Why are people so excited about Wolfram|Alpha?

Because it lets you go beyond what you've gotten used to asking a computer.

Wolfram|Alpha is not a search engine. Search engines work very well when you need to look something up: if it exists, they will find it for you.

The "if it exists" part is the catch, because the most interesting questions are often those that have not been asked before, or whose answers have never been written down. And if it's not written down on someone's web page, a search engine is not going to find it.

Search engines are a bit like a parent who refuses to do your homework for you, and instead tells you where you can look up the facts you need, then expects you to put them together to work out the answer yourself. It's a fine teaching technique, but can get pretty annoying if you really just want the answer.

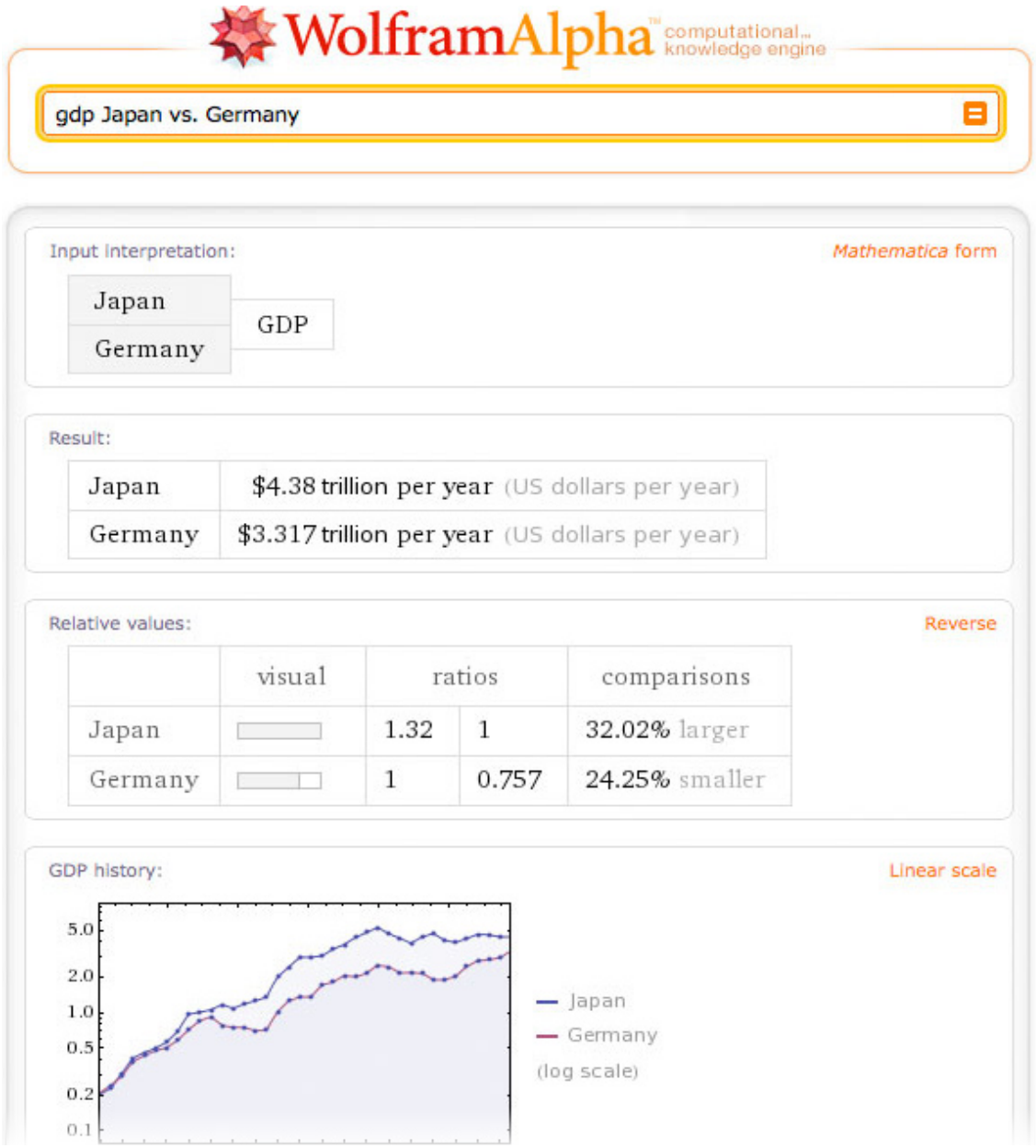
Say you're writing an article about Japan's economy and you want to compare it to the EU. If Japan were an EU country, what percentage of this hypothetical expanded EU's GDP would it represent? You could use a search engine to look up Japan's GDP and then look up the EU's GDP, but no search engine is going to tell you the GDP of a hypothetical combined EU + Japan—that's math you'd have to do yourself (and don't forget currency conversion problems).

If you ask Wolfram|Alpha the same question, it tells you straight out that Japan's GDP would be 23% of that of the hypothetical combined entity.

Wolfram|Alpha did the math, and it automatically factored in today's currency conversion rates (which you would have had to look up separately if you were using a search engine). Think about it: Wolfram|Alpha just answered a question that had not been asked before, and gave an answer that could not be not found by any search engine.

Would Japan be the biggest country in the EU + Japan? Let's ask which country has the biggest GDP in the EU.

