, which Maple does not.

Developments in Maple 2018 that do not appear to be following Mathematica developments are new interface layouts, practice sheet generation, extensions to quantum physics, group theory and differential equation solving functions

New Features in Maple 2017

Maple 2017	Mathematica	Notes
Visualization		
Dynamic plot annotations	2007	Maple's annotation options are a limited version of Mathematica's `Tooltip` command. `Tooltip` is not limited to use within graphs, and can also be applied within tables, to text or within typeset math; it can also contain any kind of content, not just text. `Tooltip` is just one kind of annotation that Mathematica can apply to elements in graphics. `Label` and `Callout` allow annotations that appear in fixed positions or that can be automatically positioned to avoid overlap. Mathematica can also be set to execute arbitrary code using `EventHandler` on events such as mouse down, up, hover, drag and key events.
Contour plot support for tooltip	2007	As well as automatically adding tooltips in `ContourPlot`, Mathematica does the same in `GraphPlot`, `PieChart` and other visualizations that Maple, so far, does not. Mathematica also makes automatic use of `Tooltip` to disambiguate similar traditional math notations. Maple does not.
Periodogram	2012	As well as `Periodogram`, Mathematica supports `Spectrogram` and `Cepstrogram` visualizations of signals and `ImagePeriodogram` visualizations from images. Mathematica can also compute 35 different properties of audio over time or frequency space using `AudioMeasurements` and `AudioLocalMeasurements`.
Violin plots	2010	Mathematica's `DistributionChart` supports eight different types of distribution visualization, of which violin plots are just one. Mathematica automatically annotates its violin plot with additional tooltip information. Maple does not.
Weibull plot	2010	Weibull plots are a special case of a `QuantilePlot` with a log–log scaling function.
Bar charts support color schemes	2008	Mathematica's `BarChart` also supports a collection of predefined and user–defined bar shapes.
Bar charts support individual bar colors	2008	Mathematica's `BarChart` also supports individual bar shapes.
Color palette display	2008	Mathematica's `ColorDataFunction` automatically displays as color swatches.

Maple 2017	Mathematica	Notes
Chroma, Hue, Luma, etc.	2008	Mathematica natively supports six color spaces, allowing it to convert to or directly represent color in `LCHColor`.
Discontinuity option in DensityPlot	2007	Mathematica automatically detects discontinuities without needing special instruction.
Statistics		
Remove columns from DataFrame	2014	Maple's DataFrame design is limited to 2D tables of rows and columns. This addition continues to embed that assumption. Mathematica's `Dataset`, which appeared before Maple's DataFrame, allows arbitrarily deep data structures, including the simple case of rows and columns.
Sort supports DataFrame	2014	When Mathematica added its generalized database structure `Dataset`, every function could be applied to it.
Geo computation		
Choropleths	2014	Maple's ChoroplethMap command is a very limited implementation of Mathematica's `GeoRegionValuePlot`. Maple can only color country regions, while Mathematica knows the geometry of other administrative divisions such as states, counties and continents, historical country boundaries and user–defined regions. Mathematica supports a choice of map textures including street maps, terrain, a choice of satellite imagery and user–defined textures, while Maple maps are just blank colors. Mathematica supports over 500 map projections, while Maple supports only 16. Choropleth is just one type of geo visualization. Maple lacks other types such as `GeoHistogram`, `GeoSmoothHistogram` and `GeoBubbleChart`. Mathematica also supports geo visualization for other planets and moons, while Maple supports only Earth.
Geographic data	2007	Maple's new geographic data is a limited implementation of Mathematica's `"City"` entity type. The Mathematica entity system provides up to 97 properties on `"City"` entities, but also provides more than 60 other entity types for which geographic information is known, such as mountains, weather stations, oil fields and volcanoes. Mathematica can also convert street addresses into geo positions.
Great circle paths	2014	While Maple can place lines between geo points, it cannot place lines using direction and distance directives or correctly draw geo disks and geo circles as Mathematica can.
Graphs		
Style control for graphs	2007	As well as being able to control the colors of edges and vertices, as Maple added in this release, Mathematica allows complete control of the shape of edges and vertices and provides a collection of predefined style collections.
New special graphs	2007	Mathematica's `GraphData` command provides access to over 450 properties of nearly 7,000 special graphs. All six of the new graphs added to Maple were already in this database.
DrawAutomorphism		While Mathematica does not provide this visualization, the underlying data is generated with the Mathematica command `GraphAutomorphismGroup`.
GraphDiameter	2010	Implemented in Mathematica as `GraphDiameter`.
Eccentricity	2010	Implemented in Mathematica as `VertexEccentricity`.

