



Math Mole

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Quotes:

Read Euler: he is our master in everything.

–Pierre Simon de Laplace

All science is either physics or stamp collecting.

–Ernest Rutherford

Science without religion is lame, religion without science is blind.

–Albert Einstein

Puzzle1: Using each of the numbers $\cos(\frac{\pi}{7})$, $\cos(\frac{2\pi}{7})$, and $\cos(\frac{3\pi}{7})$ twice, and the operations $+$, $-$, \times , and \div as many times as you like, find an expression that equals $-\frac{1}{2}$. Multiplying by -1 is not allowed.

Puzzle2: Does there exist a Fibonacci number whose decimal representation ends in nine nines?

Mathematician of the Day



Leonhard Euler - Switzerland 1707-1783

- Defined the concept of the function, as well as the notation of sine, cosine, and tangent as sin, cos, and tan.
- Memorized all of Vergil's Aeneid; mathematics were not his sole interest.
- $e^{i\theta} = \cos(\theta) + i \sin(\theta)$. 'Nuff said.
- Upon his death, it was remarked of him that "il cessa de calculer et de vivre", which translated means that he ceased to calculate and to live.

Image from: <http://www-history.mcs.st-andrews.ac.uk/Mathematicians/Euler.html>

Today:

More about subspaces, spanning, linear independence and basis.

Tomorrow:

Relate subspaces to matrices.

Puzzle3: Five men crash-land their airplane on a deserted island in the South Pacific. On their first day they gather as many coconuts as they can find into one big pile. They decide that, since it is getting dark, they will wait until the next day to divide the coconuts. That night each man took a turn watching for rescue searchers while the others slept. The first watcher got bored so he decided to divide the coconuts into five equal piles. When he did this, he found he had one remaining coconut. He gave this coconut to a monkey, took one of the piles, and hid it for himself. Then he jumbled up the four other piles into one big pile again. To cut a long story short, each of the five men ended up doing exactly the same thing. They each divided the coconuts into five equal piles and had one extra coconut left over, which they gave to the monkey. They each took one of the five piles and hid those coconuts. They each came back and jumbled up the remaining four piles into one big pile. What is the smallest number of coconuts there could have been in the original pile?

Career Spotlight: Cryptologist

Education: Most employers look for a minimum of a master's degree in mathematics. Cryptologists must be educated thoroughly in many branches of mathematics including abstract algebra, probability, and statistics.

Work Situation: The National Security Agency is the largest employer of mathematicians in the nation. NSA cryptologists devise and break codes for secret communications. Education for cryptology is never complete. While working for the NSA, the government provides more training programs in cryptology and other areas of mathematics.

Pay: Depending on level of education, entry-level mathematicians can earn from \$38,481 to \$62,680. To free up space for hiring young people with modern skills, the agency is continuing to offer early-out retirement incentives and \$25,000 bonuses.

Outlook: Ever since World War II, cryptologists have become increasingly important in government activities. During the Cold War an approximated number of 40,000 mathematicians and engineers were employed by the government. Demand has currently decreased to about a third of that number, but cryptologists are still in high demand by the NSA.