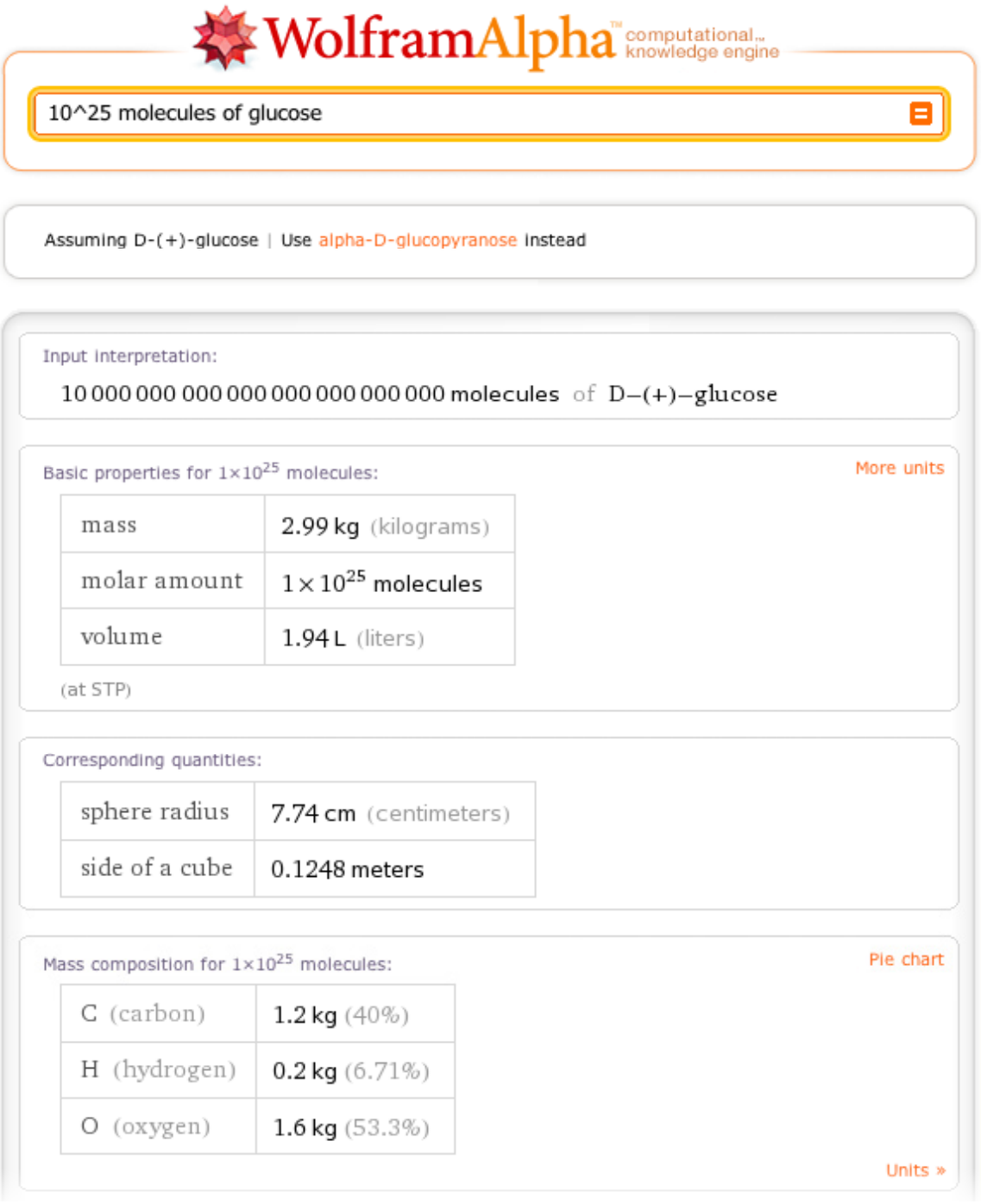
It's Germany, so how does Germany's GDP compare to that of Japan?



Well, it looks like in the 1970's they were about the same, but now Japan is over 50% bigger. You can finish your article now: if Japan were to join the EU, it would be the biggest member, one and a half times as large as Germany, and would represent over 23% of the EU s total GDP.

Notice that we didn't ask Wolfram|Alpha a big wordy question like "What percentage of GDP would Japan be in a hypothetical combined EU and Japan?" That doesn't work any better in Wolfram|Alpha than it does in a search engine. Instead, just as you learn to use a search engine effectively by putting in the right combination of keywords, you learn to use Wolfram|Alpha by distilling your question into one or more facts and relationships between them.

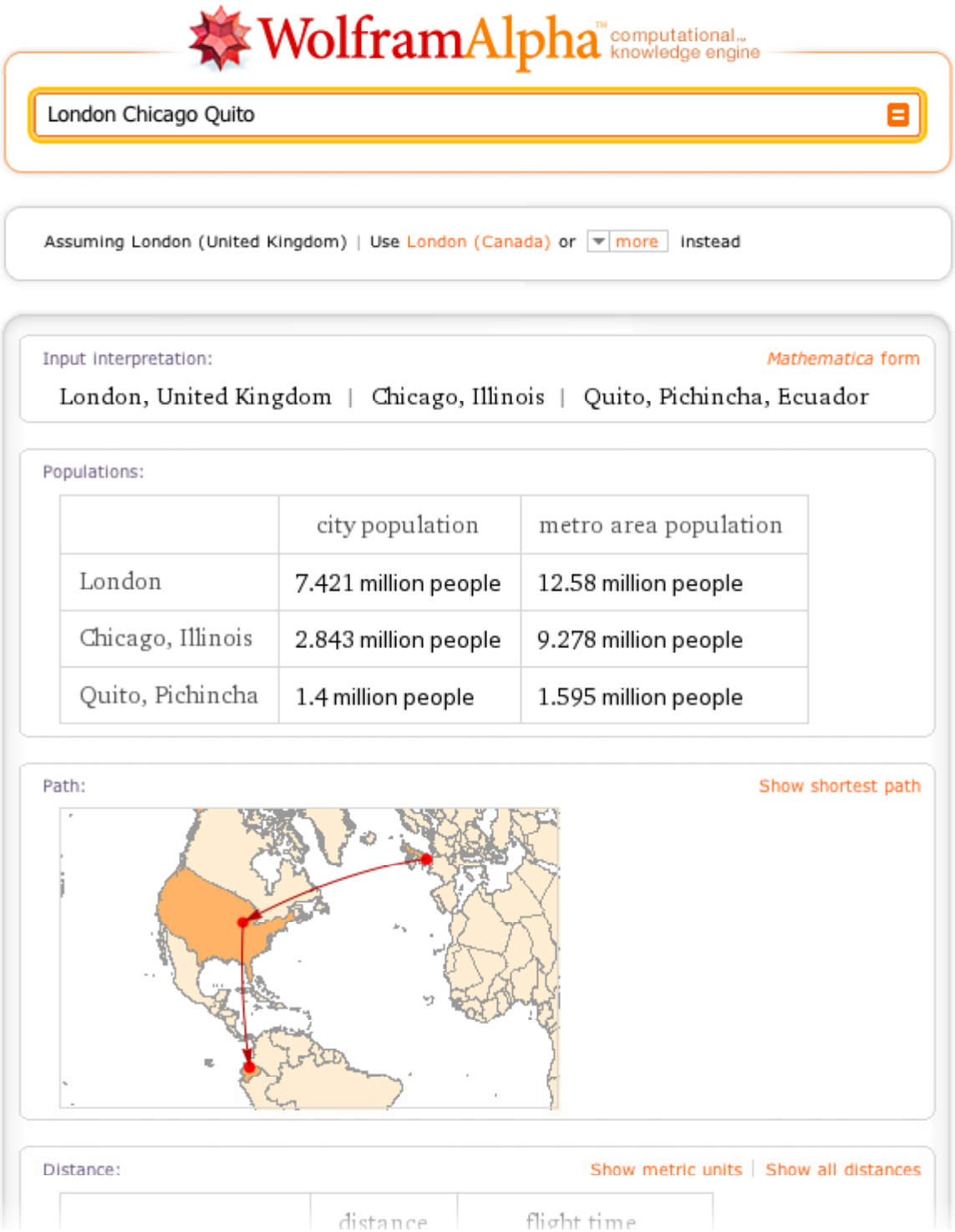
In many subject areas Wolfram|Alpha can take a question almost exactly as you would naturally encounter it. Let's try a more technical example. A typical chemistry homework assignment might ask for the weight of 10^25 molecules of glucose. That's something you can enter verbatim, and read the answer right off the results page, along with a dozen other interesting things, not about glucose in general, but about that specific quantity of glucose.



