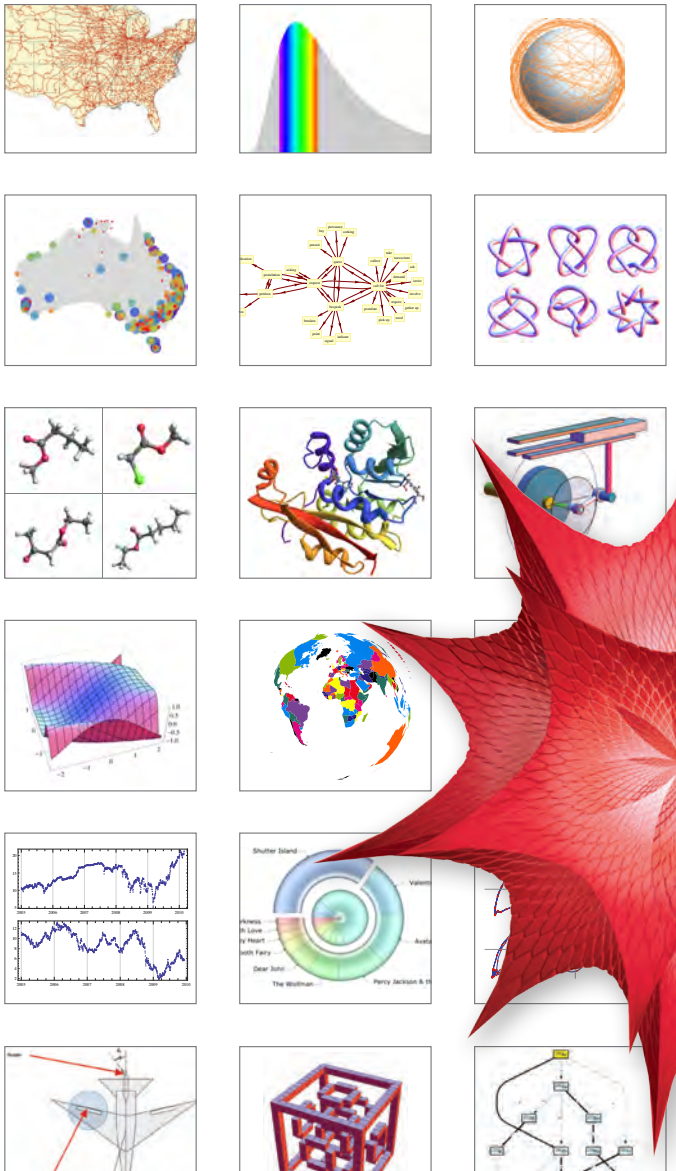
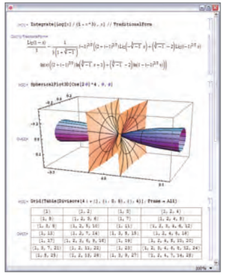


COMPUTE · DEVELOP · DEPLOY

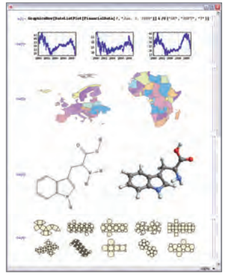
A QUICK OVERVIEW *of Mathematica*®

EXPLORE · LEARN · CREATE

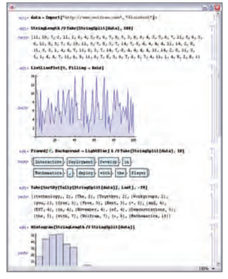
Mathematica is… *a computing environment* *a language* *a vast knowledgebase*



Do immediate *Mathematica* computation and visualization



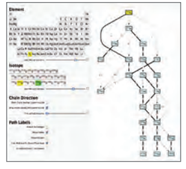
Instantly access the *Mathematica* knowledgebase



Build up a record of your work in a *Mathematica* notebook

Create an interactive *Mathematica* document or presentation

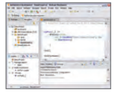
Write programs in the *Mathematica* language



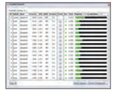
Create a complete *Mathematica* application

