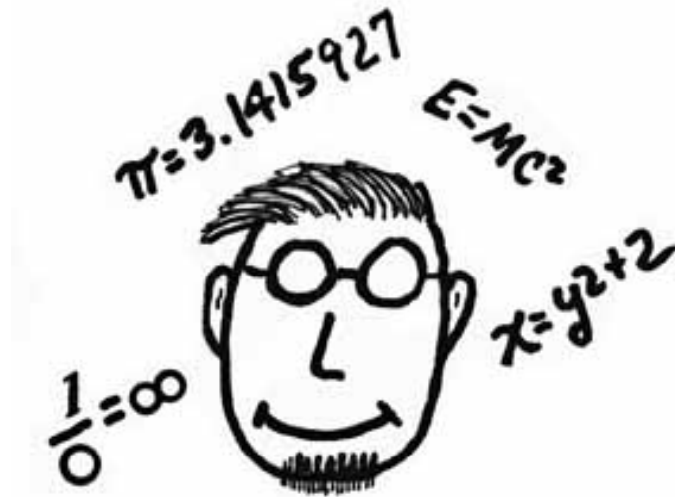


The Development of Mathematical Thinking

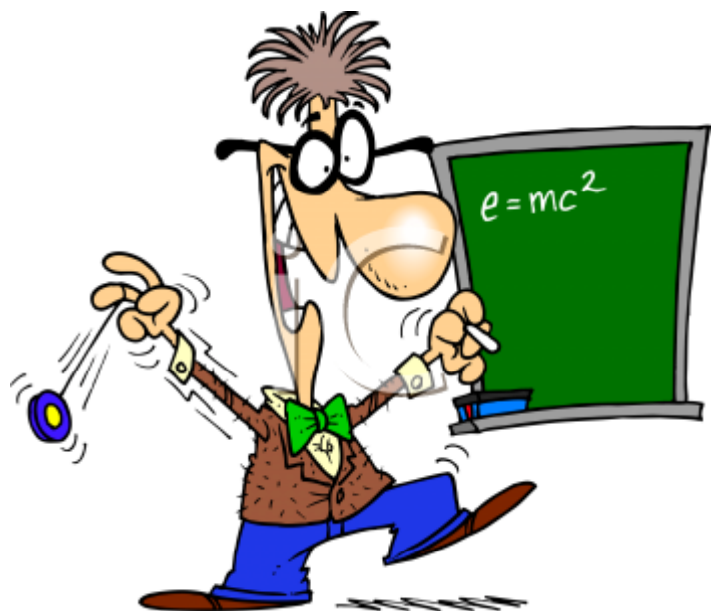
The Maths Learning Centre



The Maths Learning Centre

Did you say
'Maths'?





“People are not disturbed by things but by the views which they take of them”

Epictetus



Is it maths itself which is disturbing, or is it the way in which it is viewed?

I don't 'do Maths'



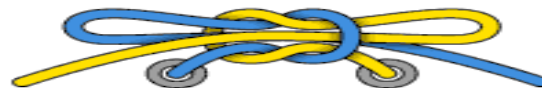
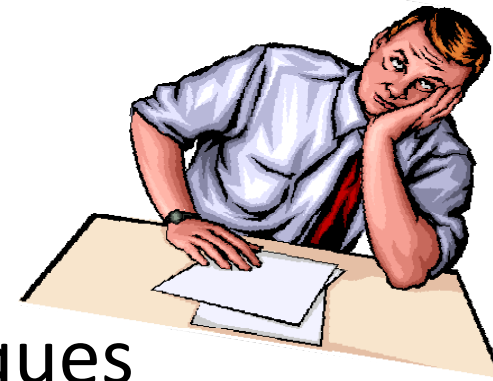
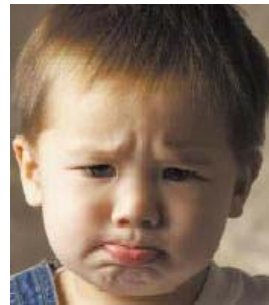
Who do we support?