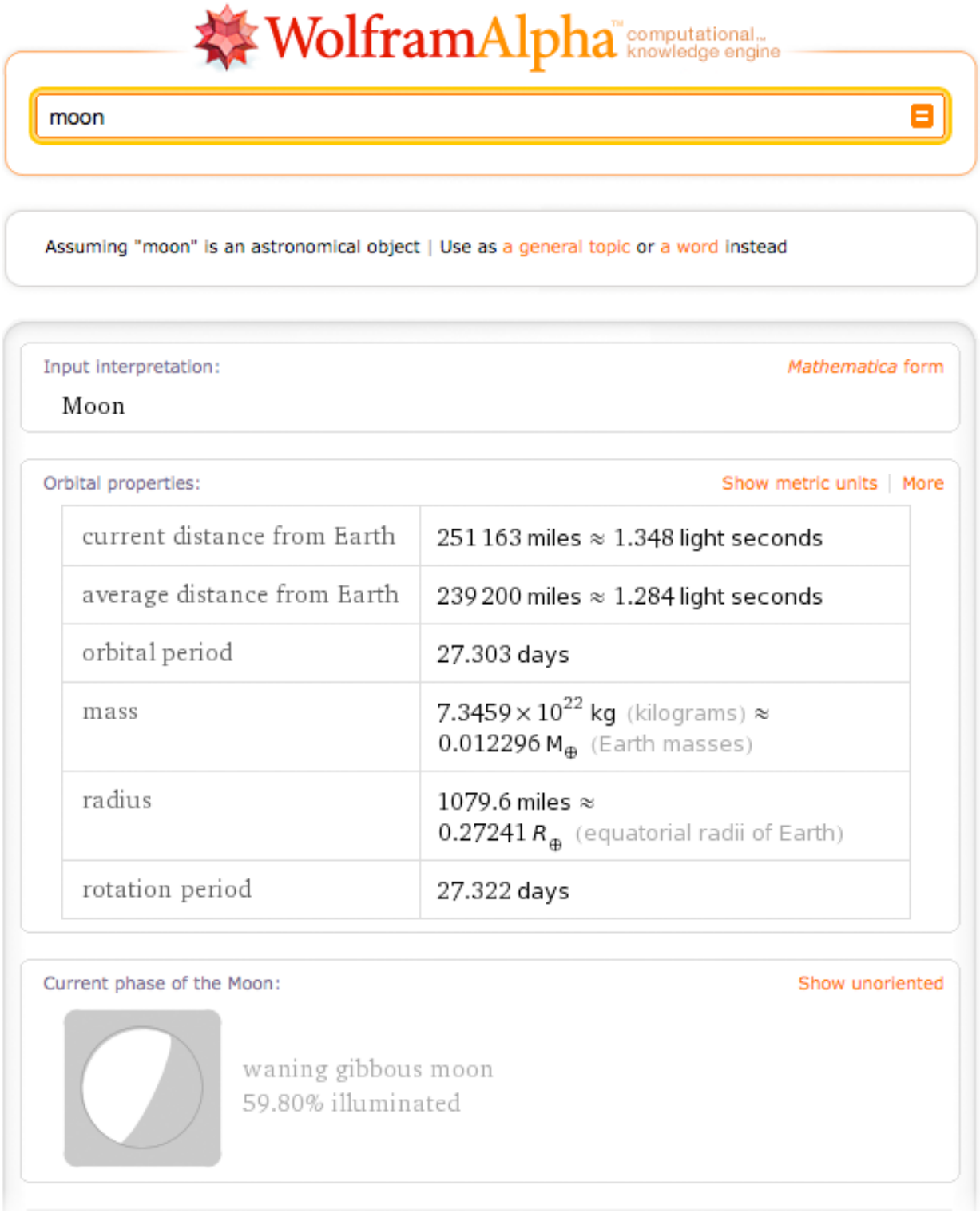
To get this answer, Wolfram|Alpha had to combine its knowledge of Avogadro's number with the molecular weight of glucose, and also know which formula to use to combine those facts to give the final answer. A search engine would have forced you to figure out all those things yourself, and would have given you information only about glucose in general, not about the specific amount you asked about.

Of course Wolfram|Alpha is far more than a tool for doing chemistry homework. Because it knows facts and relationships in so many areas of human knowledge, Wolfram|Alpha can make these sorts of inferences, and generate real answers, using data as diverse as the temperature in Madrid (right now, in real time) how old Barack Obama was in 1975 —both questions you can ask Wolfram|Alpha directly.