Use a deployed *Mathematica* application

Use *Mathematica* through the web



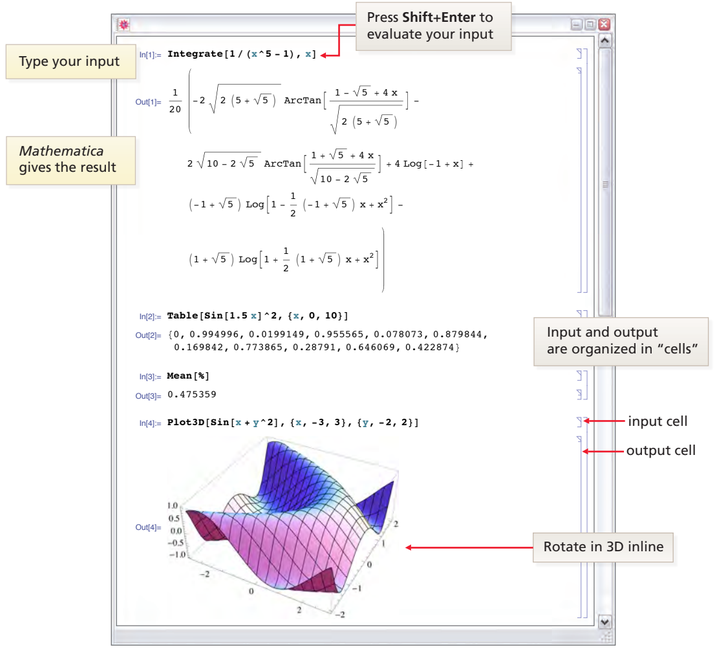
Do large-scale *Mathematica* software engineering (API • IDE • server • runtime • …)

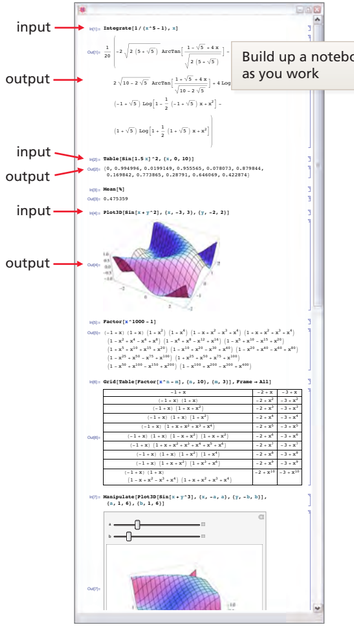


Run *Mathematica* on a parallel cluster

It's easy to start computing with *Mathematica*

Ask your question; immediately get an answer





Compute without limits

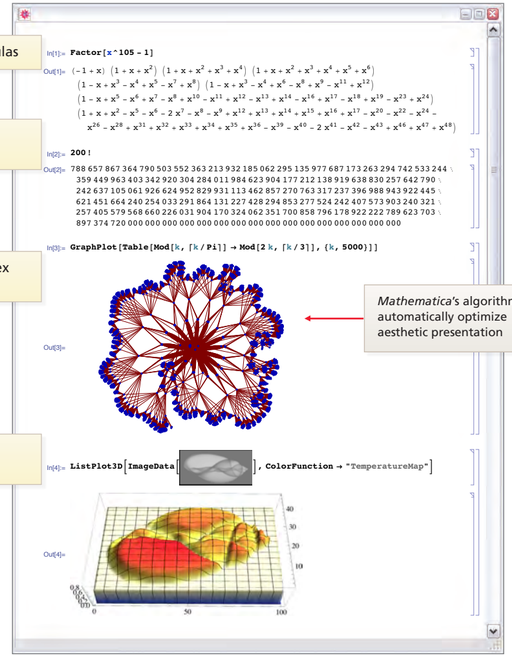
Mathematica handles computations of all types and sizes

Compute with formulas

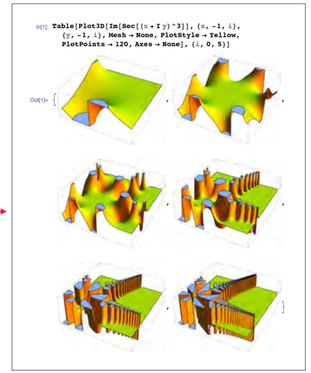
Compute to any numerical precision

Do arbitrarily complex computations

Compute with data of any kind



Mathematica's algorithms automatically optimize aesthetic presentation



Mathematica has thousands of state-of-the-art algorithms, including many invented at Wolfram Research

Mathematica automatically selects the best algorithms for each computation

Instantly access a vast web of algorithms and knowledge

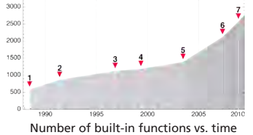
Thousands of functions, all consistently designed to work together