- Those to whom Maths strikes terror to the heart
- Those who like it and are willing but do not understand what their lecturers are on about
- Those who remember the subject with reasonable calm but it was a very long time ago
- Those who were bored rigid by dull school teaching –and dreading doing it again

How is Maths viewed?

For one group of people, Maths is:

- Boring
- Rigid, rule-based
- Illogical
- A bunch of unrelated techniques
- All sewn up



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How is Maths viewed?

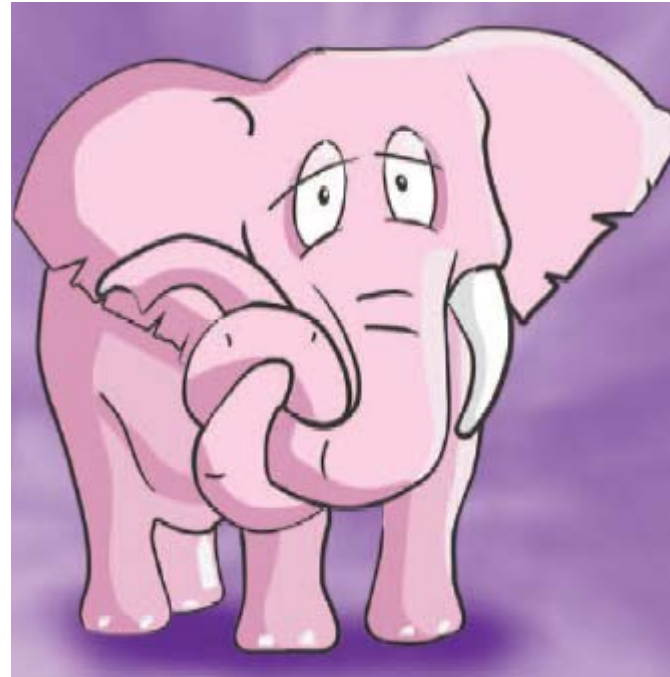
For another group of people, Maths is:

- Fun
- Creative
- Logical
- Like a puzzle
- A journey of continuing exploration



Myths about Maths

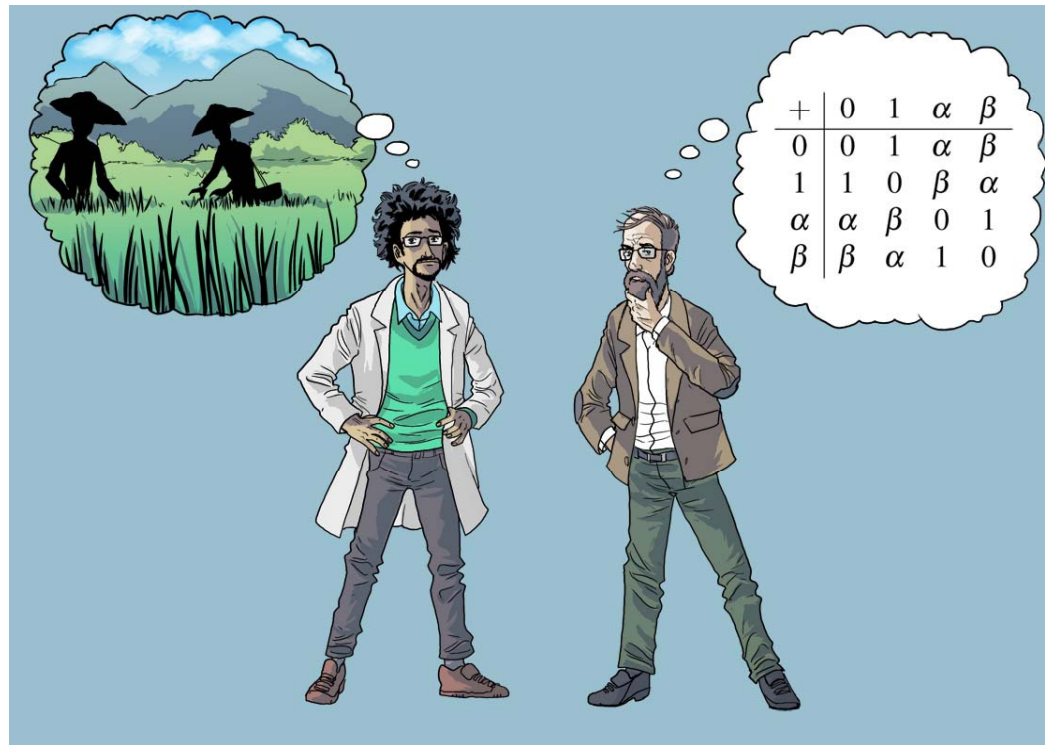
Maths requires a
good memory



Maths is not creative

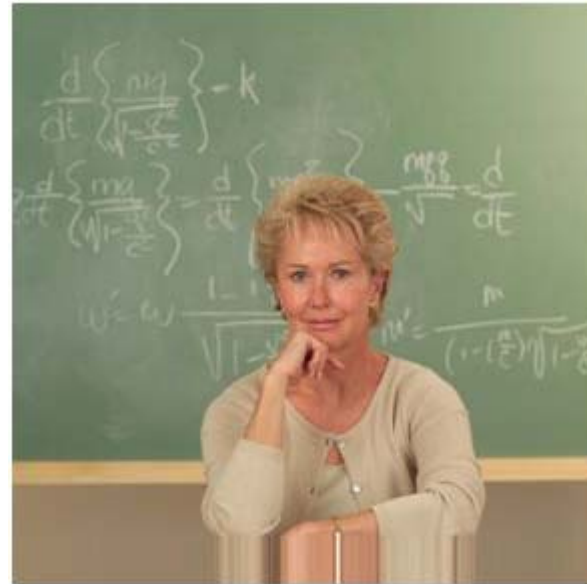


There is just one way to solve a Maths Problem



A good mathematician is--

- Intuitive
- Creative
- Pattern-spotting
- Imaginative
- Able to think 'out the box'



Over to you

- What are the main barriers to successful Maths Learning?
- What is your own perception of the Subject?

What we try to do

- Encourage students to think in an open, creative way by eliciting their thoughts
- Link ideas together
- Ask 'open' questions
- Go to where the students are—and develop from there
- Teach for understanding—not meaningless rules
- Show relevance
- Be clear
- Use humour
- Use stress emphasis and rhythm in your voice