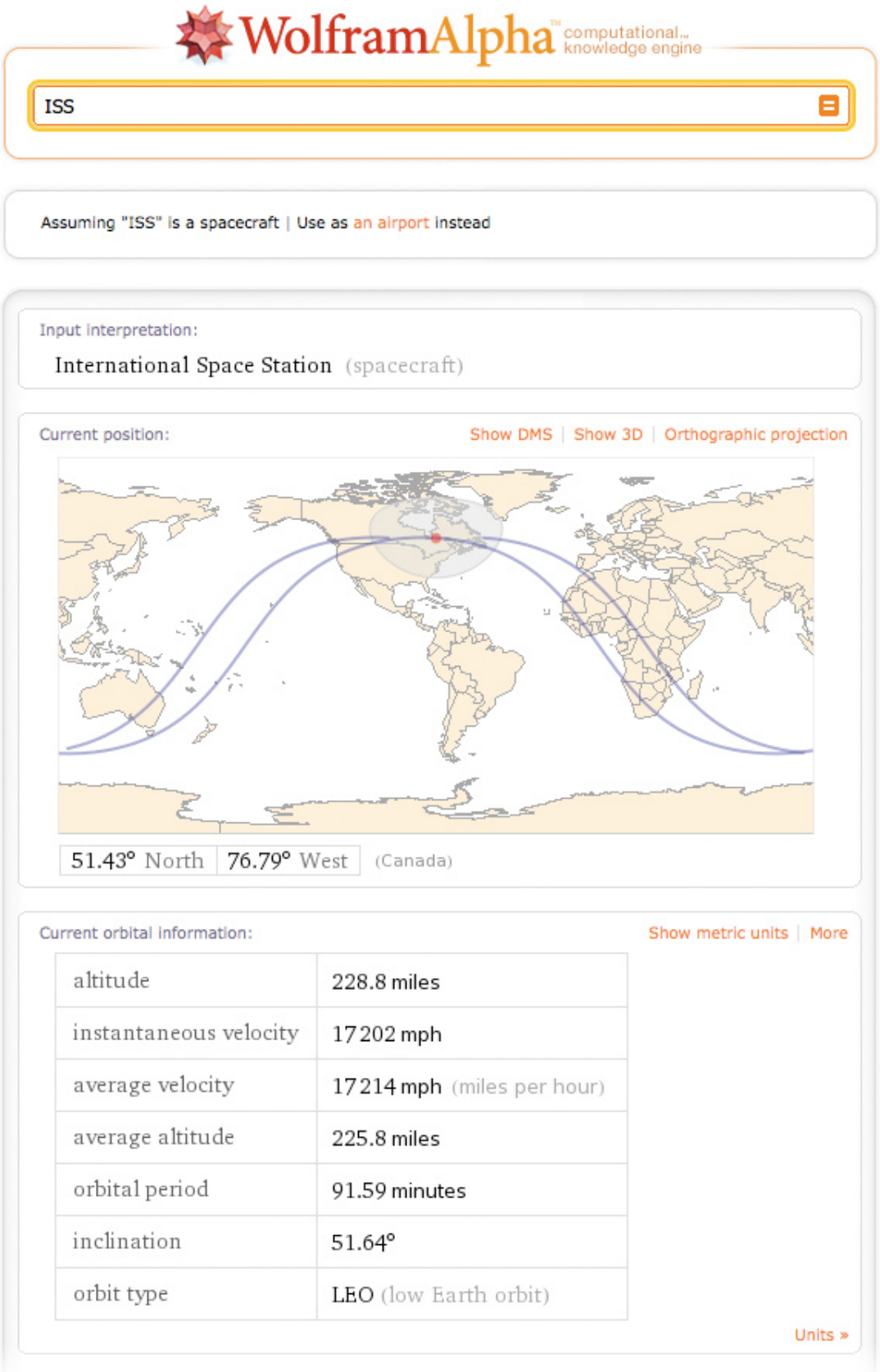
Wolfram|Alpha knows geography. Give it three cities and it will compare and contrast them for you.



