



Numeracy Trail

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The Document

The aim of the maths trail is not to teach new mathematical concepts but to reinforce and use mathematical knowledge in a practical way.



Introduction

Welcome to Cwmcarn Forest Drive and our Numeracy Trail. This trail has been developed by a group of teachers and Cwmcarn staff with the aim of reinforcing the maths taught in school. The activities are therefore designed to be practical and to develop mental maths skills rather than written tasks, so recording is therefore limited.

This pack contains a variety of suggested activities to be used on the trail. Teachers may do as many activities as they wish, using their own discretion to add and adapt the activities to suit the ability of their children.

Close attention has been paid to both the National Numeracy Strategy and Curriculum 2000. The activities have been developed along the lines of the National Numeracy Strategy.

For practical reasons it would be better for children to work in groups of 6-8 and should be supervised by an adult.

It is expected that the trail will take half a day. Each activity is likely to take 15-20 minutes.

Various aspects of maths have been included in the trail eg. shape, number, problem solving, length etc. The practical application of these is to be encouraged with pupils explaining both reasoning and thought processes. All tasks depend upon an active involvement, putting into practice the mathematical knowledge the children have.

Equipment Required

The children are expected to wear suitable outdoor clothing, particularly footwear. Some materials will be provided by Cwmcarn Forest Drive but it is expected that schools bring their own pencils and clipboards, 1 per group.

Participating schools will be expected to photocopy the relevant sheets according to their group organisation.

The Value of the Trail

These are the main aims of this maths trail for the children.

- Applying their mathematical skills in practical situations
- Use of correct mathematical language
- To work together to complete a task
- To reinforce the skills they have already developed
- To have fun

National Numeracy Strategy

The pack has been designed alongside the National Numeracy Strategy. All key elements have been covered with the activities eg. shape, number, length. Here is a list of the key objectives as identified by the National Numeracy Strategy.



Numeracy Trail

Key Objectives

⇒ Year 2

- Count, read, write and order whole numbers to at least 100, know what each digit represents (including 0 as a place holder).
- Describe and extend simple number sequences (including odd/even numbers, counting on or back in ones or tens from any two-digit number; and so on).
- Understand that subtraction is the inverse of addition, state the subtraction corresponding to a given addition and vice versa.
- Know by heart all addition and subtraction facts for each number to at least 10.
- Use knowledge that addition can be done in any order to do mental calculations more efficiently.
- Understand the operation of multiplication as repeated addition or as describing an array.
- Know and use halving as the inverse of doubling.
- Know by heart facts for the 2 and 10 multiplication tables.
- Estimate, measure and compare lengths, masses and capacities, using standard units, suggest suitable units and equipment for such measurements.
- Read a simple scale to the nearest labelled division, including using a ruler to draw and measure lines to the nearest centimetre.
- Use the mathematical names for common 2-D and 3-D shapes; sort shapes and describe some of their features.
- Use mathematical vocabulary to describe position, direction and movement.
- Choose and use appropriate operations and efficient calculation strategies to solve problems, explaining how the problem was solved.

⇒ Year 3

- Read, write and order whole numbers to at least 1000, know what each digit represents.
- Count on or back in tens or hundreds from any two or three digit number.
- Recognise unit fractions such as $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$, $\frac{1}{10}$ and use them to find fractions of shapes and numbers.
- Know by heart all addition and subtraction facts for each number to 20.
- Add and subtract mentally a 'near multiple of 10' to or from a two-digit number.
- Know by heart facts for the 2, 5 and 10 multiplication tables.
- Understand division and recognise that division is the inverse of multiplication.

- Use units of time and know the relationships between them (second, minute, hour, day, weeks, month, year).
- Understand and use £, p notation.
- Choose and use appropriate operations (including multiplication and division) to solve word problems, explaining methods and reasoning.
- Identify right angles
- Identify lines of symmetry in simple shapes and recognise shapes with no lines of symmetry.
- Solve a given problem by organising and interpreting numerical data in simple lists, tables and graphs

⇒ Year 4

- Use symbols correctly, including less than (<), greater than (>), equals (=).
- Round any positive integer less than 1000 to the nearest 10 or 100.
- Recognise simple fractions that are several parts of a whole, and mixed numbers, recognise the equivalence of simple fractions.
- Use known number facts and place value to add or subtract mentally, including any pair of two-digit whole numbers.
- Carry out column addition and subtraction of two integers less than 1000 and column addition of more than two such integers.
- Know by heart facts for the 2, 3, 4, 5 and 10 multiplication tables.
- Derive quickly division facts corresponding to the 2, 3, 4, 5 and 10 multiplication tables.
- Find remainders after division.
- Know and use the relationships between familiar units of length, mass and capacity.
- Classify polygons, using criteria such as number of right angles, whether or not they are regular; symmetry properties.
- Choose and use appropriate number operations and ways of calculating (mental, mental with jottings, pencil and paper) to solve problems.