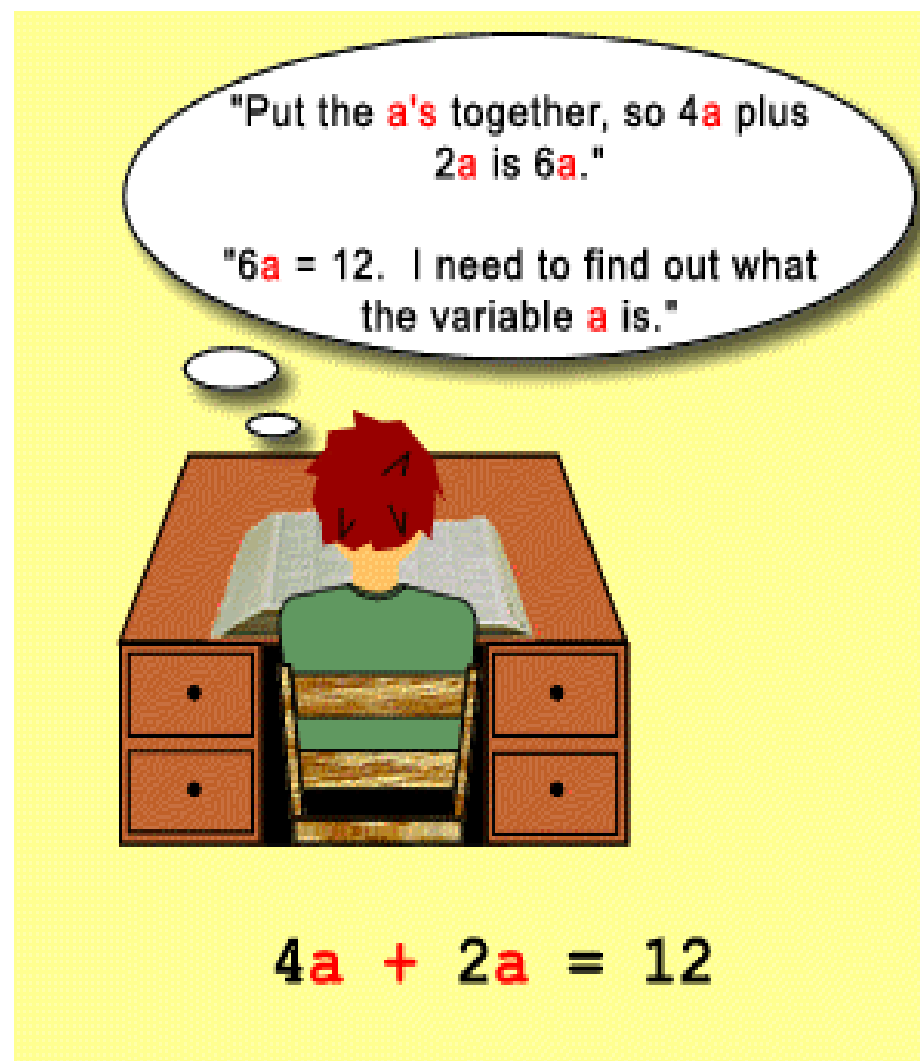


What we don't do

- Start with the premise that Maths is a boring technique

**Algebra
is boring**

'Algebra is boring '



What we don't do

- Try to avoid the issue—
pretend we are actually
doing something else--

***‘This puzzle requires only reasoning and logic.
There is no Maths required’***

		1						
		2		3				4
			5			6		7
5			1	4				
	7						2	
				7	8			9
8		7			9			
4				6		3		
						5		

Ways and Means

- Shadow workshops
- Drop-ins
- One-to-one teaching
- The GCSE class

Collaborating with lecturers

DO

- Communicate with them – keep in touch
- Stay with the general outline of the course
- Be aware of phase tests, etc

Collaborating with lecturers DON'T

- Present your workshop as a straight alternative
- Be critical of lecturers
- Change the order radically

Collaborating with lecturers

Not necessary

- Keep shadowing exactly week by week
- Teach techniques in exactly the same way

Writing resources

- What do we need to consider?

Over to you

- What makes a good worksheet?
- What makes for a bad one?
- What are the features of a worksheet that encourage learning development to take place?

- What do students find **easy?**



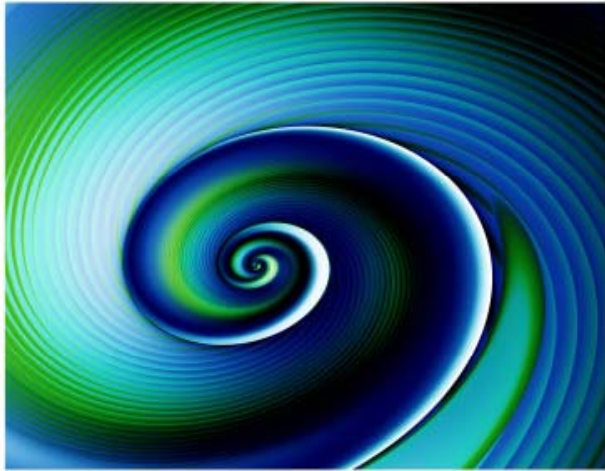
- What do they find **difficult?**



Methodology

- Grade examples carefully from easy to difficult
- Link topics and processes together

The Spiral approach



You may
not fully understand
at the first attempt

Play with new ideas

Developing student's Mathematical skills

- How to approach **new** problems
- How to **link** one idea with another
- How to analyse **why** you don't get something
- How to make good notes
- How to invent your own questions
- How to be an **active**, not passive Maths learner