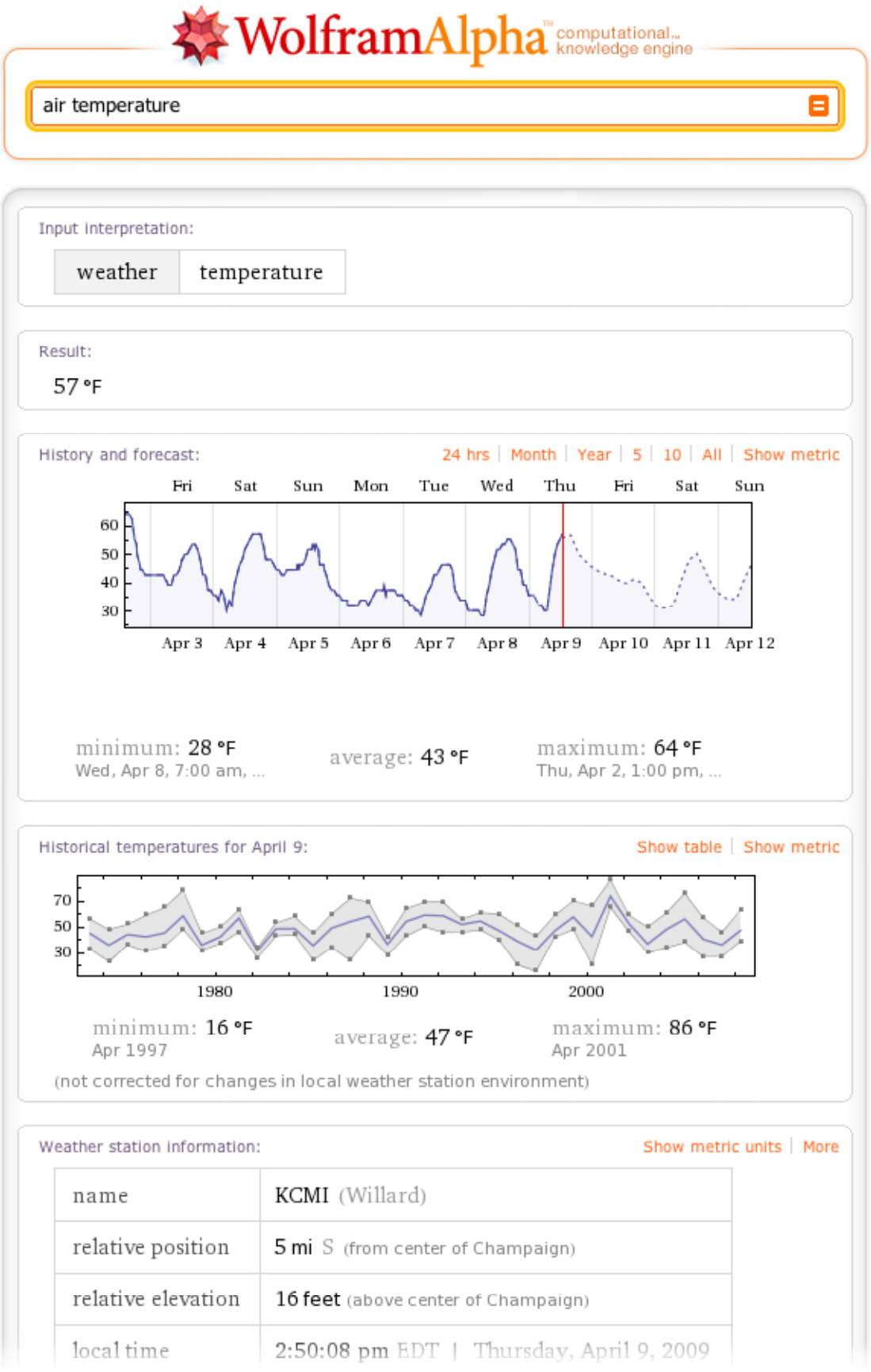
Wolfram|Alpha knows space. Type in “moon” and it will tell you the distance from the Earth to the Moon. But it’s not just the average distance you would find with a search engine, it’s the actual distance right now, which varies from hour to hour.



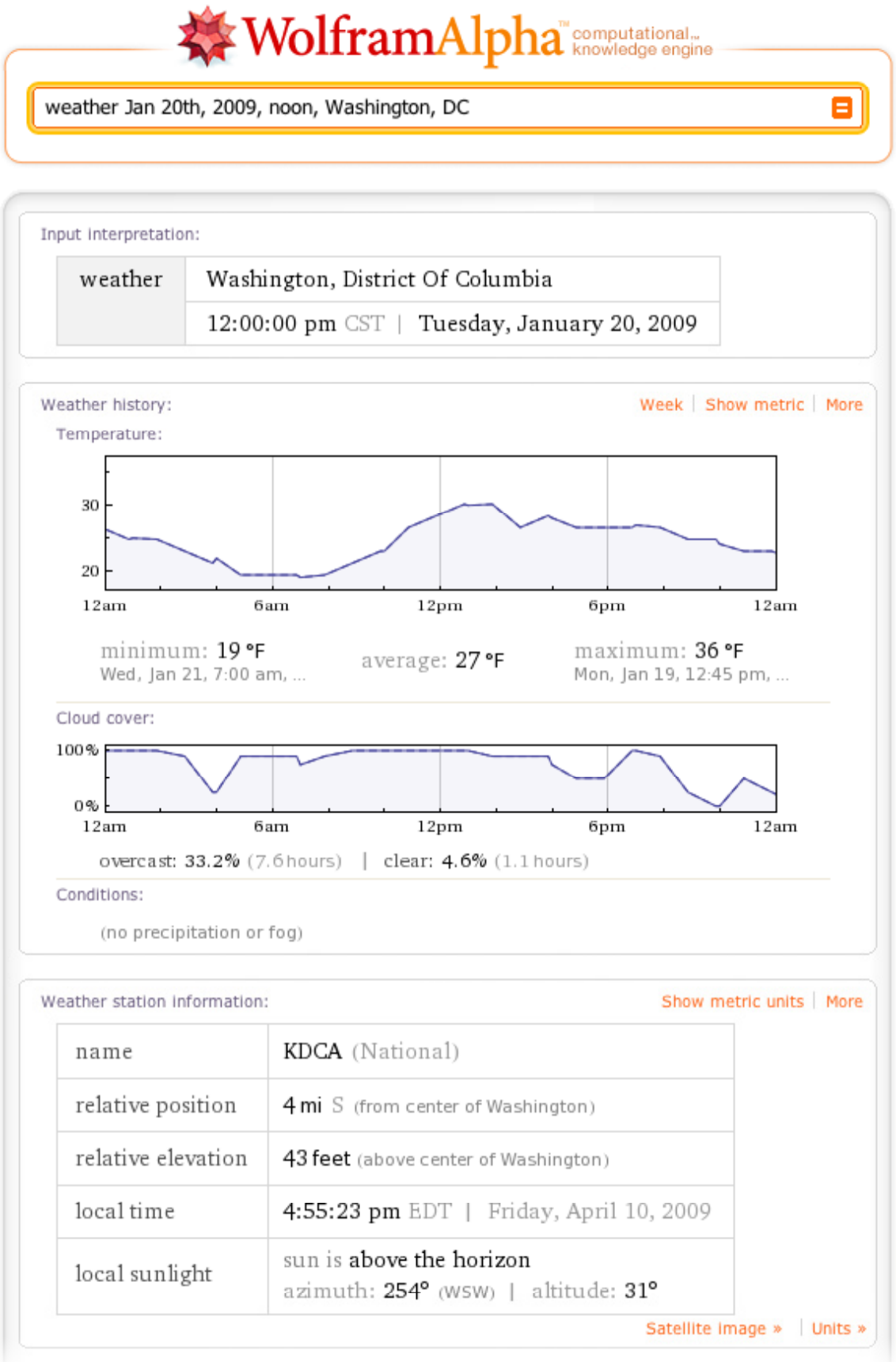
If you ask about the International Space Station, Wolfram|Alpha tells you what direction in the sky to look for it from where you are currently located.



