Mathematics sample units

The following ten units have been developed in great detail for you to tailor as appropriate to your class and where they are in their own mathematics learning. Below are thumbnail descriptions of the units:

Fractals
Using the topic of fractals pupils explore the beauty of the patterns and sequences generated from the Von Koch snowflake, constructing their own diagrams.

The unit looks at a number of areas of mathematics particularly number and algebra and work on adding and multiplying fractions, leading to using multiplicative relationships with a single multiplier.
Explicit links are made to literacy to support the writing of instructional text.

Line painting
Pupils are given opportunities to explore line painting through a practical approach, enabling pupils to appreciate the need to use algebraic reasoning in a visual setting. The main themes are looking at using and applying mathematics and constructing functions arising from real life problems and plotting their corresponding graphs. There are opportunities to make links to using ICT.

MP3 Players
In this unit pupils investigate buying and using an MP3 player. They consider best buys and compare different MP3 players using proportional reasoning. The unit looks at scatter graphs, ratio and proportion, percentage changes, and simple functions arising from real-life problems. The pupils will need access to ICT and if possible the internet to research prices and data about MP3 Players. If the internet is not available a range of shopping catalogues will provide the same information.

Boxes
This unit develops an understanding of volume and surface area of 3-D objects through exploring nets. There are opportunities for practical work in all of the lessons. The unit looks at perimeter, area and volume in context. In addition, there are opportunities to develop visualisation and problem solving skills and to use ICT. Some preparation of resources will be required prior to teaching the unit.

Will it or won’t it? (tiling)
This topic aims to develop pupils’ understanding of angle properties in shapes. It begins with the idea of tiling a floor and which shapes will tessellate. The initial emphasis is on discovering angle facts from regular polygons and moves to using angle facts to predict tessellations and tilings. Finally pupils use angle facts to support geometrical reasoning and make a presentation of their solutions and assess others’ solutions. The curricular targets include knowing the angle sum at a point, on a straight line and in a triangle plus solving problems using properties of angles, of // lines and of a range of polygons. This unit will link with design and technology and art and design through topics such as quilting.

Disaster relief
This unit asks pupils to plan the relief aid for a fictitious Tsunami along the South American Pacific coast. The project is centred on Concepcion, Chile’s second largest urban conglomeration. This was the scene of an actual Tsunami in 1960, after an earthquake off the Chilean coast. A variety of facts will be considered and then various strategies will be used to establish how many people may be affected by the disaster, what food, water and shelter are needed and how it could all be transported. The unit supports curricular targets in fractions, decimals, percentages, ratio and proportion and allows the pupils to problem solve. There are clear cross curricular links that could be made with geography in the introductory phase. The geography department may well have materials that could be used to engage the pupils. Internet access is particularly useful for this unit.

Towers
This is a mathematical investigation that starts with the idea of someone being locked up in a tower. The context needs to be adapted so that it will appeal to the pupils, for example built around spies, knights of old, TV characters. The tower shape and number of windows is varied and patterns are explored. The unit provides the opportunity to generate a range of sequences that can be described in words and symbols by the pupils. The unit enables pupils to develop an understanding of investigative mathematics and connected algebraic skills. There is a strong emphasis on pupils working in a group on such a piece of work. This unit is an exploration within mathematics itself but may be extendable to other curricular areas.

Stop the press
This topic takes a practical example of costing advertising space in a newspaper and involves the use of spreadsheets to assist in calculating and re-calculting costs. It aims to develop pupils’ awareness of the need for algebraic formula. Pupils need to understand why a formula might be used, to write such a formula and apply it with various conditions. Pupils work collaboratively to solve the problems and then present their conclusions to the other groups. There are assessment opportunities built around presentational skills as well as those that relate to the mathematical learning objectives.

Drop dead gorgeous
This unit engages the learners in discussion about attractiveness, using photographs of the faces of famous people. The aim of this unit is for students to explore the golden ratio as a determinant of attractiveness. In particular the link to facial beauty is explored using the ideas of ratio and correlation. The Fibonacci sequence as well as the Golden Ratio itself is also investigated. The unit involves the use of ratio and proportion, data handling, shape and space and measures. There are links with citizenship and media studies through studying the celebrity culture and art and design through the study of facial form.

Here today, gone tomorrow
Using the subject of Global Warming pupils look at and analyse data to answer the question – “Is there Global Warming in the World?” The module uses appropriate data
and charts and students are expected to analyse the data through drawing charts and diagrams and then interpreting the charts that are drawn. Pupils work in small groups preparing a presentation, using the evidence they have found, to agree or disagree with the statement “Global Warming is affecting the climate of the World.

The unit involves forming hypotheses, analysing, representing and interpreting data. There are the opportunities for links with science (heat, properties of ice and water) and geography (climate, maps).

Further sample units

Also on the CD ROM are single page over views of a further 7 Units developed by the Cornwall LA team and their teachers. We hope that these will act as a stimulus for your own thinking and as a good starting point for unit development. The Progression Maps provide a useful resource to identify curricular targets that are pitched at the right level. The maps can be found at: www.standards.dfes.gov.uk/progressionmaps

Below are brief thumbnails of the units:

**Codes and ciphers:**
This unit could be built around exploration of a variety of codes – from the Rosetta Stone to the place of the Enigma machines and modern computer encryption. Pupils can analyse frequency of different letters in text and approaches to coding messages. Pupils can compare simple distributions, estimate probabilities from experimental data and use ICT to represent data.

Links with History and World War II or science are possible. There are good web sites that explore the Enigma machine and its logic visually.

