Computational Knowledge Engine

Democratizing Knowledge

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About Wolfram|Alpha

- Computes answers to natural language questions

- Integrates disconnected trusted data sources
- Sophisticated automated algorithm and visualization selection
- General and domain-specific linguistic and presentation development

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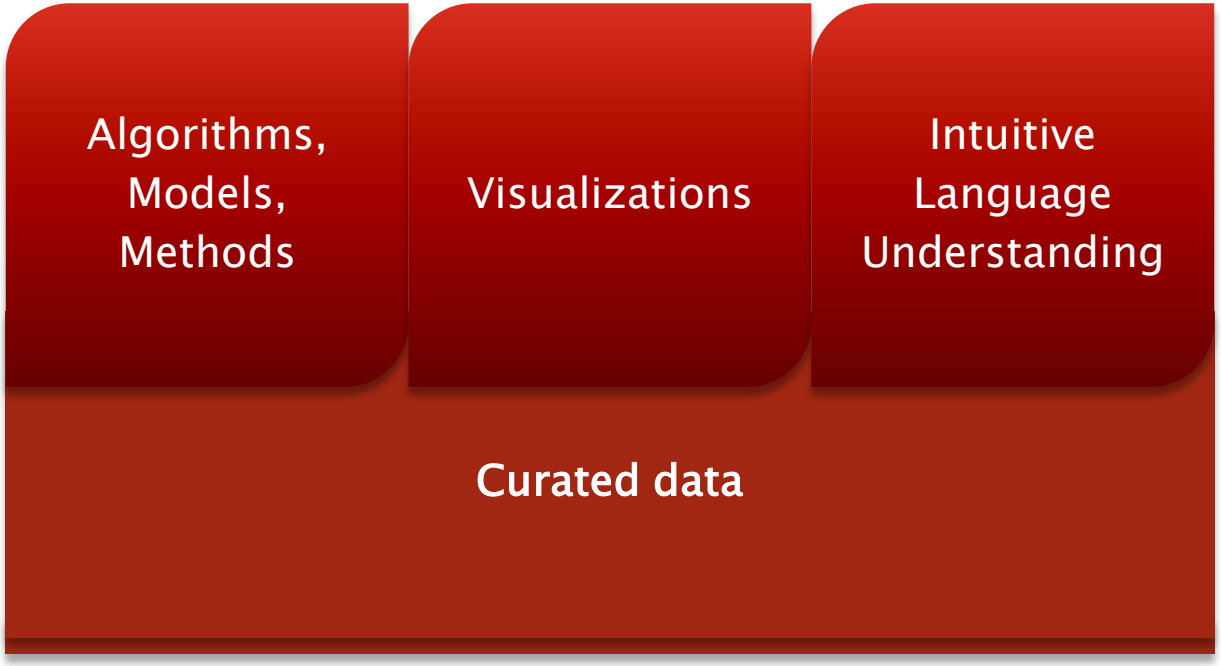
Computational Knowledge Engine



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- First instantiation of Wolfram|Alpha technology

- Ambitious long-term project
  - Democratize knowledge by curating and computing world's systematic knowledge
  - Become recognized as the independent source of authoritative factual knowledge and computation

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WolframAlpha.com Examples

- GE employees / US population
- ISS from LA
- Which is the fifth largest country?
- Weather in Big Apple when Obama turned 40
- Gold silver red
- Earthquakes near Tokyo during the 1990s
- male 45 inch 6 years 50 pounds
- male smoker age 40 LDL 150

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GE employees / US population

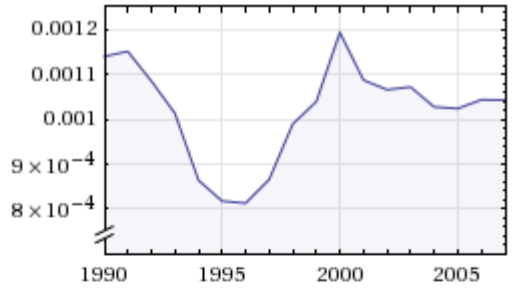
Input interpretation: *Mathematica* form

General Electric employees / United States population

Result: Show details

0.001056

History:



Computed by: Wolfram *Mathematica* Source information » Download as: PDF | Live *Mathematica*