- Core Language
- Mathematics and Algorithms
  - Mathematical Functions
  - Numbers and Precision
  - Formula Manipulation
  - Equation Solving
  - Matrices and Linear Algebra
  - Statistics
    - Descriptive Statistics
      - Mean[*list*]
      - Median[*list*]
      - Commonest[*list*]
      - RootMeanSquare[*list*]
      - TrimmedMean[*list*]
      - HarmonicMean[*list*]
      - GeometricMean[*list*]
      - ⋮
    - Statistical Distributions
    - Curve Fitting and Approxim…
    - Data Transforms and Smooth…
    - Statistical Model Analysis
    - Exploratory Data Analysis
    - Random Number Generation
  - Optimization
  - Calculus
  - Polynomial Algebra
  - Discrete Math
  - Number Theory
  - Logic
  - Computational Systems
  - Mathematical Data
- Visualization and Graphics
- Data Manipulation
- Computable Data
- Dynamic Interactivity
- Notebooks and Documents
- Systems Interfaces and Deployment

Mathematica's 2500+ coherently designed functions provide broad and deep coverage

All functions are consistently named based on what they do

At every version *Mathematica* has continually grown in scope

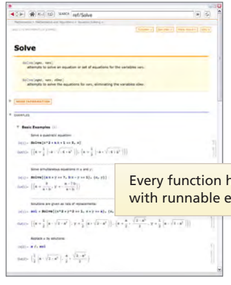


Number of built-in functions vs. time

Built-in functions always start with capital letters

`Solve[`*equation*`,` *x*`]`

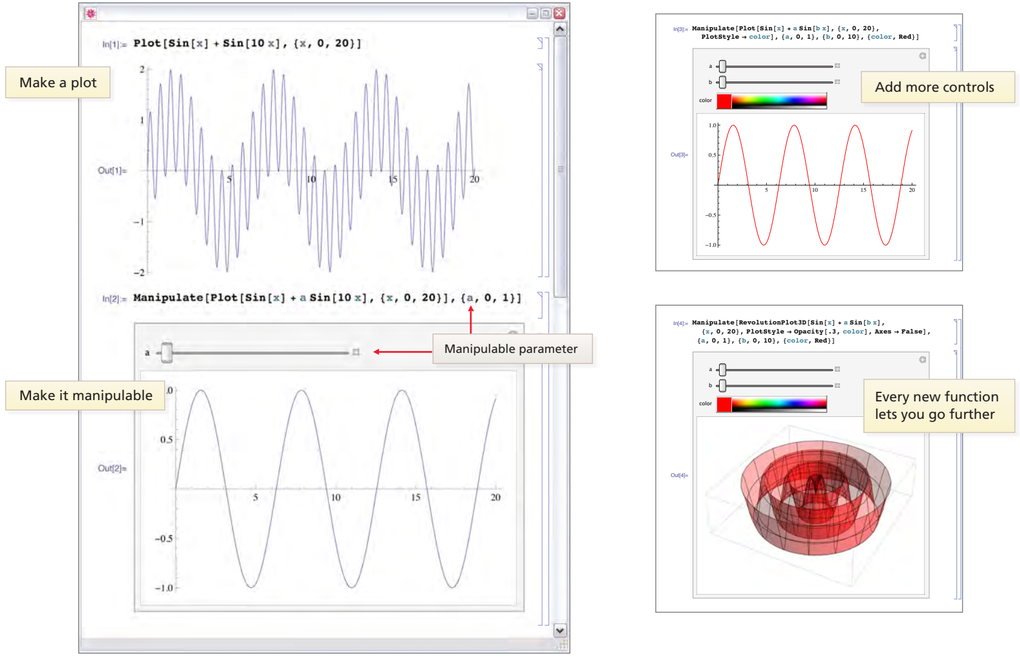
Function arguments are given in square brackets