**As many ways as you can**
The TV programme Deal or no Deal could be used as the stimulus for this unit. The unit focuses on real life game shows where probability can be used to help decide what decision to make at various key points in a game.

The unit can involve the use of probability and the ability to reason and make decisions based on probability calculations. An understanding of fractions, decimals and percentages will be essential for the reasoning and decision making.

There are links with citizenship through links with gambling and personal responsibility and the effects that sudden wealth can have on individuals and families. Pupils hoping to study subjects such as media studies, sociology and psychology will find that the unit could provide useful background.

**The Olympic village 2012**
Pupils could plan and design the Olympic village for athletes in the London 2012 Olympics. They could produce a 3-D model that is to scale that satisfies the conditions for the uses, for example the number of people in a stadium. Transport and costs of construction could be included. Pupils would need to use ideas from measures, scale, money and number.

**Let’s go to Disneyland**
Pupils are given a set budget and they have to plan a holiday for themselves considering a variety of constraints e.g. temperature exchange rates etc. The unit involves a great deal of using and applying mathematics. There will be opportunities for using algebra in spreadsheets and pupils will need to perform some mental and written calculations. There are links with geography - the leisure industry, maps, and climate.

Let’s go on holiday
Pupils are asked to imagine they work for a travel agent and have to research the best holiday for their clients set criteria. Pupils can then sell a holiday destination or a choice of destinations to others in the group. Alternatively they can use a similar approach to going to Disneyland but to a destination of their choice.

Dragon’s Lair
This unit could model the TV programme Dragon’s Den, with pupils having to do market research for their product - produced in DT, Art, Graphics or Home Economics. The unit could include share dealing and address the issues of how do real businesses raise money.

Banker help. I’m in debt
There are two main ideas developed in this unit. First of all students consider debt situations and how much people will have to repay at different interest rates. Then students investigate the option of buying a house (could be adapted to a car) and calculate percentages etc through stamp duty.

All of the above seven units have details on the CD-ROM for you to print off and consider how you would develop them for your pupils.

Other sample unit ideas:

The thumbnail descriptions below do not have associated materials on the CD-ROM but may give you ideas for your own units:

1. Escape from Mars
This unit could be built around the mathematical investigations that encourage group collaboration. Each member of the group has some of the information and together with the other ‘players’ has to produce an effective solution to the problem. Pupils will need to use measurement, mass; velocity; distance; time; use problem solving strategies, particularly communicating and mathematical reasoning
Links with geography and science are possible.

2. How does it grow?
This unit could be built around population expansion and the social implications, the need for aid or the economic implications of a country such as Japan which has a high population density and a very successful economy. Pupils will be involved in simple economic modelling; simple exploration of population growth – simulations of predators and prey or population explosions. An alternative context could be the exploration of plant growth – where some trees grow by enlargement and others do not (Laurel leaves
versus oak leaves.) Pupils can explore ratio and proportion, enlargement, large numbers, standard form.
Links with science and geography are possible.

3. Reasoning with data
This unit uses the context of Census at School data to explore pupils’ responses to questions for example about mobile phone use in school, in Britain, and other countries. The unit emphasises the use of the data handling cycle, in particular formulating hypotheses, analysing, representing and interpreting data, with a strong emphasis on interpreting.
There are links with citizenship through moral and social discussions and with science, technology and geography.

4. Downhill fast
This unit uses the context of children’s playground slides to explore ideas of gradient. The context is widening to include exploration of skiing and theme park rides. The main focus of the unit is on the sequences, functions and graphs, measures and shape and space strands. The unit has links with science (gravity, velocity-time graphs) and geography (the leisure industry).

5. Festival Maths
This unit allows the school to design work around a variety of religious and culture events. Examples are Christmas, Diwali, Eid, Chinese New Year, (… Buddhist, Jewish, secular …) and will depend on the backgrounds of the pupils. Since most festivals involve decorations of some kind it could involve shape and space. It could also involve using and applying mathematics in planning events. There are links with RE and citizenship and possibly science (fireworks).

6. Games
This unit requires pupils to design board games for themselves and/or younger pupils. As board games are largely games of chance the main strand used is probability. The layout of the games will involve shape and space and measures. There are links with technology, design, marketing as well as potential for developing links with local primary school groups.

7. Simmering skills
The last unit ‘simmering skills’ is intended to be a resource that teachers can use in the run up to GCSE but would also be relevant at other times during Y10 and Y11 as pupils need extra support on mathematical knowledge and skills.
**Overview of the units**

In total there are 23 sample units 10 of which are described in great detail. The areas of mathematics that they do or could address, depending on your decisions, are summarised in the table below:

<table>
<thead>
<tr>
<th>Unit Title</th>
<th>Strands</th>
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<tbody>
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<td>PS</td>
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<tr>
<td>2 Disaster relief</td>
<td>X</td>
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<td>3 MP3 Players</td>
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The strand codes used in the columns are as follows:

- **Using and applying mathematics**
  1. Problem solving
  2. Communicating
  3. Reasoning
  4. Place value, ordering and rounding
  5. Integers, powers and roots
  6. Fractions, decimals, percentages, ratio and proportion
  7. Calculations – mental methods and written methods

- **Numbers and the number system**
  4. Place value, ordering and rounding
  5. Integers, powers and roots
  6. Fractions, decimals, percentages, ratio and proportion
  7. Calculations – mental methods and written methods

- **Algebra**
  1. Equations, formulae and identities
  2. Sequences, functions and graphs

- **Shape, space and measures**
  1. Shape and space
  2. Measures

- **Handling data**
  1. Handling data
  2. Probability.