Maple 2017	Mathematica	Notes
Graph6 import	2007	
Math		
SearchSmallGroups	2014	Mathematica uses a common function, `EntityList`, to search any entity type (cities, chemicals, animals, etc.) that matches a criterion. This includes searches of `"FiniteGroup"` entities.
CharacterTable	2014	CharacterTable is a property of the `"FiniteGroup"` `Entity` type.
Sums of binomial functions	1991	Most of the examples given as improved Maple output already produced compact answers in Mathematica in terms of `Binomial` functions.
Integration improvements		All the "What's New in Maple 2017" integration examples were already solvable in Mathematica.
ChineseRemainder	2007	
IthFermat		This Maple function just calculates $2^{2^n} + 1$; however, Maple returns "object too big" for IthFermat(30), while Mathematica correctly calculates all 323,217,816 digits.
SimplestRational	1988	Implemented in Mathematica as `Rationalize`.
coulditbe	2003	Implemented in Mathematica as `Reduce` and `Exists`.
Parity	1988	Implemented in Mathematica as `Xor`.
content	1988	Similar functionality is available in Mathematica using the command `FactorTermsList`.
LambertW simplifications	1996	
Appell functions	1999	`AppellF1` is supported in Mathematica.
New PDE solving algorithms		Some of the newly solved PDE examples given in the Maple promotional literature are already solved in Mathematica.
Improvements to Limit		`Limit` finding is longstanding functionality in both Maple and Mathematica. Mathematica has also added significant improvements to `Limit` in 2017.
User interface		
Automatically insert multiplication symbols	2007	Mathematica allows you to customize the choice of multiplication symbol that gets inserted.
Visibility control of code edit regions	1996	`Notebooks` have supported an option to hide content since they were first incorporated into the Wolfram Language.
Password protection	1991	Mathematica applies content encryption to code rather than notebook contents. Like this new Maple capability, the Mathematica command `Encode` allows you to read–protect source code, but it also allows you to limit the execution of code to a specific license or to a specific computer.

Maple 2017	Mathematica	Notes
Track Combo Box or List Box by index	2007	Mathematica's PopupMenu and ListPicker can both be indexed by arbitrary labels, not just by index or value.
Time series operations from context menu	2012	Mathematica's Suggestions Bar has always supported TimeSeries operations.
30 new math apps	2007	In 2007, Wolfram launched the Wolfram Demonstrations Project as a home for all kinds of interactive demonstrations and math apps. In the same amount of time that Maple added 30 math apps, http://demonstrations.wolfram.com grew by over 700 demonstrations to total more than 11,200, thanks, in part, to the easy authoring made possible by Mathematica's Manipulate command.
Connectivity		
URL Package	2014	In addition to being able to construct arbitrary URL requests, Mathematica also supports asynchronous URL interaction and OAuth authentication.
SMT–LIB, YAML, MP4 import and export		While Mathematica does not yet support these formats, it still supports more than twice as many Import and Export formats as Maple does.

New features of Maple that did not appear to be correlated to Mathematica features include general relativity functions and Swift code generation, entropy charts, Venn diagrams and various user interface improvements.

New Features in Maple 2016

Maple 2016	Mathematica	Notes
Data science & statistics		
DataSeries	2014	Mathematica's Association data structure provides not only the convenience of a key–value data structure construct but is also an efficient hash table structure for large data sets.
DataFrame	2014	Maple's DataFrame structure is similar to Mathematica's Dataset structure except it is limited to simple 2D tables. In contrast, Mathematica also supports arbitrarily deep, irregularly structured heterogeneous data.
Multiset	2014	Maple's Multiset is only one special case of a more general reduce step in map–reduce type problems. Mathematica supports this with Merge[data, Total] but is capable of doing arbitrary merges of map data, for example, by tracking the largest key value using Merge[data, Max].
Principal component analysis	2010	As well as PrincipalComponents, Mathematica supports DimensionReduction and a range of machine–learning techniques using the functions Predict and Classify.
Scree plot	2010	This is implemented in Mathematica more generally as ParetoPlot and becomes a scree plot when applied to Eigenvalues.

Maple 2016	Mathematica	Notes
Linear regression summarize	2008	`Over` 60 properties of a Mathematica `LinearModelFit` or `NonlinearModelFit` are available including `ParameterTable`.
Hypothesis testing summarize	2010	Mathematica hypothesis tests include the property TestDataTable for summarizing test results.
Explore		
In 2007, Mathematica introduced the concept of automatically–generated, interactive computional interfaces. Since then, Maple has been edging towards the functionality that was available in Mathematica's `Manipulate` function at launch. There are still many capabilities Maple's Explore command lacks, such as automatic cloud deployment, asynchronous evaluation, gamepad inputs, user–created control elements, automatic performance adjustment, and much more.		
Text area controllers for evaluating at custom values of a parameter	2007	`Expression` input fields in Mathematica support both inert and live evaluation content. Mathematica also supports a large collection of `Interpreter` types which can interpret and enforce input other than generic text or math, such as city names, country names, email addresses, chemical names, or more than a hundred other types.
Simplified calling sequence	2007	This change mirrored Mathematica's syntax for describing parameters directly.
Name resolution	1988	While `Manipulate` was added to Mathematica in 2007, the ability to create functions that consider their arguments before evaluating them has been a core part of the Wolfram Language since its inception using the attributes `HoldAll`, `HoldFirst`, and `HoldRest`.
Controller customization	2007	Mathematica allows customization of all of its controller types including size, step size, initial values, tooltips, etc.
Controller placement	2007	
Color customization	2007	Mathematica provides a general `Panel` construct that can be used for any content, not just `Manipulate`. It has always supported arbitrary color choices.
Borders	2007	Mathematica provides a general `Framed` construct that can be applied to any content, not just `Manipulate`. Where Maple allows border settings of only true or false, Mathematica supports control of `Thickness`, color, `Dashing`, and corner `RoundingRadius`.
Alignment and width	2007	Mathematica allows widths and heights to be absolute or proportional to the container (such as page width or column width) and a range of alignment options.
Record	2007	Storing evaluation results to a variable in Mathematica's `Manipulate` command is the same as any other evaluation without needing a special option. In addition to storing in a variable, changes can be written to files, and there is a bookmark feature built into the `Manipulate` user interface that lets users save interesting combinations of parameters. These can also be predefined by the developer.
Graph theory		
DrawGraph: round vertices	2007	While Maple added support for round or square vertices in graph drawing, Mathematica allows any graphic or image to be used or can be programmatically generated from the vertex name or its coordinates.

