

Maths Across the Curriculum

A mathematician, like a painter or a poet, is a maker of patterns... The mathematician's patterns, like the painter's or the poet's must be beautiful; the ideas like the colours or the words, must fit together in a harmonious way. Beauty is the first test.

GH Hardy

Opportunities for maths across other curricular subjects should be sought whenever possible - it should be seen as a tool to support other learning and therefore be viewed as integral to all learning rather than a separate subject which has no link to the real world.

Opportunities for maths, however, should not be viewed in very basic ways but should be viewed as skills which can enhance learning from a range of subjects. According to David Didau, there are, broadly, four areas of maths:

- Number
- Operations & calculations
- Shape, space & measures
- Data handling

The first two have very limited applications other than in the most simplified way (for example in science by working with data) across the curriculum but the second two are, potentially useful everywhere.

Some ways in which mathematical thinking could be used across the curriculum:

- Identifying structures & relevant data
- Being systematic
- Searching for patterns
- Thinking logically
- Predicting & checking
- Breaking down problems into smaller parts
- Interpreting solutions in context of problem
- Estimating to check likelihood of answers

Some ways in which maths could be used across the curriculum:

1. Sequencing

In order to help students think systematically, logically and to break down problems into smaller parts it helps to see things sequentially. Six Degrees of Separation, is useful way to get pupils to reflect on the explanations we've offered. The idea is that they need to logically sequence their understanding from one concept to another. Prompts could be provided to pupils connected to the topic we're studying, give them an end point they have to connect to and get them to sequence what they know:

1. Write 1–6 along a timeline.
2. Put your topic at number 6.
3. Get from the stimulus to your topic in no more or less than six steps.

This could be used in history lessons to track key events i.e. steps from the end of WWI to the beginning of WWII or key philosophers in Greek history. Equally a similar process could be followed to show links between different religions in RE or scientific processes in Science.

2. Asking mathematical questions

The skills taught in maths lessons can be used within other subjects by asking mathematical questions to be applied in different ways such as:

- How could you sort these.....?
- How many ways can you find to ?
- What happens when we ?
- How many different can be found?
- What is the same/different?
- Can you group these in some way?
- Is there a pattern?
- How can this pattern help you find an answer?
- What do think comes next? Why?
- Is there a way to record what you've found that might help us see more patterns?
- What would happen if....?

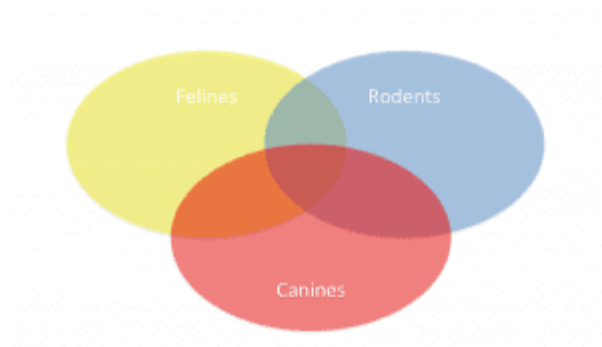
3. Domain specific thinking (with maths)

Using the basic skills taught in mastery lessons where we ask children to explain their thinking, children can be encouraged to think differently about their learning in other subjects:

- specialising – trying special cases, looking at examples
- generalising – looking for patterns and relationships
- conjecturing – predicting relationships and results
- convincing – finding and communicating reasons why something is true.

4. Organising information

The skills learned when organising data (such as using Venn diagrams or Carroll diagrams) can be applied in many subjects across the curriculum.



Equally, other ways of presenting data or links can be used alongside mathematical skills:

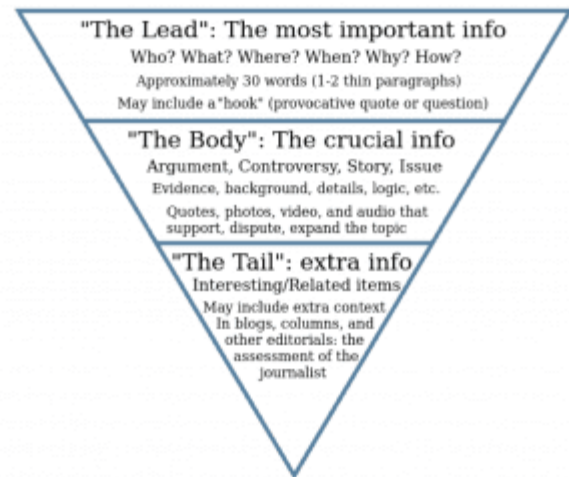
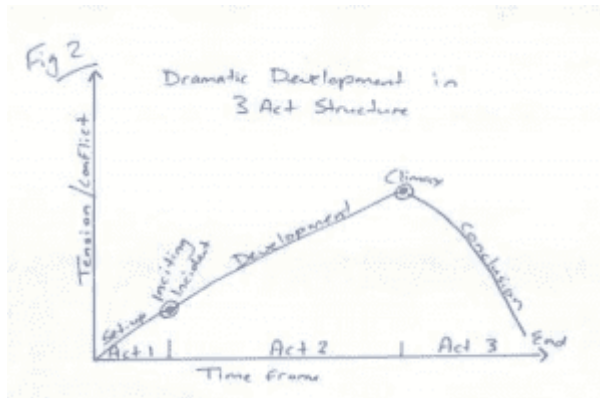
Letters from the Lighthouse	What have they got in common?	Holes
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5. Presenting information