Wolfram|Alpha knows weather, both yours and everyone else's. If you ask what the air temperature is, it tells you your air temperature, using the nearest available weather reporting station, and up to date to within a few minutes.



If you want to know the weather at some other time or place, just ask.



How do hurricanes Katrina and Andrew compare? Any time you give Wolfram|Alpha two concepts, it tries to compare and contrast them for you, using facts, figures, or maps.

WolframAlpha™ computational… knowledge engine

hurricane Katrina, hurricane Andrew

Assuming Katrina (2005) | Use Katrina (1981) or more instead

Input interpretation:

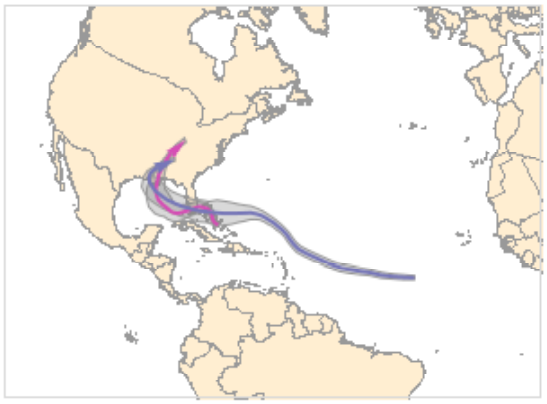
Katrina (hurricane)Comment | Andrew (hurricane)Comment

Properties: Show metric units | More

	Katrina (hurricane)	Andrew (hurricane)
start date	Tuesday August 23, 2005 (3.6 years ago)	Sunday August 16, 1992 (16.7 years ago)
end date	Wednesday August 31, 2005	Friday August 28, 1992
duration	7 days	11 days
maximum wind speed	150 mph (August 28, 2005)	150 mph (August 23, 1992)
storm type	hurricane (category 5)	hurricane (category 5)

Units »

Storm path:



— Katrina 2005

— Andrew 1992

(track width indicates wind speed of storm)

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

Wolfram|Alpha knows math. Put in a function and you get a nice show and tell about it.

WolframAlpha computational... knowledge engine

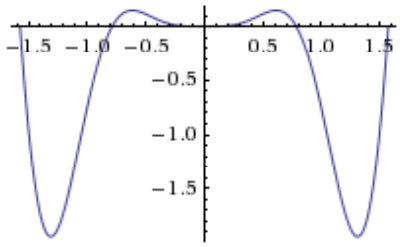
x^3 sin(4 x)

Assuming multiplication | Use a list instead

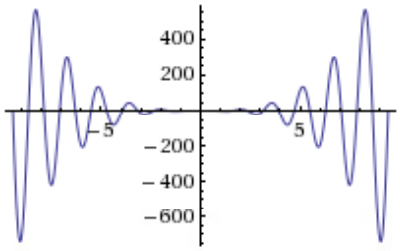
Input: *Mathematica* form

$$x^3 \sin(4\,x)$$

Plots:



(x from −1.5 to 1.5)



(x from −7.5 to 7.5)

Alternate forms:

$$4\,x^3 \sin(x) \cos^3(x) - 4\,x^3 \sin^3(x) \cos(x)$$

$$8\,x^3 \sin\left(\frac{\pi}{4} - x\right) \sin(x) \sin\left(x + \frac{\pi}{4}\right) \cos(x)$$

$$\frac{1}{2}\,i\,e^{-4\,i\,x}\,x^3 - \frac{1}{2}\,i\,e^{4\,i\,x}\,x^3$$

Roots:

$$x = 0$$

$$x = \frac{\pi\,n}{4}, \quad n \in \mathbb{Z}$$

$\mathbb{Z}$ is the set of integers »

If you want something more specific, tell Wolfram|Alpha what you'd like to do with the formula, say, for example, integrate it.

WolframAlpha computational knowledge engine

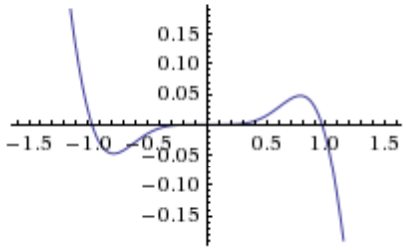
integrate x^3 sin(4 x)

Indefinite integral: Show steps

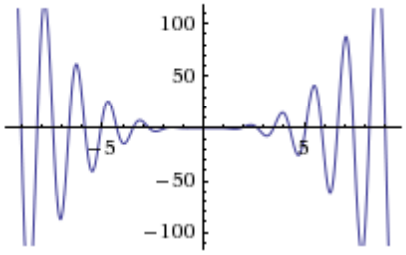
$$\int x^3 \sin(4x)\, dx =$$

$$\frac{3}{128}\left(8x^2-1\right)\sin(4x) - \frac{1}{32}x\left(8x^2-3\right)\cos(4x) + \text{constant}$$

Plots of the integral:



(x from -1.5 to 1.5)



(x from -7.5 to 7.5)

Alternate forms of the integral:

$$\frac{1}{128}\left(-32x^3\cos(4x) + 24x^2\sin(4x) - 3\sin(4x) + 12x\cos(4x)\right) + \text{constant}$$

$$\frac{3}{256}i\left(e^{-4ix} - e^{4ix}\right)\left(8x^2-1\right) - \frac{1}{64}\left(e^{-4ix} + e^{4ix}\right)x\left(8x^2-3\right) + \text{constant}$$

$$-\frac{1}{4}x^3\sin^4(x) - \frac{1}{4}x^3\cos^4(x) + \frac{3}{2}x^3\sin^2(x)\cos^2(x) + \frac{3}{4}x^2\sin(x)\cos^3(x) - \frac{3}{4}x^2\sin^3(x)\cos(x) + \frac{3}{32}x\sin^4(x) + \frac{3}{32}x\cos^4(x) - \frac{3}{32}\sin(x)\cos^3(x) - \frac{9}{16}x\sin^2(x)\cos^2(x) + \frac{3}{32}\sin^3(x)\cos(x) + \text{constant}$$

Not sure how that integral was done? Use the Show Steps button to find out.