Maple 2016	Mathematica	Notes
MaximumMatching		This functionality is provided by the Mathematica commands `FindMaximumFlow` and `FindMinimumCostFlow`. Maple requires the data to be an undirected, unweighted, bipartite graph. This is the simplest possible case supported by the Mathematica commands, which can optimize flows over multiple weighted steps across directed, undirected, and mixed graphs.
CliqueCover, CliqueCoverNumber		Similar functionality can be achieved using Mathematica's `FindCliques` command.
GlobalClustering–Coefficient	2012	
IntervalGraph	2005	
IsArborescence		This can be achieved using `ConnectedGraphQ` and `FindSpanningTree` in Mathematica.
LocalClustering–Coefficient	2012	Implemented in Mathematica as `LocalClusteringCoefficient`.
ReverseGraph	2010	Implemented in Mathematica as `ReverseGraph`.
TransitiveClosure	2005	
Logic		
Logic: Satisfiable	2008	This is implemented in Mathematica as `SatisfiableQ`.
Logic: Satisfy	2008	This is implemented in Mathematica as `SatisfiabilityInstances` with additional functionality as `SatisfiabilityCount`.
Logic: TruthTable	2008	This is implemented in Mathematica as `BooleanTable`.
Mathematical functions		
Conjugate of RootOf objects	1996	Support for `Conjugate` was included with the introduction of Root objects in Mathematica.
Products of RootOf objects	1996	Support for `Product` was included with the introduction of Root objects in Mathematica.
Series of Airy functions	1988	Support for `Series` was included with the introduction of Airy functions in Mathematica.
Series of Gamma function	1988	Support for `Series` was included with the introduction of `Gamma` in Mathematica.
Series of Hypergeometric functions	1996	Support for `Series` was included with the introduction of hypergeometric functions in Mathematica.
Limits of oscillatory functions	1988	The examples given in Maplesoft's marketing of improvements were all already solvable in Mathematica.

Maple 2016	Mathematica	Notes
Integrals of rational functions	1988	The examples given in Maplesoft's marketing of improvements were all already solvable in Mathematica.
Sums involving Jacobi theta	1988	This is implemented in Mathematica as `EllipticTheta`.
Series of abs and signum	2004	
Piecewise sums	2004	
Sums diverging to ± ∞		The examples given in Maplesoft's marketing of improvements were all already solvable in Mathematica.
Doubly infinite sums		The examples given in Maplesoft's marketing of improvement were already solvable in Mathematica.
Symbolic PDEs		Some of the new solutions provided by Maple for symbolic PDEs were already possible in Mathematica. For numeric PDE solving, Maple does not have an equivalent of the powerful FEA–based solver built into Mathematica.
Mathematical identities: Bessel, KelvinBei...	2015	Since 1998, Wolfram has maintained the website functions.wolfram.com, which contains over 107,000 formulas and identities ready to compute with Mathematica. Since 2015, Mathematica has included these as a built–in, searchable data source via the command `MathematicalFunctionData`.

Document interface

From its inception in 1989, the Wolfram notebook interface has set the agenda for Maple's interface. In 1996, it was re–engineered so that documents could be entirely described in a Wolfram Language representation. The unification between document and language made a range of programmatic generation, analysis, and control of documents possible that Maple is still unable to match today.

Tables: programmatic creation and control	1996	As well as programmatic control of table cell colors, sizes, and alignment, Mathematica provides support for styled borders and cells which span rows or columns.
Programmatically adjust math containers	1996	
Non–executable math content	1996	Mathematica supports this feature on a cell, named style, stylesheet, or document level using the option `Evaluatable`.
Component font color	2007	Most interactive components in Mathematica support not just font color but also font family, weight, italics, background color, etc.
Component transparency and fill color	2007	
Replaceable content	1996	
Arbitrary document zoom level	1996	
Global zoom setting	1996	Mathematica allows zoom setting at any level, not just global and document. For example, a low resolution bitmap logo in a notebook's docked cell might use `Magnification` → 1 to prevent it from following a user's choice of document–level zoom and appearing pixelated.

Maple 2016	Mathematica	Notes
Full screen mode on Mac	2012	Mathematica has always supported Mac OS X with fully native implementations.
Optional section openers	1996	
Visualization		
Coloring with functions of coordinate values	1991	The Mathematica option `ColorFunction` provides parametric color control to many different kinds of plots. In addition, Mathematica's use of symbolic wrappers for data points makes support for `Tooltip`, `Button` actions, `Label`, and more controllable at an individual–point level.
HeatMap	2004	This is implemented in Mathematica as `MatrixPlot`, `ArrayPlot`, and `ListDensityPlot` depending on interpolation choices.
GridPlot		While no direct equivalent is available in Mathematica, this graphic can be easily created with the more general `GraphicsArray` command.
Color schemes	2007	Mathematica provides over 170 pre–defined color schemes. In addition, the `PlotTheme` option controls a whole collection of aesthetic choices at once from a collection of designs created by Wolfram graphic designers.
Miscellaneous		
Math Apps and applications		In 2007, Wolfram launched the Wolfram Demonstrations Project as a home for all kinds of interactive demonstrations and math apps. In this release, Maple added approximately 22 new interactive Math Apps and applications. In the same amount of time, demonstrations.wolfram.com grew by over 500 demonstrations to total more than 10,500, thanks, in part, to the easy authoring made possible by Mathematica's `Manipulate` command.
NumberTheory package		Maple 2016 deprecated around 50 number theory commands and redesigned them to use Mathematica–style naming (full words with camel–case capitalization). For example, Maple's cfrac command has been renamed to `ContinuedFraction`, the same as in Mathematica. In general, recent additions to Maple use naming conventions similar to Mathematica, but most older Maple commands are still accessed by inconsistently abbreviated and capitalized legacy names.
Thermophysics data	2014	Mathematica provides access to thousands of data sets and thermophysics data is accessed via the command `ThermodynamicData`. It can also be accessed using free–form input in Mathematica which is interpreted by Wolfram|Alpha. For example "enthalpy water 298K 1 atm" returns the result 104293 J/kg.
Student multivariate calculus		Mathematica does not attempt to provide student versions of its functions and so does not face the question of how many of its functions need two versions. Some of the functionality provided by student packages is available via the Wolfram|Alpha integration to give rich, step–by–step solutions, and using the command `$Pre=Assuming[_∈Reals,Simplify[#]]&` tells Mathematica to treat all user variables as reals.
Workbook file format		While Mathematica does not have the user interface for browsing within archives, it has supported the ability to read or write files within standard .zip or .gz archive formats since 2007. This allows you to package multiple files together and access each component separately, similar to this new Maple feature.