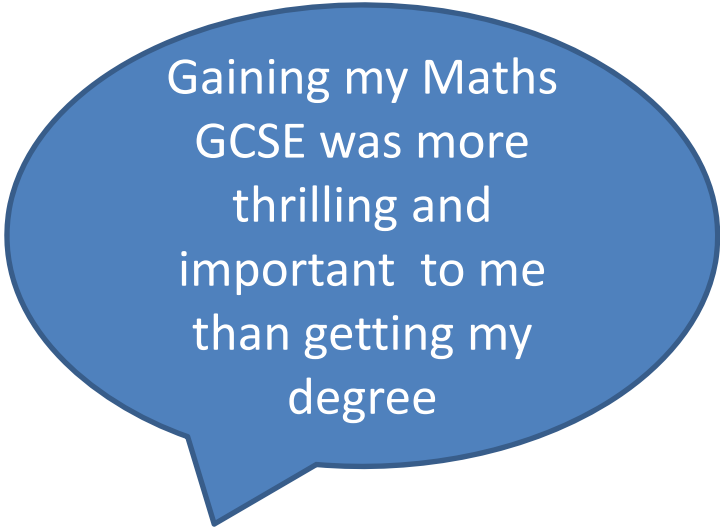
Other skills enhanced and developed

- Logical Reasoning
- Analytical thinking
- Reflection
- Creating own questions
- Linking one topic to another
- Spotting patterns and relationships
- Structuring ideas

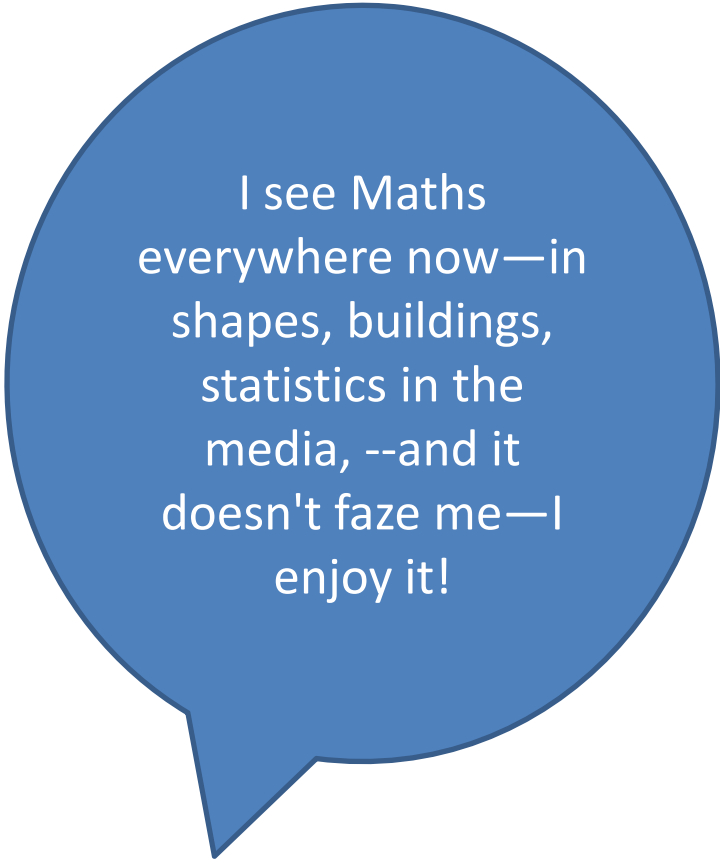
Perhaps—above all

- Gaining confidence in a subject you initially found difficult/intimidating/boring
- Increases self-esteem, self-confidence academically

Some quotes



Gaining my Maths
GCSE was more
thrilling and
important to me
than getting my
degree



I see Maths
everywhere now—in
shapes, buildings,
statistics in the
media, --and it
doesn't faze me—I
enjoy it!