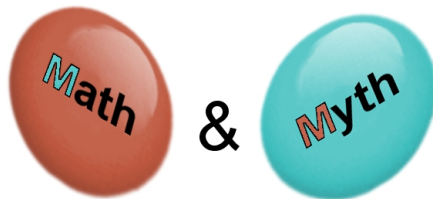


# Communicating in English for a University Context



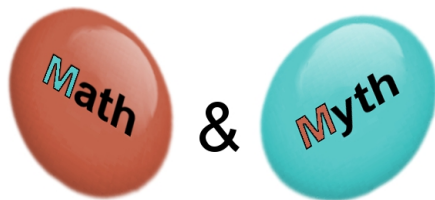
Fernando Chamizo

Universidad Autónoma de Madrid

March 13th, 2012

<http://www.uam.es/fernando.chamizo>

# Main objective



The primary purpose of this talk is that

**You enjoy it!\***

\* Disclaimer: This slide is not a contract. No money refund if you learn something.

## Sentences that every mathematician has heard many times

- **So, you're mathematician... Can you check the bill?**
- **Is there any unsolved problem in Mathematics?**
- **What is this for? Why didn't you study engineering?**

# The Myths

- So, you're mathematician... Can you check the bill?

## Myth 1

**Math is the ability to do long calculations**

- **Is there any unsolved problem in Mathematics?**
- **What is this for? Why didn't you study engineering?**

# The Myths

- So, you're mathematician... Can you check the bill?

## Myth 1

**Math is the ability to do long calculations**

- Is there any unsolved problem in Mathematics?

## Myth 2

**Math is finished since ancient times**

- **What is this for? Why didn't you study engineering?**

# The Myths

- So, you're mathematician... Can you check the bill?

## Myth 1

**Math is the ability to do long calculations**

- Is there any unsolved problem in Mathematics?

## Myth 2

**Math is finished since ancient times**

- What is this for? Why didn't you study engineering?

## Myth 3

**Math has no real-world applications**

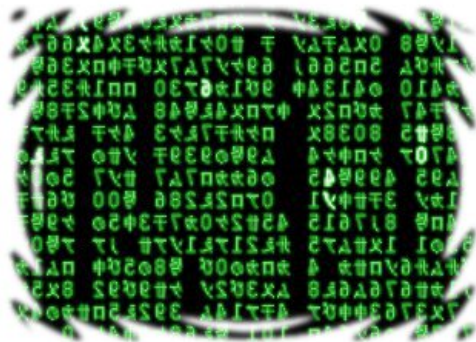


“You take the blue pill and [...] you believe whatever you want to believe [...] You take the red pill and you stay in Wonderland”

# Myth 1: Mathematics and calculations

## Myth 1

Math requires ability with mental calculations



*“Why don’t we start something a little fun?”*



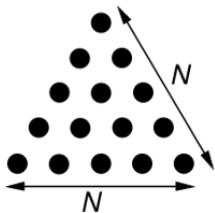
# Myth 1: Mathematics and calculations

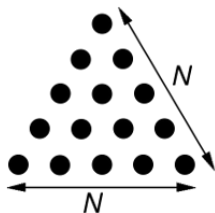
Math does **not** requires ability with mental calculations

In fact mathematicians use very frequently symbols and tricks to avoid calculations.

**Example:**

$$1 + 2 + 3 + 4 + \cdots + 97 + 98 + 99 + 100 = ?$$





A rectangular pattern is simpler than a triangular one for counting

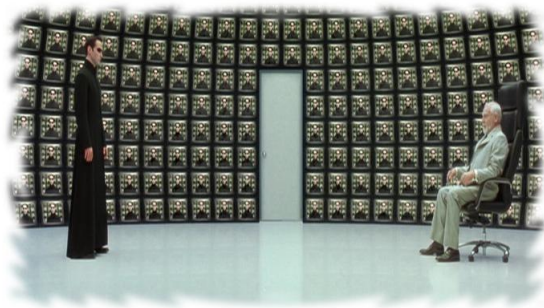
$$1 + 2 + 3 + 4 + \dots + 97 + 98 + 99 + 100 = \frac{100 \cdot 101}{2} = 5050$$

$$1 + 2 + 3 + 4 + \dots + N = \frac{N(N + 1)}{2}$$

# Myth 2: Mathematics and progress

## Myth 2

Math is exhausted



*"Flawless. Sublime. A triumph only equaled by its monumental failure."*

## Myth 2: Mathematics and progress

### Math is a **living science**

Mathematics advances continuously and there are breakthroughs from time to time, as in any other Science.