Maple 2016	Mathematica	Notes
Saved variable values	1988	Mathematica has had the ability to save variables or other state information since its inception and extended it in 1996 with a very fast binary format. See `Save` and `DumpSave`. In 2015, Mathematica introduced the ability to automatically save changes to variables both locally and to the cloud. `CloudSymbol` can even be used to share between multiple users during simultaneous or asynchronous sessions.
Parallel computation: ThreadSafeLock		While Maplesoft promotes thread–based programming as a feature, it remains hampered by the small number of commands which are actually thread safe. `Thread`SafeLock is another tool to allow users to try and manage this situation. Mathematica's approach to parallel computation, of launching multiple, full–compute kernels, does not suffer from thread safety issues, making it much simpler to use. See "Comparison of Parallel Programming"
Iterator package		Iterating over discrete structures is supported in the Wolfram Language.
Forgetting remember tables	1988	Because Mathematica's idiom for remember tables generates objects that can be manipulated by the Wolfram Language, Mathematica is able to clear individual or classes of remembered values, not just the whole table.
Word lists	2007	Maple added a dictionary of English words. Mathematica provides dictionaries and word searches in many languages; single–word translation between languages; and, for English, more than 30 properties of each word such as synonyms, antonyms, and parts of speech. See `WordData`, `DictionaryLookup`, and `WordTranslation`.

New features of Maple 2016 that were not, at least in part, following Mathematica capabilities focus on general relativity functions and Julia code generation.

New Features in Maple 2015

Maple 2015	Mathematica	Notes
MapleCloud web access	2014	The capabilities of the MapleCloud remain far behind those of the Wolfram Cloud. MapleCloud does not support content creation, content editing, scheduled tasks, report generation, computational APIs, data accumulation, or programmatic control or offer a private version of its cloud. All of these capabilities and more are available in the Wolfram Cloud.

Maple 2015	Mathematica	Notes
Data sets	2009	In 2009, Wolfram launched Wolfram|Alpha, a project to make the world's data computable. In the wake of Wolfram|Alpha, Quandl was set up in 2012 but with more limited technical aspirations. It does not attempt to unify different data sets with common entity names (e.g. country names, cities, animal taxonomies, etc.) and common unit systems. It does not attempt to integrate relevant computation into the data and does not attempt to provide natural language access. Maple's link to Quandl is limited to data search and retrieval; it has not attempted the deep integration with data provided by Mathematica. For example, data requests in Mathematica are provided with units interpretable by Mathematica. Mathematica unit conversions automatically use current values for currencies. Geo computations in Mathematica can take any geographic entity (e.g. a city, building, or mountain name) as specifications. Forms in Mathematica applications can have semantic restrictions (e.g. the user must enter country name), which are validated against data. Mathematica users can also make data available through Wolfram|Alpha through the Wolfram DataDrop. Data is deeply integrated into Mathematica, not just importable. Of course, Mathematica users can also easily access Quandl data using the Import command.
Polyhedral sets	2014	Mathematica contains a powerful geometric regions package, which supports arbitrary combinations of *n*–dimension discrete, parametric, or primitive defined regions. Polyhedral regions are one of the simplest subsets of this framework and can be created by using the Mathematica function ImplicitRegion with only linear constraints. While the properties calculated by Maple's Polyhedral Sets functions are not a strict subset of Mathematica's region framework, the scope of regions is. Maple cannot represent non–convex regions, disjoint regions, or regions with curved edges.
Plot thumbnails in output	2007	Mathematica's Computable Document Format (CDF) has a general symbolic content description that allows any displayable content to be embedded in any other content. Plots appearing in output is just one such example of this much more general principle. In contrast, Maple still cannot put a plot on the face of a button, buttons in graphics, images in combo–boxes, or many other combinations which are trivial in Mathematica.
Default point probe	2008	Mathematica's graphics support the option CoordinatesToolOptions, which allows any content driven by any program to be dynamically displayed as a point probe, not just the four fixed choices that Maple now provides.
Trigonometric and hyperbolic functions palette		Since 1996, Mathematica has allowed users to create arbitrary palettes. This palette can be implemented in Mathematica with: CreatePalette[Grid[Partition[PasteButton/@ {Sin, Cos, Tan, Sec, Csc, Cot, Sinh, Cosh, Tanh, Sech, Csch, Coth, ArcSin, ArcCos, ArcTan, ArcSec, ArcCsc, ArcCot, ArcSinh, ArcCosh, ArcTanh, ArcSech, ArcCsch, ArcCoth, θ, π, ϕ, ω},4]]]
Random variables palette		Since 1996, Mathematica has allowed users to create arbitrary palettes. This palette can also be implemented in Mathematica in a few minutes.
Content generation: layout elements	2007	Mathematica provides a full symbolic description for documents, allowing arbitary content generation, transformation, and analysis, not just generation. Every aspect of the content, layout, style, and interactivity is controllable, not just a subset of layout elements. Mathematica also provides a template system to make repeated automatic content generation even easier.
Content generation: embedded components and application authoring	2007	Mathematica's full symbolic description for documents includes all interactive elements, allowing arbitary content generation, transformation, and analysis, not just generation.