⇒ Year 5

- Multiply and divide any positive integer up to 10,000 by 10 or 100 and understand the effect.
- Order a given set of positive and negative integers.
- Use decimal notation for tenths and hundredths.
- Round a number with one or two decimal places to the nearest integer.



Key Objectives

- Relate fractions to division and to their decimal representations.
 - Calculate mentally a difference such as $8006 - 2993$.
 - Carry out column addition and subtraction of positive integers less than 10,000.
 - Know by heart all multiplication facts up to 10×10 .
 - Carry out short multiplication and division of a three digit by a single digit integer.
 - Understand area measured of a two digit by a two-digit integer.
 - Understand area measured in square centimetres (cm^2), understand and use the formula in words 'length x breadth' for the area of a rectangle.
 - Recognise parallel and perpendicular lines and properties of rectangles.
 - Use all four operations to solve simple work problems involving numbers and quantities, including time, explaining methods and reasoning.
 - Use a fraction as an operator to find fractions and numbers or quantities (eg. $\frac{5}{8}$ of 32, $\frac{7}{10}$ of 40, $\frac{9}{100}$ of 400 centimetres).
 - Understand percentage as the number of parts in every 100 and find simple percentages of small whole number quantities.
 - Solve simple problems involving ratio and proportion.
 - Carry out column addition and subtraction of numbers involving decimals.
 - Derive quickly division facts corresponding to multiplication tables to 10×10 .
 - Carry out short multiplication and division of numbers involving decimals.
 - Carry out long multiplication of a three digit by a two-digit integer.
 - Use a protractor to measure acute and obtuse angles to the nearest degree.
 - Calculate the perimeter and area of simply compound shapes that can be split into rectangles.
 - Read and plot co-ordinates in all four quadrants.
 - Identify and use the appropriate operations (including combinations of operations) to solve word problems involving numbers and quantities and explain methods and reasoning.
 - Solve a problem by extracting and interpreting information presented in tables, graphs and charts.
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- ⇒ **Year 6**
- Multiply and divide decimals mentally by 10 or 100 and integers by 1000 and explain the effect.
 - Order a mixed set of numbers with up to three decimal places.
 - Reduce a fraction to its simplest form by cancelling common factors.



Key Stage 2 Programme of Study

Using and Applying Mathematics

Pupils should be given opportunities to:

- Use and apply mathematics in practical tasks, in real-life problems and within mathematics itself, taking an increasing responsibility for organising and extending task
- Devise and refine their own ways of recording, communicating the methods used to others
- Ask questions and explore alternative ideas in order to support the development of their reasoning.

1 Making & Monitoring Decisions to Solve Problems

Pupils should be taught to:

1. select and use the appropriate mathematics and materials
2. try different mathematical approaches, identify and obtain information needed to carry out their work
3. develop their own mathematical strategies and ideas and look for ways to overcome difficulties
4. check their results and consider whether they are reasonable.

2 Developing Mathematical Language and Communication

Pupils should be taught to:

1. extend their understanding and use of mathematical language in number, shape, space, measures, data handling and relationships, including the terms 'multiple of', 'factor of' and 'symmetrical to'
2. use diagrams, graphs and simple algebraic symbols
3. present information and results clearly, and explain the reasons for their choice of presentation.

3 Developing Mathematical Reasoning

Pupils should be taught to:

1. understand and investigate general statements, e.g. 'wrist size is half neck size', 'there are four prime numbers less than 10'.

2. search for pattern in their results.
3. make general statements of their own, based on evidence they have produced.
4. explain their reasoning.

Number

Pupils should be given opportunities to:

- develop flexible and effective methods of computation and recording, using them with understanding to solve problems in a variety of contexts
- use calculators, computers and a range of other resources, as tools for exploring number structure and to enable work with realistic data
- encounter early ideas of algebra and mathematical structure through exploration of pattern and number relations.

1 Understanding Number and Place Value

Pupils should be taught to:

1. count on or back from any two digit or three digit number in tens or hundreds; recognise and extend number sequences formed by counting on or back from any integer in steps of constant size, extending to negative integers when counting back.
2. read, write and order integers, understanding that the position of a digit signifies its value; use correctly the symbols $<$, $>$, $=$, $*$; multiply and divide any integer by 10 or 100, extending to multiplying and dividing by 1000; round integers to the nearest 10 or 100 and then 1000; order a set of negative integers.
3. extend their understanding of the number system to negative numbers in context, and decimals with no more than two decimal places in the context of money, and three decimal places when working with metric units.
4. understand and use, in context, fractions and percentages to estimate, describe and compare proportions of a whole; recognise the equivalence between the decimal, fractional and percentage forms of a half, quarters, tenths and hundredths.