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ISS from LA

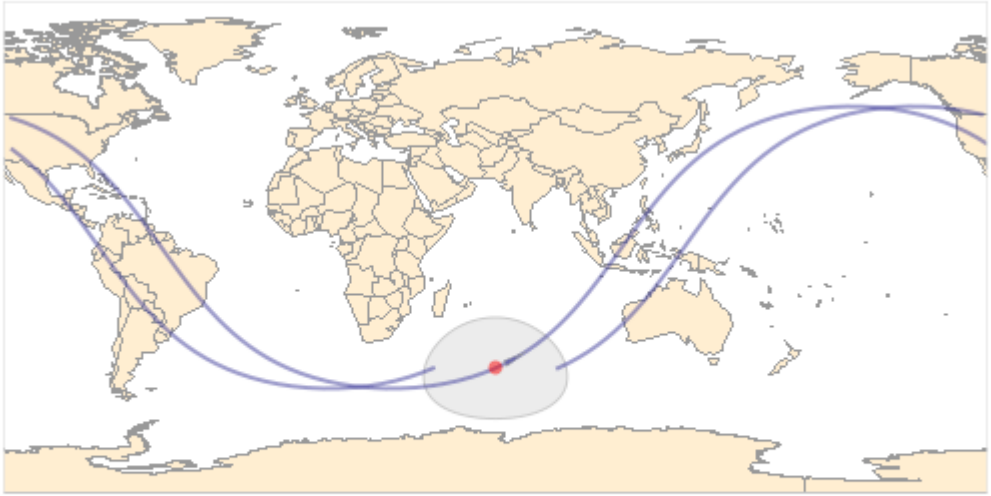
Assuming "ISS" is a spacecraft | Use as an airport instead

Assuming "LA" is a city | Use as a US state instead

Input interpretation:

International Space Station (spacecraft)	location Los Angeles, California

Current position: Show DMS | Show 3D | Orthographic projection



44.21° South | 66.77° East (ocean)

(computed from orbital elements determined 7 hours ago)

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ISS to JFK

Input interpretation:

Wiscasset Airport to John F. Kennedy International Airport

Distance: Show metric units

309.7 miles

Direct travel times: More

aircraft (550 mph)	33 minutes 40 seconds
sound	24 minutes 20 seconds
light in fiber	2.33 ms (milliseconds)
light in vacuum	1.66 ms (milliseconds)

(assuming direct great–circle paths)

Map:

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Weather in Big Apple when Obama turned 40

Input interpretation:

weather	New York, New York		
	date	of Barack Obama (politician)	age 40 years

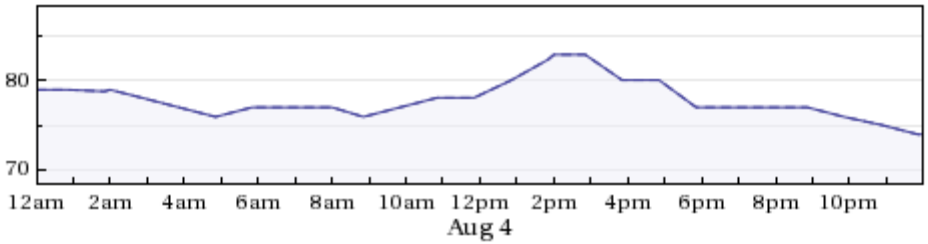
Recorded weather for New York, New York: Show metric | More

time range	day of Saturday, August 4, 2001
temperature	average: 78 °F (74 to 83 °F)
conditions	rain, overcast, cloudy
relative humidity	average: 76% (65 to 88%)
wind speed	average: 7 mph (3 to 13 mph)

Units »

Weather history: Day | Show metric | Less

Temperature:



minimum: 74 °F	average: 78 °F	maximum: 83 °F

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Which is the fifth largest country

Input interpretation:

5th largest country

Result by area: More

⋮

3	United States	3.719 million mi^2	
4	China	3.705 million mi^2	
5	Brazil	3.286 million mi^2	
6	Australia	2.968 million mi^2	
7	India	1.269 million mi^2	

Units »

Result by GDP: More

⋮

3	China	$3.4 trillion per year	
4	Germany	$3.317 trillion per year	
5	United Kingdom	$2.768 trillion per year	
6	France	$2.546 trillion per year	
7	Italy	$2.095 trillion per year	

Units »

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Earthquakes near Tokyo during the 1990s

Input interpretation:

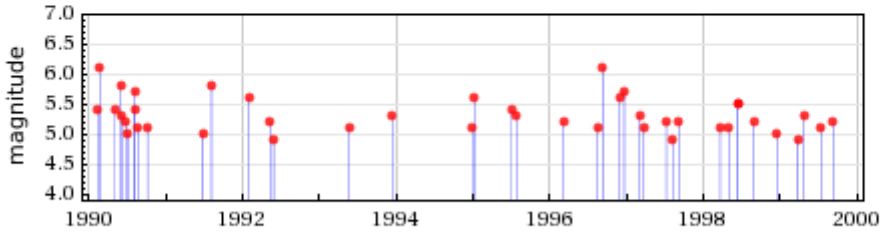
earthquakes | Tokyo, Japan | 1990 to 1999