Maple 2015	Mathematica	Notes
Content generation: the Tabulate command	2007	Mathematica's `Grid` command allows much more control over tabular layout than Maple's Tabulate command, including individual cell level background color, size, alignment, and frame controls (not just whole grid settings). It supports horizontally and vertically spanning cells and vertical alignment. Maple supports none of these.
Data plots: many plots in one plot command		This function is a syntactic shortcut to existing plot types, all of which are supported in Mathematica.
Data plots: new intuitive calling sequences and support for different data types	1988	Mathematica has a unified data model so you do not need to worry about whether your data is a list, matrix, array, or any other type. The issue of competing similar data types still affects many other Maple functions, not just data plots.
Numerical solutions of ODE with delay	2008	Maple's numerical differential equation solvers still lack the finite element methods available in Mathematica that are needed to solve partial differential equations. Maple can only handle delay differential equations numerically. Mathematica can solve them symbolically as well.
Explore		Mathematica introduced the powerful `Manipulate` command for instant interface creation in 2007. Maple continues to incrementally develop functionality towards that offered by the initial release of `Manipulate` but still has a long way to go.
Explore: customizable interactive marker controls on 2D plots	2007	In Maple, the number of interactive markers is fixed by the author. In Mathematica, you can also allow users to add or remove markers interactively.
Explore: images on play/pause/loop animation controls	2007	In Mathematica, buttons and other UI elements can use any image, but in Maple, only pre–defined ones can be used.
Explore: 2D math for parameters with sliding controls	2007	In this context, it appears that Maplesoft means math characters (like α), rather than 2D math. In Mathematica, as well as arbitrary special characters, parameters can be labeled with any content, including full 2D typeset expressions (including fractions, roots, etc.) or images. In fact, you can put such content anywhere.
Explore: support for vertical orientation of slider controls	2012	Mathematica's `Rotate` command, can display any control or other content with any angle of orientation, not just vertical and horizontal.
Explore: CheckBox controllers	2007	
Explore: startup code	2007	Mathematica also supports code that initializes when content that needs it is first displayed on screen. This allows you to avoid unnecessary code execution for content that is not viewed.
Explore: document properties when launching as a new document	1996	While Mathematica's `Manipulate` command was only added in 2007, the ability to generate interactive content in fresh windows and control the window properties has been available since 1996.
Finance: computing Greeks on derivatives	2010	Maple supports general Greeks calculations on the `Black`–Scholes model, while Mathematica's `FinancialDerivative` command supports specific Greeks calculations on over 100 different financial derivatives contracts.

Maple 2015	Mathematica	Notes
Grid computing: Run, Set, Get, GetLastResult, Wait, WaitForFirst	2008 (Available earlier as an add−on)	These functions are roughly equivalent to the Mathematica commands `ParallelSubmit`, `DistributeDefinitions`, `WaitNext`, and `WaitAll`. Maple still lacks some of the higher level functions that make Mathematica's parallel programming so simple, such as `ParallelMap`, `ParallelTable`, and `SetSharedVariable`.
Sub−second current time	1996	
Group theory: group data	2010	Amongst the huge collection of datasets built into Mathematica, there is a searchable `FiniteGroupData` database with over 50 properties of several hundred finite groups.
Group theory: CayleyGraph	2010	
Group theory: IsCyclic	2010	Mathematica's `Cycles` command fully enumerates cycles.
Group theory: ComplexProduct	2010	For permutation groups, this is provided in Mathematica by `PermutationProduct`.
Group theory: ElementOrder	2010	For permutation groups, this is provided in Mathematica by `PermutationOrder`.
Import/export	1996	Maple followed Mathematica's design of having automated generic `Import` and `Export` commands, which can import different kinds of data automatically. However, Mathematica's `Import` and `Export` commands support over 185 different formats, while Maple's supported only 51 formats. Furthermore, many of the Mathematica import and export filters provide additional options. For example, when importing a `JPEG` into Mathematica, you can choose whether you are importing an image, the image data, or the EXIF and other meta−data (such as camera shutter speed, image capture date, image device name, etc.).
Import/export: MathML	1999	
Import/export: FASTA	2007	
Import/export: GenBank, SHP	2008	
Import/export: KML	2010	Mathematica provides import and export of KML. Maple provides only import.
Import/export: JSON, GPX	2010	
Import/export: Graphlet, GraphML, GXL, Pajek, and TGF	2010	
Import/export: FASTQ	2012	
Integrate		Mathematica has extremely powerful symbolic integration. All examples given in Maplesoft marketing materials as newly solved in Maple 2015 were already solved by Mathematica.
Embedded components: speaker component	1992	Mathematica documents can contain MIDI sound as well as waveform sounds. Maple supports only waveform sounds.