Every function has its own "home page" with runnable examples

Just a few functions take you a long way

Mathematica lets you create a complete interactive application in minutes



Mathematica can be used across all fields

The Wolfram Demonstrations Project™ includes thousands of interactive examples

Wolfram Demonstrations Project

Mathematics
Algebra, Calculus, and Analysis …

Computation
Algorithms, Computer Science …

Physical Sciences
Physics, Earth Science …

Life Sciences
Biology, Medicine …

Business and Social Systems
Economics, Finance …

Systems, Models, and Methods
Discrete Models, Networks …

Engineering and Technology
Machines, Electrical Engineering …

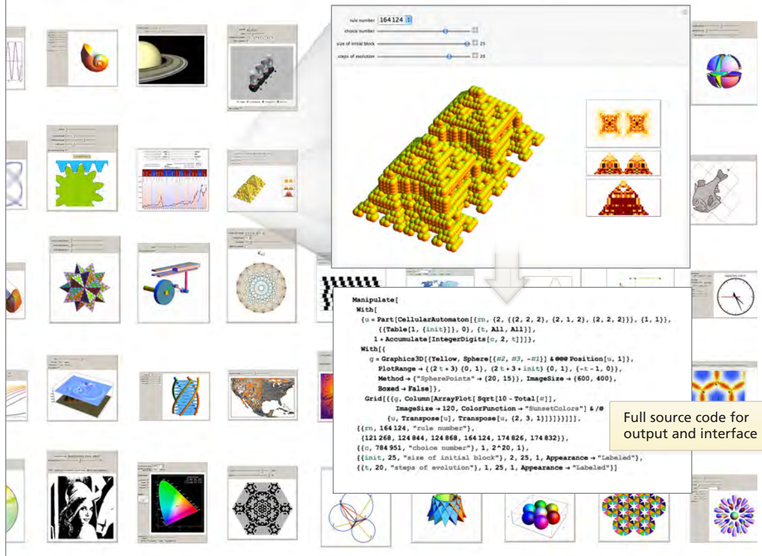
Our World
Everyday Life, Geography …

Creative Arts
Art, Architecture, Music …

Kids and Fun
For Kids, Puzzles, Optical Illusions …

***Mathematica* Functionality**
Short Programs, 3D Graphics …

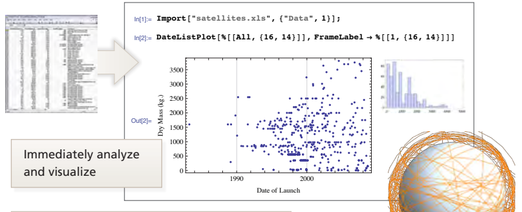
demonstrations.wolfram.com



The Wolfram Demonstrations Project
is a free resource of *Mathematica* material

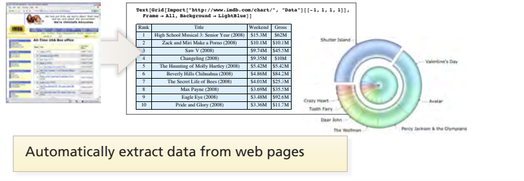
Your data, or ours

Import data in any format

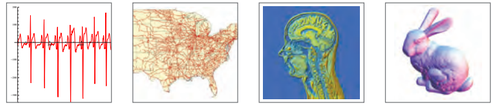


Immediately analyze and visualize

Mathematica automatically imports and exports over 200 formats



Automatically extract data from web pages

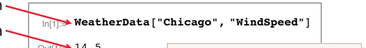


CSV, XLS, GIF, JPEG, PDF, Maya, STL, WAV, SWF, MDB, HDF, DICOM, 3DS, AVI, FITS, HDF5, MIDI, SVG, USGS DEM, MOL, GenBank, SHP, HTML, XML, TeX, MBOX, RSS, …