Indefinite integral: Hide steps

$$\int x^3 \sin(4x)\,dx =$$

$$\frac{3}{128}\left(8x^2-1\right)\sin(4x) - \frac{1}{32}x\left(8x^2-3\right)\cos(4x) + \text{constant}$$

Possible intermediate steps:

$$\int x^3 \sin(4x)\,dx$$

For the integrand $x^3 \sin(4x)$, integrate by parts, $\int f\,dg = fg - \int g\,df$, where
$f = x^3$, $dg = \sin(4x)dx$,
$df = 3x^2 dx$, $g = -\frac{1}{4}\cos(4x)$:

$$= \frac{3}{4}\int x^2 \cos(4x)\,dx - \frac{1}{4}x^3\cos(4x)$$

For the integrand $x^2 \cos(4x)$, integrate by parts, $\int f\,dg = fg - \int g\,df$, where
$f = x^2$, $dg = \cos(4x)dx$,
$df = 2x dx$, $g = \frac{1}{4}\sin(4x)$:

$$= -\frac{1}{4}x^3\cos(4x) + \frac{3}{16}x^2\sin(4x) - \frac{3}{8}\int x\sin(4x)\,dx$$

For the integrand $x\sin(4x)$, integrate by parts, $\int f\,dg = fg - \int g\,df$, where
$f = x$, $dg = \sin(4x)dx$,
$df = dx$, $g = -\frac{1}{4}\cos(4x)$:

$$= -\frac{1}{4}x^3\cos(4x) + \frac{3}{16}x^2\sin(4x) + \frac{3}{32}x\cos(4x) - \frac{3}{32}\int \cos(4x)\,dx$$

For the integrand $\cos(4x)$, substitute $u = 4x$ and $du = 4dx$:

$$= -\frac{3}{128}\int \cos(u)\,du - \frac{1}{4}x^3\cos(4x) + \frac{3}{16}x^2\sin(4x) + \frac{3}{32}x\cos(4x)$$

The integral of $\cos(u)$ is $\sin(u)$:

$$= -\frac{3\sin(u)}{128} - \frac{1}{4}x^3\cos(4x) + \frac{3}{16}x^2\sin(4x) + \frac{3}{32}x\cos(4x) + \text{constant}$$

Substitute back for $u = 4x$:

$$= \frac{1}{128}\left(3\left(8x^2-1\right)\sin(4x) - 4x\left(8x^2-3\right)\cos(4x)\right) + \text{constant}$$

Which is equal to:

$$= \frac{3}{128}\left(8x^2-1\right)\sin(4x) - \frac{1}{32}x\left(8x^2-3\right)\cos(4x) + \text{constant}$$

Wolfram|Alpha knows health and nutrition. If you're a 38-year-old male with a total cholesterol level of 200, how does that compare to the average?

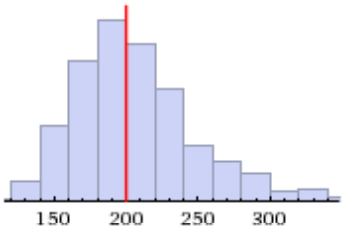
WolframAlpha computational... knowledge engine

male 38 cholesterol 200

Input interpretation:

	200 mg/dL (milligrams per deciliter)
serum total cholesterol	male
	(33 to 43) years

Reference distribution: More

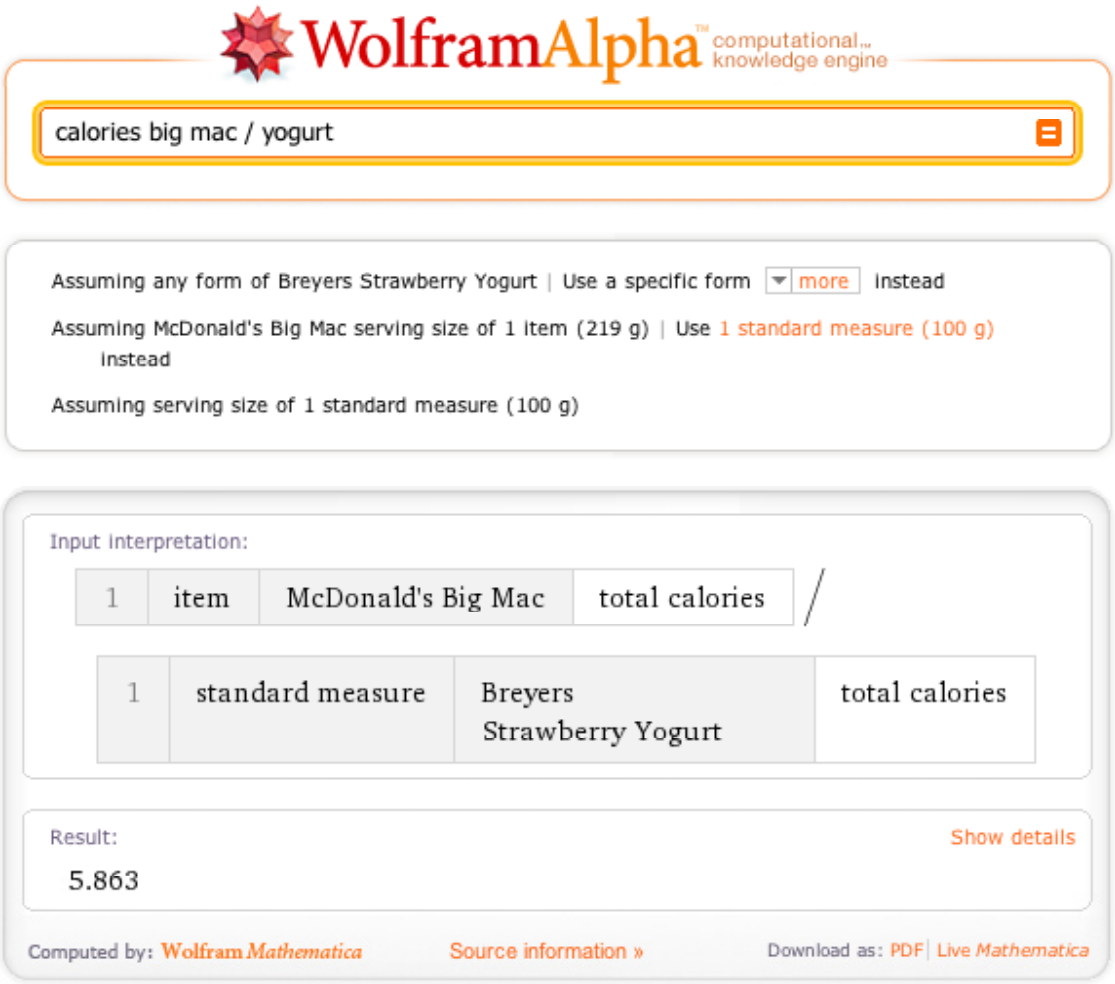
95% reference range	(139 to 296) mg/dL
$\pm 1\sigma$ range	(163 to 244) mg/dL
distribution	
fraction below	51.6% of population
fraction above	48.4% of population
data sample size	419 people