Maple 2015	Mathematica	Notes
Embedded components: microphone component	2007	As well as being able to capture sound from a GUI component, Mathematica can also capture images from a webcam or other imaging device.
Embedded components: gauges, set initial angle	2012	
Embedded components: gauges, set range	2012	
Math functions: coulditbe		This functionality is part of the `Reduce` function in Mathematica, which also solves broader classes of quantifier elimination problems.
Embedded components: ListBox	2012	This is supported as `ListPicker` in Mathematica. In Mathematica elements of the `ListPicker` can be images, 2D typeset math, or other content, not just text.
Embedded components: Meter, Rotary Gauge, Volume Gauge, Plot, Text, Radiobutton, and Components programmatic setting	2007	All Mathematica interactive and static components can be programmatically set or changed.
Embedded components: resizable slider	2007	In Mathematica, most interactive components can be made arbitrary sizes. `Slider` is no exception.
Bifurcation maps	1996	While not a named function in Mathematica, bifurcation plots are sufficiently simple that they have existed as examples in the documentation of Mathematica since 1996.
Math apps	2007–Present	In 2007, Wolfram launched the Wolfram Demonstrations Project as a home for all kinds of interactive demonstrations and math apps. In this release, Maple added approximately 60 new math apps to total around 400. In the same amount of time, thanks partly to the easy authoring made possible by Mathematica's `Manipulate` command, demonstrations.wolfram.com grew by over 300 apps to total more than 10,000.
Special functions identities	2002	Wolfram Research makes its database of functions available for free at functions.wolfram.com. It currently contains over 300,000 formulas relating to more than 320 special and elementary functions. Mathematica added programmatic access to this database in 2015.
Statistical reference tables	N/A	Computational software should remove the need for reference tables. If you really want printed statistical reference tables, then they would be easy to produce in Mathematica by using the `Grid` and Table commands.
Units: temperature object	1992	Units, including temperature units, were first included in Mathematica in 1992. Since 2012, Mathematica's units have been handled automatically in data plots, solvers, optimization routines, and more. They handle live data units (such as currency rates) and time–based units (such as currency rates). Mathematica's use of Wolfram|Alpha linguistics allows entry of units in any format (e.g. "kph," "kilometers per hour," etc.). Maple's units system did not do any of these.
Visualization: shading between two curves	2007	Mathematica's `Filling` allows shading between any combination of curves, axes, and plot boundaries, not just between two curves.
Visualization: empty plots	1988	

Maple 2015	Mathematica	Notes
Visualization: pointline style	2007	
Visualization: color schemes for curves	2007	As well as allowing you to define custom color schemes, Mathematica provides more than 170 pre–designed color schemes. These are designed for different aesthetic choices, standard interpetations (e.g. heat map), continuous gradients, and indexed discrete collections. .
Robust regression	2007	Use of the `NormFunction` option within `FindFit` allows for several robust fitting approaches. Loess fitting has been available as a free package since 1998.

New features of Maple 2015 were not, at least in part, following Mathematica capabilities focus on ordinals, general relativity functions, bivariate limits, and new code generation targets.

New Features in Maple 18 (2014)

Maple 18 (2014)	Mathematica	Notes
Time series	2012	Maple does not include Mathematica's support of FARIMA processes, time series–based hypothesis testing, or time series property measurements such as covariance functions. Mathematica does not yet support exponential smoothing models.
Exponential smoothing	2007	Implemented in Mathematica as `ExponentialMovingAverage`.
Keyword and command name searching in help	1996	Mathematica's help system is built around interactive `CDF` content, allowing examples to be edited and evaluated in place and dynamic content to be interacted with. Maple's help files are static, uneditable, and unevaluatable.
Visualization—background colors in 2D plots	1988	`Background` colors are controllable in Mathematica's 3D plots as well as 2D plots.
Visualization—custom plot shading	2007	As well as being able to apply arbitrary color blends or pre–designed color gradients to plots, Mathematica also allows the application of these blends using a custom mapping function, effectively giving you an extra dimension to 3D plots.
Visualization—background images in plots	2007	Mathematica provides powerful image processing capabilities that Maple lacks, so that as well as background images being included verbatim, they can also be transformed programmatically.
Visualization—texture mapping	2010	Mathematica provides powerful image processing capabilities that Maple lacks, so that as well as texture images being used verbatim, they can also be transformed programmatically.
Visualization—color tools	2012	Mathematica supports CMYK, HSB, XYZ, LAB, and LUV color spaces, as well as RGB.
Visualization—programmatic control of image size	1988	
Signal processing—Blackman–Nuttall and Bohman windows	2012	