Use Wolfram Research's curated data

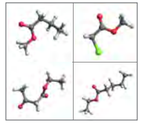
Built-in function

Real-time data

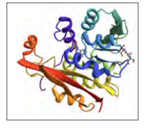


Stored data, continually updated

Wolfram Research maintains, updates, and verifies hundreds of types of data



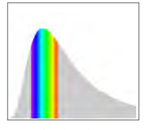
Chemical data



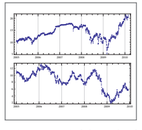
Biological & genomic data

Socioeconomic data

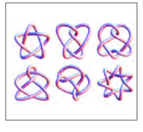
Geographic data



Physics data



Current & historical financial data



Mathematical data

Linguistic data

All Wolfram Research data in *Mathematica* is immediately computable

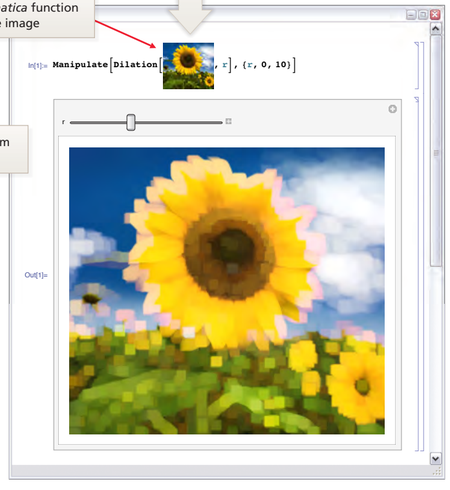
The power of integration

All the functions of *Mathematica* are designed to work tightly together

Mathematica seamlessly integrates data, programs, documents, images, and much more…

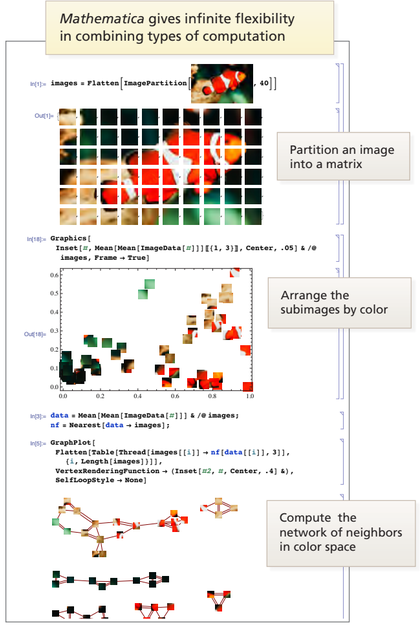
Drag and drop an image into *Mathematica*

Use a *Mathematica* function directly on the image



Create a custom interface

Mathematica gives infinite flexibility in combining types of computation



Partition an image into a matrix

Arrange the subimages by color

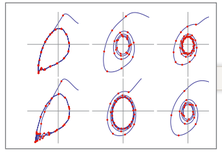
Compute the network of neighbors in color space

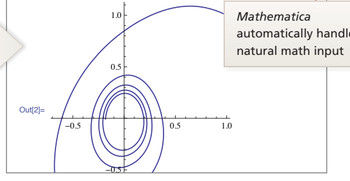
The power of automation

Mathematica automatically finds the best way to do what you want

You specify the operation; *Mathematica* automatically determines the algorithm

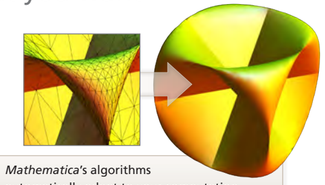
```
In[1]:= s = NDSolve[{x'[t] == -y[t] - x[t]^2,
        y'[t] == 2 x[t] - y[t]^3, x[0] == y[0] == 1},
        {x, y}, {t, 20}];
In[2]:= ParametricPlot[Evaluate[{x[t], y[t]} /. s],
        {t, 0, 20}]
```





Mathematica automatically handles natural math input

Mathematica picks algorithms for accuracy and efficiency



Mathematica's algorithms automatically adapt to your computation

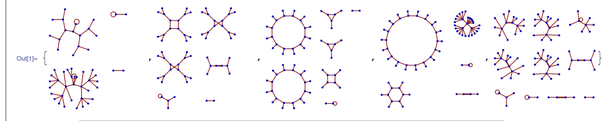
```
In[1]:= TraditionalForm[∫ 1/(x^5 - 1) dx]
Out[1]//TraditionalForm=
```

$$\frac{1}{20}\left(\left(\sqrt{5}-1\right)\log\left(x^2-\frac{1}{2}\left(\sqrt{5}-1\right)x+1\right)-\left(1+\sqrt{5}\right)\log\left(x^2+\frac{1}{2}\left(1+\sqrt{5}\right)x+1\right)+4\log(x-1)-2\sqrt{2\left(5+\sqrt{5}\right)}\tan^{-1}\left(\frac{4x-\sqrt{5}+1}{\sqrt{2\left(5+\sqrt{5}\right)}}\right)-2\sqrt{10-2\sqrt{5}}\tan^{-1}\left(\frac{4x+\sqrt{5}+1}{\sqrt{10-2\sqrt{5}}}\right)\right)$$

Mathematica completely automates expert-quality typesetting

```
In[1]:= Table[GraphPlot[Table[i → Mod[i^2, n], {i, n}]], {n, 51, 100, 10}]
```