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

Units »

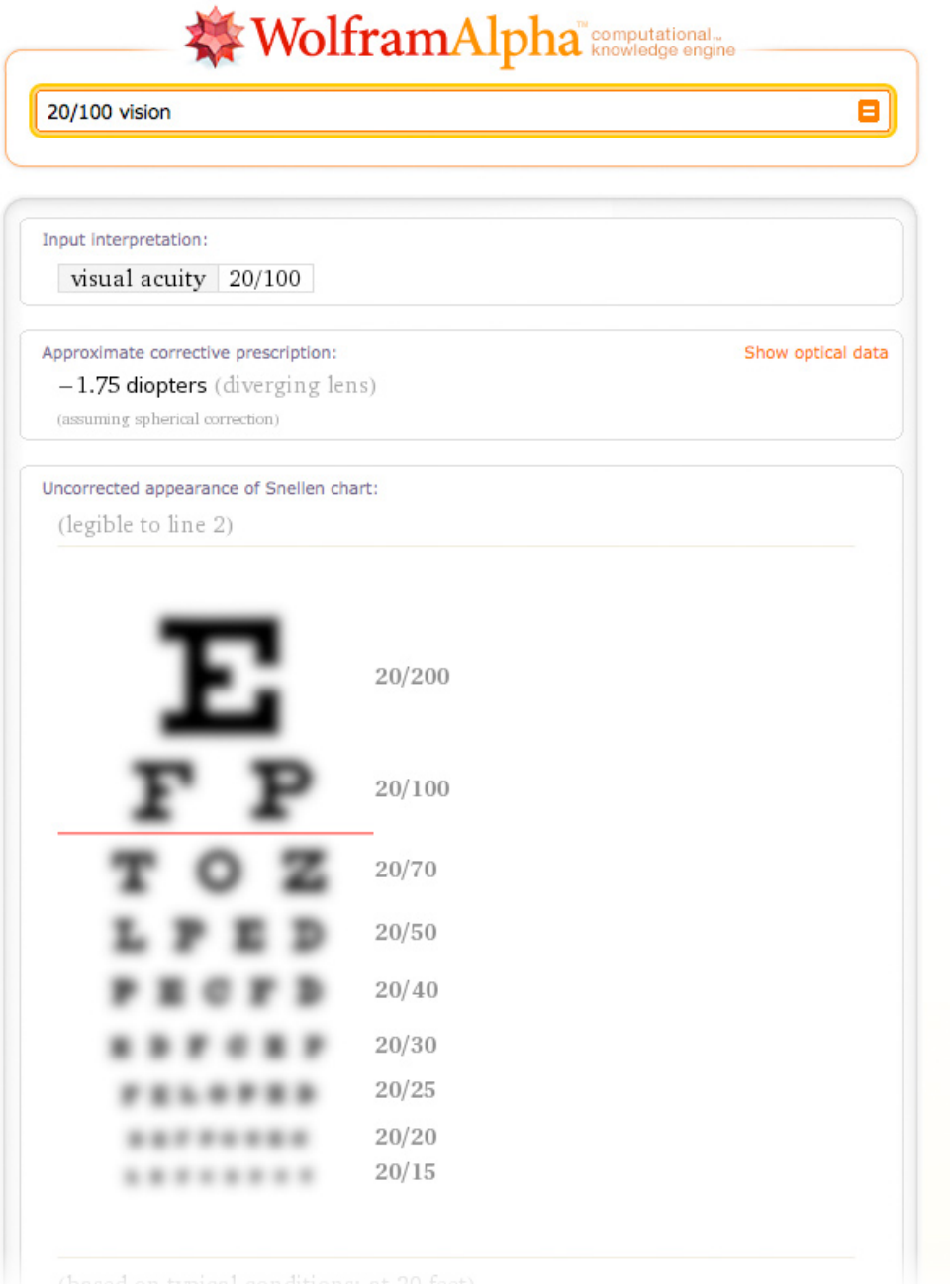
Computed by: Wolfram Mathematica Source information » Download as: PDF | Live Mathematica

If you eat a Big Mac, how many more calories is that compared to a yogurt?



Notice that for a relatively vague question, such as this one, Wolfram|Alpha made a number of automatic assumptions for you, such as what kind of yogurt and how much of it. The Assuming lines let you choose from different brands and serving sizes. (A Big Mac, on the other hand, is a standard object the world over, and requires no further clarification.)

Wolfram|Alpha can return results in many forms, not just tables and maps. If you want to know what it's like having 20/100 vision, Wolfram|Alpha will show you a picture.



We hope that these examples have given you a flavor of what Wolfram|Alpha can do. It's important to realize that while Wolfram|Alpha doesn't know everything about everything, it is not a bag of tricks. Wolfram|Alpha's knowledge is deep and broad in the areas it covers, and growing every day. The underlying technology and algorithms are applicable to virtually any area of human endeavor.

The consistent theme is that Wolfram|Alpha tries to give you the answer, not references or hints about where you might find it. Try any of the examples above in your favorite search engine and see how well it does. Do you get the answer, or a nagging series of half answers? A search engine gives you information, but Wolfram|Alpha gives you the answer.