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Calculus palette	1996	Mathematica 3.0 introduced completely customizable input and action palettes that can be shared between users.
Möbius Project	2007	In 2007 the Wolfram Demonstrations Project set out a clear vision for a platform for sharing interactive apps for demonstrating technical ideas. In the year since MapleSoft launched their imitation, it accumulated 235 apps, 75 of which were included in Maple. Thanks to the ease of interface creation provided by Mathematica's superior `Manipulate` command, in the same period the Wolfram Demonstrations Project grew from 8500 apps to over 9400 apps.
One–step app creation—custom placement of controls	2007	Maple's "Explore" command is a skin–deep attempt to support Mathematica's popular `Manipulate` command. As well as being able to position controls spacially, Mathematica also supports advanced layout controls such as collapsible areas, tab views, and more. These can be applied to both controls and outputs.
One–step app creation—choice of control types	2007	While Maple now allows you to change the control component for ranges, Mathematica also provides alternative control choices for discrete, `Boolean`, and color inputs and supports custom component creation.
One–step app creation—combo boxes	2007	Mathematica also allows lists of parameters to be chosen by setter bars, multi–select combo boxes, sliders, and custom components.
One–step app creation—customization of the size of the display component	2007	As well as controlling the size of output, Mathematica supports dynamic resizing under program or user control. Mathematica also supports constrained region resizing with automatic scrollable area and dynamic adjustment of the interface to accommodate large content.
One–step app creation—interactive marker controls on 2D plots	2007	Mathematica also supports user creation and deletion of locators and custom locator appearance, using any image.
One–step app creation—image output	2007	Mathematica's `Manipulate` command automatically supports any kind of output supported by Mathematica, including formatted text, math, sound, graphs, 2D and 3D graphics, dynamic content, and GUIs, as well as images and 3D images. Maple still has a long way to go to catch up with `Manipulate`.
Interactive components—controllable shortcuts	2007	
Interactive components—masked input fields	2010	
Interactive components—auto–fit math component	2007	All kinds of output can be auto–fitted or constrained with automatic scroll bars in Mathematica GUIs.
Interactive components—custom image toggle button	2007	
Interactive components—embed sounds	2007	While Mathematica did not support OGG until later that year it already supported `AIFF`, `AU`, `FLAC`, `SND`, Wav, Wave64, and MIDI sounds.

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Interactive components—hide borders	2007	As well as being able to control the presence of borders, Mathematica allows you to control the style of borders independently on each side (thickness, color, dashing, transparency, etc.) It also supports arbitrary rounded corners.
Statistics for students	2013	There is a rich ecosystem of educational tools built on Mathematica, but they are not included in the product itself. The Wolfram Demonstrations Project is a key source, but the central tool of the Maple Statistics for Students functionality is similar to this example published on the Wolfram Blog in 2013.
Graph theory—DrawGraph performance improvements	2007	Mathematica's `GraphPlot` supports six different styles of graph plotting. The Maple 18 marketing materials make an ill–considered comparison in graph–drawing performance with Mathematica, since Mathematica defaults to a "spring" layout method, while Maple does not. Maplesoft documents acknowledge that "spring" will usually give the best visualization, but if performance is the priority then each of Mathematica's other methods is faster than Maple for the example used in the Maple marketing materials. Three of Mathematica's methods produce the visualization in under 0.25 seconds, compared to 18 seconds in Maple.
Step–by–step solutions	2010	Maple's Student Basics package provides step–by–step solutions only for linear equation solving and polynomial expanding. Mathematica, through its connection to Wolfram|Alpha, can also provide Step–by–step solutions for polynomial, trigonometric, and logarithmic equation solving; as well as limits, integrals, derivatives, differential equations, partial fractions, line intercepts, number theory factoring, completing the square, determinants, row reduction statistics problems, basic arithmetic and more.
URL import	2007	Mathematica can import data from URLs in over 160 formats.
3D graphics formats	2007	Mathematica supports 16 3D graphics formats, including the six that Maple added.
Compressed file support	2007	As well as the ZIP and GZIP formats supported by Maple, Mathematica also supports TAR, BZIP2, and two formats of its own that are optimized for compressing Mathematica expressions.
Inert expression representation	1988	Implemented in Mathematica as `HoldForm` and `Hold`.
Random matrix generation	2007	Mathematica supports generation of random data over any number of dimensions from over 140 different distributions.

New Features in Maple 17 (2013)

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One step app creation	2007	Maple's "Explore" command is a skin–deep attempt to appear to support Mathematica's popular `Manipulate` command. It only supported sliders while Mathematica's, much more powerful `Manipulate` function can automatically use checkboxes, pop up–menus, sliders with arbitrary discrete steps, 2D sliders, 2D discrete sliders, locators within displayed contents and more, as well as sliders. "Explore" has no control over the appearance, direction, size or placement of its sliders and no control or automation over refresh quality or triggers. "Explore" cannot be nested, doesn't support bookmarks, cannot be exported to animations, and does not support hardware controllers. It cannot be extended with custom controllers, or automatically embedded in generated reports. Mathematica supports all of this and more.
Möbius Project	2007	The Wolfram Demonstrations Project set out a clear vision for a platform for sharing interactive apps for demonstrating technical ideas. Thanks to the ease of interface creation provided by Mathematica's superior `Manipulate` command, over 8500 apps had been created and shared by the Mathematica community. The Möbius Project was intially an immitation of Demonstrations before being redesigned after failing to attract the same quantity of content.
Maple Player	2007	Wolfram Research has provided a free `Player` for Mathematica content for over 20 years. `With` the advent of easy–to–author interactive content in 2007, the Math`Player` was upgraded to Wolfram CDF Player with a full Mathematica Kernel to drive interactive computational content in the Computable Document `Format`. CDF `Player` supports all major platforms and can be embedded in HTML under all major browsers.
Math apps	2007+	Specialized Mathematica apps appear for free in The Wolfram Demonstrations Project not in Mathematica. In the preceding year Demonstrations grew by around 1000 apps compared to the 45 promoted in this Maple release. The Maple 17 New Features pages show three examples: "River crossing" appeared in the Demonstrations Project in 2012, there are 22 Demonstrations related to "Cost of production" and the "Tides" example can be implemented in a single line of Mathematica code. These are not major features.
Advanced Code Editor: Syntax Highlighting	2007	Maple syntax highlighting works only for plain–text code and only for kewywords and operators. In contrast, Mathematica also supports syntax highlighting for expressions within or containing typeset 2D mathematical expressions and also colors local variables, and function parameters for easier code reading.
Advanced Code Editor: Bracket Matching	2007	Again the Maple support is skin–deep, matching brackets only if you limit yourself to plain text coding. Bracket matching is particularly important in math expressions where highly nested brackets can be common and putting a bracket in the wrong level of a 2D expression is a common mistake.
Advanced Code Editor: Quote Matching	2007	Maple supports this only for text, not in typeset math. Mathematica supports both.
Advanced Code Editor: Automatic Indentation	2007	Maple supports this only for text, not in typeset math. Mathematica supports both.
Advanced Code Editor: Command Completion	2012	Maple supports this only for text, not in typeset math. This missing feature is particularly significant given the inconsistent naming and capitalization of Maple's mathematical functions. `Using` Mathematica's typeset layout for clarity of complex expressions does not have to come at the price of more limited ease of use.