Results:

Magnitude > 4 | Distance < 100 mi | JT

(circle marks 100 miles range)

Timeline:



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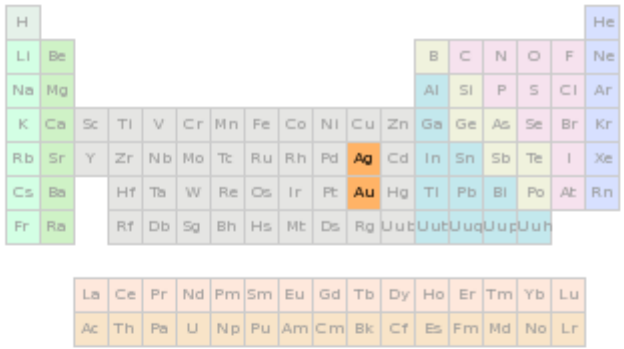
gold silver

Assuming "gold" is a chemical element | Use as a futures contract or a color instead

Input interpretation: *Mathematica* form

gold (chemical element) | silver (chemical element)

Periodic table location:



Basic elemental properties: More

	gold	silver
abbreviation	Au	Ag
atomic number	79	47
atomic weight	196.96655	107.8682

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gold silver red

Assuming basic red | Use HTML red instead

Input interpretation:

gold (color) | silver (color) | red (color)

Color swatches:

color	red 1.	green 0.84	blue 0	
color	red 0.75	green 0.75	blue 0.75	
color	red 1.	green 0	blue 0	

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male 45 inch 6 years 50 pounds

Assuming standard growth curve | Use more instead

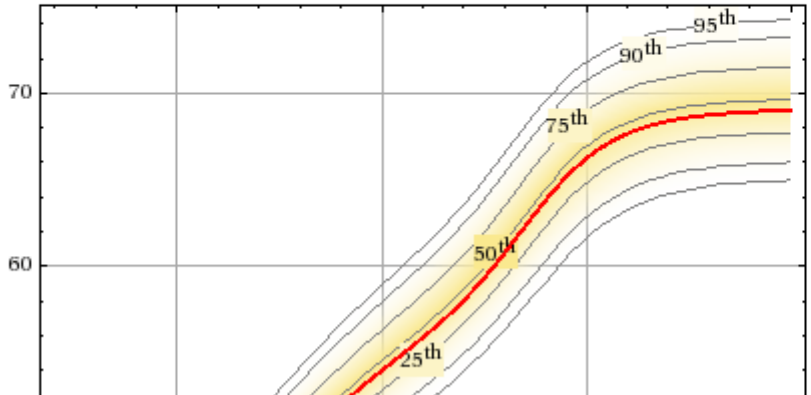
Input information:

gender	male
height	45 inches
age	6 years
weight	50 lb (pounds)

Height information:

Show smaller plot | Show metric

height	percentile	projected adult height	fraction of adult height
45 inches	41st	69 inches	65%



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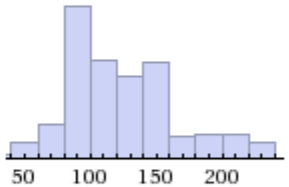
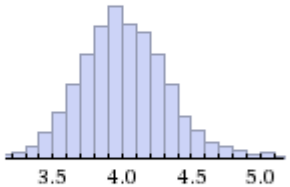
LDL vs serum potassium 150 smoker age 40

Input interpretation:

serum LDL cholesterol	(35 to 45) years
	smoker

serum potassium	(35 to 45) years
	smoker
	150

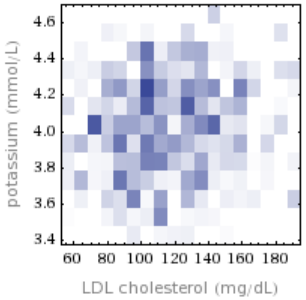
Reference distributions: More

	serum LDL cholesterol	serum potassium
95% reference range	(57 to 207) mg/dL	(3.3 to 4.6) mmol/L
$\pm 1\sigma$ range	(80 to 160) mg/dL	(3.6 to 4.3) mmol/L
distribution		
data sample size	116 people	6433 people

(data from NHANES 2006 study, weighted for USA demographics)

Units »

Reference correlation:



coefficient: 0.103
377 individuals in sample
(data from NHANES 2006 study)

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Data Curation

- Any systematic data can be curated
- Human-driven curation includes tools, processes, and methodologies
- Thousands of domains curated falling into about 50-100 domain models
- Ontology is at a meta level
- Hierarchical knowledge included with entity classes, attributes
- Relates things at computation time

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Questions?

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