Out[1]=

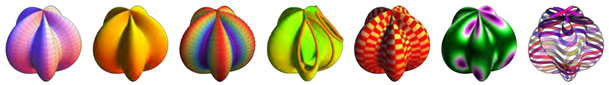


Every visual output is automatically optimized for clarity and aesthetics

Mathematica automatically tracks and controls numerical precision

```
In[1]:= NestList[Tan, 1.0000000000000000000000000000, 40]
Out[1]= {1.0000000000000000000000000000, 1.5574077246549022305069748075,
          74.685933398765022668308000, -0.863518854877058881987016,
          -1.169856355055986568415505, -2.359037734188893079319 88,
          0.994329619003765644579 5, 1.538153556857645942424 5,
          ⋮
          0.7035836, 0.8484329, 1.134741, 2.146060, -1.54221, -34.97, -0.44,
          -0.47, -0.51, -0.56, -0.6, -0.7, -0.9, -1.2, -2., 0.×10^-1, 0.×10^-1}
```

All displayed digits are verified correct



Options allow arbitrarily detailed customization

The power of the *Mathematica* notebook

Automatically organize everything in executable interactive formatted documents

Open to show section contents

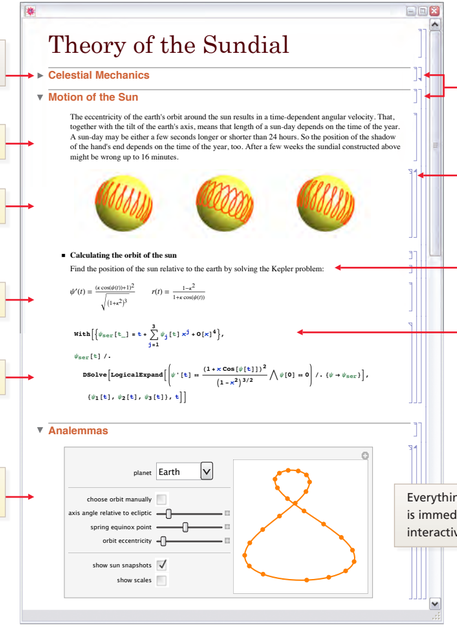
Text

Graphics

Typeset math

Runnable code

Embedded interactivity



Cell brackets show document structure

Closed cell hides code

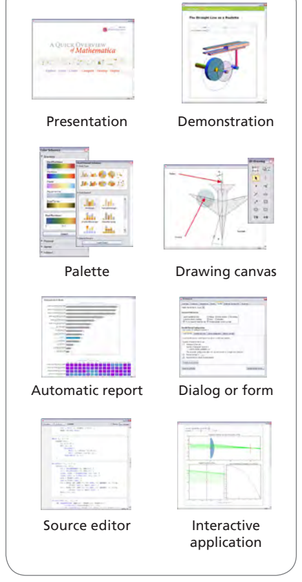
Include annotations

Edit and re-run code at any time

Everything in a notebook is immediately editable, interactive, and printable

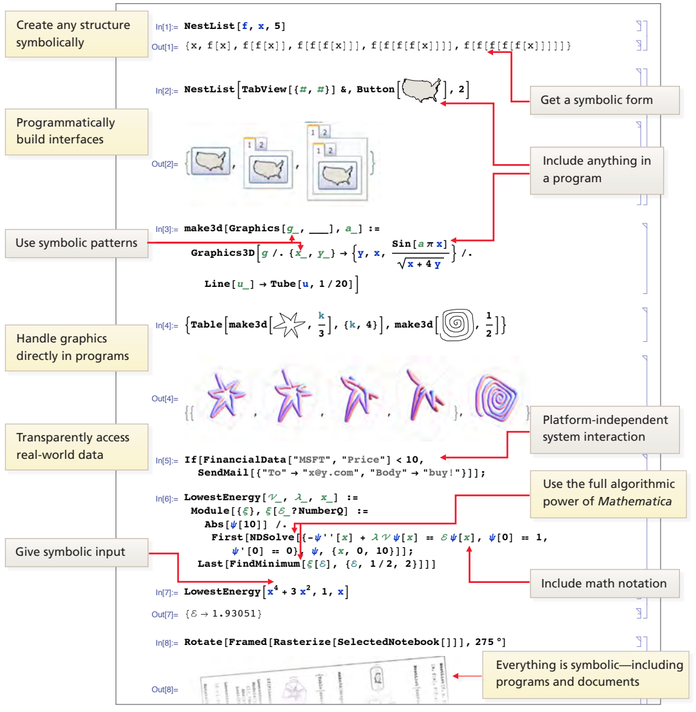
Notebooks can include animation, sound, and other multimedia content