Maple 17 (2013)	Mathematica	Notes
Advanced Code Editor: Error checking	2007	Maple supports this only for text, not in typeset math. Mathematica error checks whether options are valid for the function they appear in, as well as checking argument count and structure.
Performance: Hardware elementary functions	1999	These may have been implemented in response to being highlighted in the numerical performance benchmark created by Wolfram Research in 2011 which showed Maple to be, on average, 318–2845 times slower for these operations and 38 times slower for other numerical computations.
Performance: Parallel linear algebra	2005	The claimed improvements appear to be mainly for OSX and Linux, with only modest improvements to `Eigenvalues` and `Eigenvectors` under Windows. See the latest benchmarks here.
Performance: Sparse vector concatenation	1999	These may have been implemented in response to being highlighted in the numerical performance benchmark created by Wolfram Research in 2011 which showed Maple to be, on average, 13,512 times slower for sparse matrix computations and 38 times slower for other numerical computations.
Signal processing: Cosine, fast Fourier and wavelet transforms	2010	Typically skin–deep, Maple's implementation of DWT supports only the Haar wavelet, only in its float[8] data type and lacks continuous wavelet transforms. Mathematica's `DiscreteWaveletTransform` supports 10 different discrete wavelet families using floating point, complex or arbitrary precision numbers and `ContinuousWaveletTransform` with with 5 different continuous wavelet families. Maple's DCT supports only Type II DCT, Mathematica supports Type I,II,III and IV DCTs.
Signal processing: Bartlett, Blackman, Kaiser, Hann, and Hanning(sic) windows	2010	Again, Maple supports only a subset of Mathematica's functionality. Mathematica supports 14 non–parametric window functions and 10 parametric windows, including the 5 supported by Maple.
Signal processing:Signal generation	2012	Maple's support for signal generation still falls considerably short of Mathematica's.
Signal processing:Cross–correlation, autocorrelation, data statistics, and upsampling/downsampling	2012	There are now two different Auto`Correlation` functions in Maple, one for float[8] data and one for other data. Mathematica handles the data type used automatically. Maple's UpSample can take only float[8] or complex[8] data. Mathematica can handle any kind of data.
Signal processing:FIR, IIR, and Butterworth filters	2012	Some of this functionality has been in Mathematica since 2003.
Search and replace in math expressions	2007	Maple's concept of search and replace in math expressions is limited to finding text in math expressions. Mathematica allows searching and replace for whole typeset expressions, and using the Mathematica language search and replace can find and transform math expressions by layout, style, and general pattern matching.
Graph theory: invariant polynomials	1990s	Scope and performance of Graph Theory is much greater in Mathematica.
Graph theory: IsIsomorphic	2010	Maple's IsIsomorphic function can only handle undirected, unweighted graphs. Mathematica's GraphIsomorphicQ handles all graph types.
Graph theory: LaplacianMatrix	2008	Mathematica is able to return `SparseArray`s for very high performance when handling large graphs while Maple can only return dense matrices limiting its application to smaller graphs.

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Math: Linear inequality solving	2003	
Math: Semialgebraic system solving	2003	
Math: Solving equations with branch cuts	2003	
Visualization: Automatic 3D axes	1988	Wolfram Research highlighted this and many other sub–optimal Maple graphics defaults and controls in a 2009 report. `Clear` visualizations prevent mis–understandings and supports professional quality for your reports and publications. Wolfram Research has always considered this important. See the latest comparison of visualizations here.
Visualization: Plotting of inequalities	2002	Maple still supports this only in 2D. Mathematica supports both 2D and 3D inequality plotting.
Visualization: Visualize branch cuts	2007	Maple's functionality is not equivalent to Mathematica's automatic branch cut detection – it allows you to request a visualization of the branch cuts of individual functions but does not detect branch cuts in functions which you try to plot.
Visualization: Cayley Tables		Available on demonstrations.wolfram.com.
Control: The FrequencyResponse routine handles differential equations with input derivatives.	2010	In 2012 Mathematica added support for linear descriptor systems so that even systems with input derivatives of higher order than the plant variables are fully integrated.
Control: All models now accept linear, non–differential systems.	2012	
Control: Frequencies option for all frequency–based plots	2010	Minor feature correcting an unnecessary limitation.
Control: The Grammians command has been extended to work with discrete systems.	2010	
Programming: Use of D, I, etc as local variables	1988	
Programming: Sort with output option	2000	
Programming: Selecting or removing items from a table	1988	
Essay tools		While this package is rather specialized, Mathematica's string handling and semantic word data, make this kind of semantic analysis, similarity measurement and word counting easy.

For more comparison information, see:
http://www.wolfram.com/mathematica/compare-mathematica/compare-mathematica-and-maple.html
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