There are many open problems in Mathematics, some of them very old, some of them brand new.

# A dirt simple unsolved problem

Can an odd number equal the sum of its divisors excepting itself?

Even numbers with this property are rather well-known and they are related to certain prime numbers through one of the oldest theorems in pure Mathematics (c. 300 B.C.)

**Examples:**

$$28 = 1 + 2 + 4 + 7 + 14$$

$$496 = 1 + 2 + 4 + 8 + 16 + 31 + 62 + 124 + 248$$

# Myth 3: Mathematics and applications

## Myth 3

Math is not applicable



*"It is all around us, even now in this very room."*

## Myth 3: Mathematics and applications

Most people are unaware that Mathematics is essential in very common technological applications.

### Reversed Ockham's razor?

When something is hidden one tends to assume that it does not exist or that it is less important.



# Welcome to the real world!

J. Radon 1917

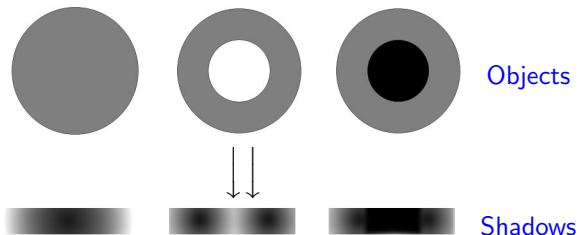
Is it possible to recover a the shape of  
a translucent object from its shadows?



# Welcome to the real world!

J. Radon 1917

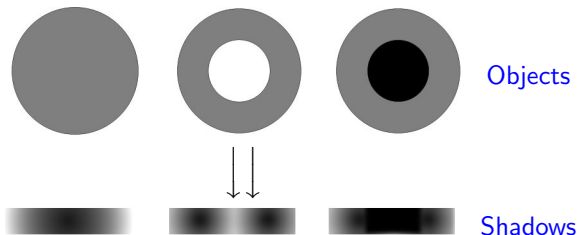
Is it possible to recover the shape of a translucent object from its shadows?



# Welcome to the real world!

J. Radon 1917

Is it possible to recover a the shape of  
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$$\rho(x, y) = \int_0^\pi \int_{-\infty}^{\infty} |r| \widehat{P}_\theta(r) e^{2\pi i(xr \cos \theta + yr \sin \theta)} dr d\theta.$$

# Welcome to the real world!

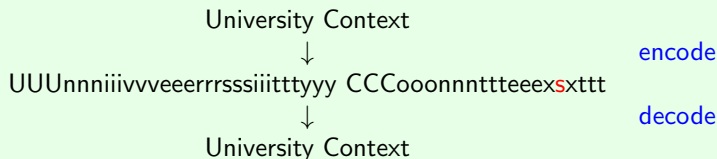
The first CAT (Computed axial tomography) scanners were installed in 1974 and they are very common nowadays



# Welcome to the real world!

R.W. Hamming 1947

Redundancy allows error correction



It is possible to reduce largely the redundancy.

$X$  = words,  $n$  = #letters/word,  $q$  = alphabet size,  
 $t$  = error correction capability

$$|X| \sum_{i=1}^t \binom{n}{i} (q-1)^i \leq q^n$$

The first CD players were released in 1983.

# To sum up

- In Math INTUITION and CREATIVITY are more important than calculations
- Math is a LIVING science
- Math is hidden inside of EVERYDAY TECHNOLOGIES

<http://www.uam.es/fernando.chamizo>

- T. Gowers. Mathematics. A very short introduction. Oxford University Press, Oxford, 2002.
- G.H. Hardy. A mathematician's apology. Cambridge University Press, Cambridge, 1992.
- S. Lang. The beauty of doing mathematics. Three public dialogues. Translated from the French. Springer-Verlag, New York, 1985.
- M. Liebeck. A concise introduction to pure mathematics. Chapman & Hall/CRC Mathematics. CRC Press, Boca Raton, FL, 2011.
- I. Stewart. Letters to a young mathematician. Basic Books, New York, 2006.
- I. Stewart. From here to infinity. The Clarendon Press, Oxford University Press, New York, 1996.

## Myth 4: Mathematicians are weirdos

- **Myth 4** [Censored] [Not qualified to enter into it]

In popular culture mathematicians are male, bald or with too much hair, wearing thick glasses, poorly dressed, boring, lacking social abilities. . .

**Fact:** In Spain more than the one half of the people with a degree in mathematics are women.



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You are more likely to find



instead of



# Thank you

A copy of this presentation will be posted in:

<http://www.uam.es/fernando.chamizo>