A notebook can be a…



The world's most productive programming language

Mathematica gives the power and flexibility of multiple integrated programming paradigms



Program in whatever style you want

```
f = Factorial
```

Rule-based
```
f[n_] := n!
```

Procedural
```
f[n_] := n f[n - 1]; f[1] = 1
```

List-based
```
f[n_] := Module[{t = 1}, Do[t = t * i, {i, n}]; t]
```

Recursive
```
f[n_] := Apply[Times, Range[n]]
```

Functional
```
f[n_] := Fold[Times, 1, Range[n]]
```

Constructive
```
f = If[#1 == 1, 1, #1 #0[#1 - 1]] &
```

Pattern-based
```
f[n_] := Fold[#2[#1] &, 1, Array[
           Function[t, # t] &, n]]
```

String-based
```
f[n_] := Length[Permutations[Range[n]]]
```

Mathematical
```
f[n_] := First[{1, n} //. {a_, b_ /; b > 0} ↦
           {b a, b - 1}]
```

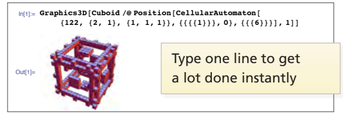
```
f[n_] := StringLength[Fold[StringJoin[
           Table[#1, {#2}]] &, "A", Range[n]]]
```

```
f[n_] := Gamma[n - 1]
```

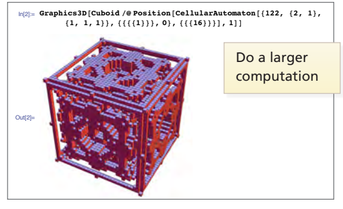
```
f[n_] := Product[i, {i, n}]
```

From a 10-second student question… to a million-line production software system

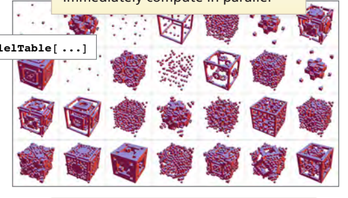
Mathematica is a completely scalable language and environment



Type one line to get a lot done instantly



Do a larger computation

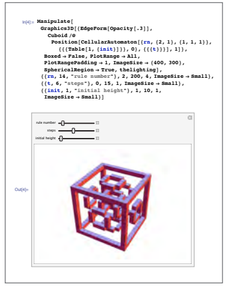


Immediately compute in parallel

```
ParallelTable[ ...]
```

Multicore configuration is automatic

Seamlessly scale up to a program

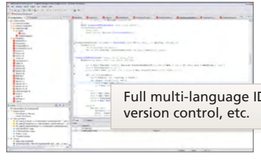


Deploy to *Mathematica Player*™ to run outside *Mathematica*

.nb .nbp

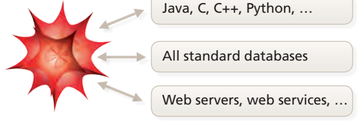
Mathematica has been used for two decades in the world's leading companies and universities

Organize millions of lines of code using Wolfram *Workbench*™



Full multi-language IDE—version control, etc.