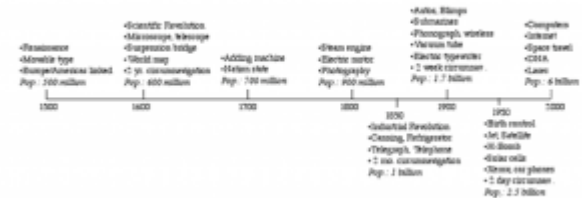
Maths provides new and useful ways of seeing the world. Many if not most subject areas can find space to expand students' thinking by asking them to express their understanding using the tools of mathematics. For instance all of these could be used in English lessons:

- Graphs
- Timelines
- Flow charts
- Graphic organisers
- Pie charts

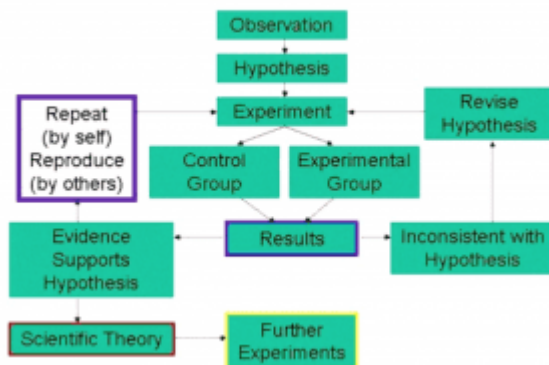
Here's some examples from different subjects:



Human History Timeline: 500 Years



The Scientific Method

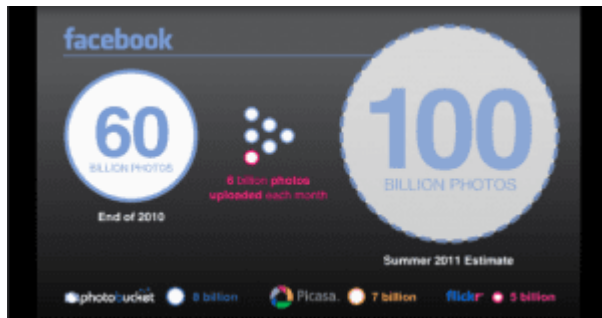


6. Seeing relationships

Understanding how big something is in relation to something else can be important in all sorts of lessons. Another area where we might benefit from mathematical thinking is scale. A favourite example is how we can get students to wrap the head around how big a billion is:

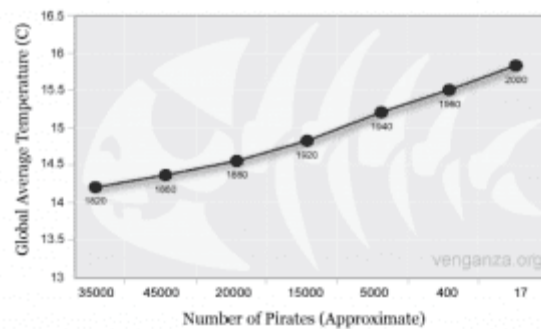
- A million seconds = 11 ½ days
- A billion seconds = 32 years

Or maybe these examples could be useful:



It's also important to see the mistakes we make when we try to establish patterns.

Global Average Temperature Vs. Number of Pirates



Correlation is not causation!

7. Accuracy matters

Maths also has something to teach us about attention to detail, particularly the difference between 'getting it right' and 'getting it done'. Error checking can be applied across the curriculum in many ways for example:

- Dates in history
- Notation in music
- Learning lines in drama
- Punctuation in English

We use mathematical thinking all the time, the trick is to make it explicit to students. If you explain how your subject uses maths to organise and express ideas, then children will be able to fully understand the beauty and use of maths outside of maths lessons.

(Based on David Didau's blog, <https://learningspy.co.uk/featured/secret-numeracy/>
2017)