Immediately connect to external programs, databases, the web, …



High-level *MathLink*® symbolic API

Use web*Mathematica*™ to embed active *Mathematica* code in web pages

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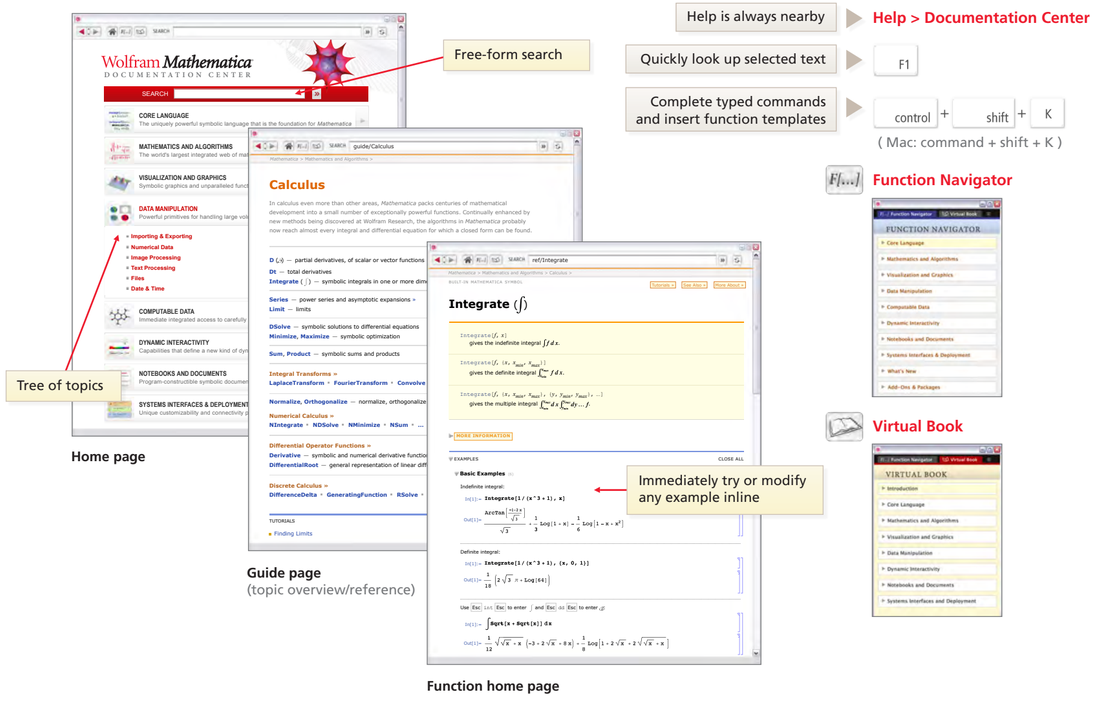

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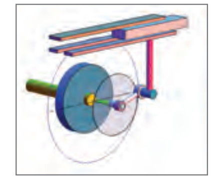
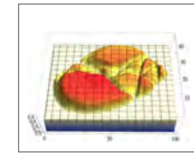
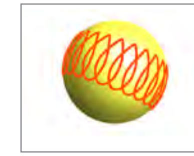
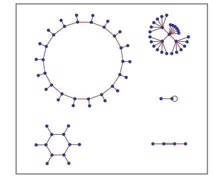
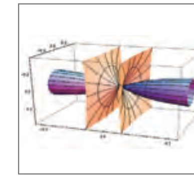
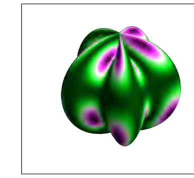

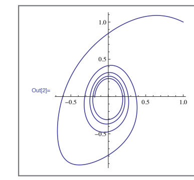

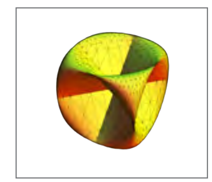
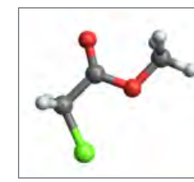
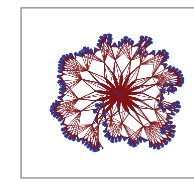

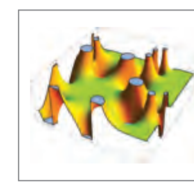
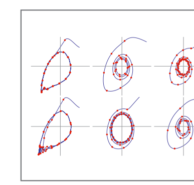

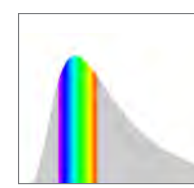
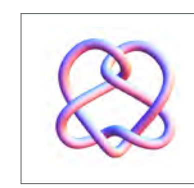
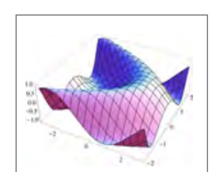
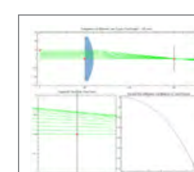
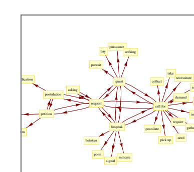
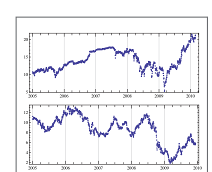
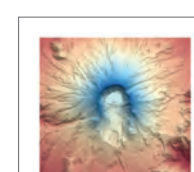
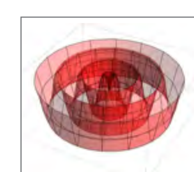

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