Key Stage 2 Programme of Study

2 Understanding Number Relationships and Methods of Calculation

Pupils should be taught to:

1. explore number sequences, explaining patterns and predicting subsequent terms; interpret and generalise, initially in words and later in symbols, patterns which arise in numerical, spatial or practical situations, e.g. investigate the number of matchsticks needed to make a row of 1, 2, 3, ... squares; construct and use formulae expressed initially in words and later in symbols, e.g. $C = 15n$ for the cost (in pence) of n articles at 15p each.
2. recognise the number relationship between co-ordinates in the first quadrant of points on a line or in a shape, e.g. the vertices of a rectangle, or a graph of the multiples of 3.
3. consolidate knowledge of addition and subtraction facts for numbers to 20 and use these, along with knowledge of place value and structure, to mentally obtain further results, e.g. $14 + 7 = 21$, so $24 + 7 = 31$, $34 + 7 = 41$, etc, or $13 - 5 = 8$, so $23 - 5 = 18$, $33 - 5 = 28$, etc; know the multiplication facts to 10×10 and use them to derive quickly the corresponding division facts; develop a range of mental methods for finding from known facts those that they have not learned, e.g. $7 \times 13 = 70 + 21 = 91$; recognise prime numbers to at least 20 and square numbers to at least 100; find multiples, factors, cubes and square roots of numbers.
4. develop a variety of mental methods of computation with integers up to 100 and explain strategies used; use informal written methods to support; record and explain their reasoning, e.g. $17 \times 19 = 17 \times 20 - 17 = 323$; extend informal written methods to develop a range of non-calculator methods of computation that involve addition and subtraction of integers, progressing to methods for multiplication and division of up to three digit by two digit integers.
5. understand and use the relationships between the four operations; including inverses; use associated language and recognise situations to which the operations apply; understand the principles (not the names) of the commutative, associative and distributive laws as they apply to addition and multiplication, and use them to do mental and written calculations more efficiently, e.g. $127 + 56 + 23 = 127 + 3 + 20 + 56 = 130 + 20 + 56 = 150 + 56 = 206$, or $17 \times 13 + 13 \times 3 = 17 \times 13 + 3 \times 13 = 20 \times 13 = 260$
6. extend methods of computation to include addition and subtraction with negative integers and all four operations with decimals; calculate fractions and percentages of

quantities, using a calculator where appropriate.

7. understand and use the features of a basic calculator; interpreting the display in the context of the problem, including rounding and reminders.

3 Solving Numerical Problems

Pupils should be taught to:

1. develop their understanding and use of the four operations to solve problems, including those involving money and measures, using a calculator where appropriate.
2. choose sequences of operations and methods of computation (including the use of a calculator) which are appropriate to a problem; adapt and apply methods accurately; record and explain their methods and reasoning.
3. estimate answers by approximating, e.g. when purchasing calculators at £3.95 each for a class of 29 children, the total cost will be approximately $30 \times £4 = £120$, check the reasonableness of solutions against the context of the problem and the size of the numbers involved; check the accuracy of answers by the use of alternative strategies including repeating the operations in a different order or using inverse operations.

Shape, Space and Measures

Pupils should be given opportunities to:

- Use geometrical properties and relationships in the solution of problems and consider a wide range of patterns, including some drawn from different cultural traditions.
- Extend their understanding of position and movement using a wide range of materials, including the use of computer software, to create and transform shapes.
- Appreciate the approximate nature of measurement and apply their measuring skills in a range of contexts.

1 Understanding and Using Properties of Shape

Pupils should be taught to:

1. visualise and describe shapes and movements, developing precision in using related geometrical language.
2. make 2-D and 3-D shapes and patterns with increasing accuracy, recognise their geometrical features and



Key Stage 2 Programme of Study

properties, and use these to classify shapes and solve problems, e.g. investigate Celtic patterns, investigate triangles which can be made on a 3 x 3 pin-board.

3. understand the congruence of simple shapes; recognise reflective and rotational symmetries of 2-D shapes.

2 Understanding and Using Properties of Position and Movement

Pupils should be taught to:

1. transform 2-D shapes by translation, reflection and rotation and visualise movements and simple transformations to create and describe patterns.
2. use co-ordinates to specify location, e.g. map references, representation of 2-D shapes.
3. use right angles, fractions of a turn and, later, degrees, to measure rotation, and use the associated language, e.g. measure the angles of a given triangle and know that their sum is 180° .

3 Understanding and Using Measures

Pupils should be taught to:

1. choose appropriate standard units of length, mass, capacity and time, and make sensible estimates with them in everyday situations; extend their understanding of the relationship between units; convert one metric unit to another; know the rough metric equivalents of imperial units still in daily use; recognise the equivalence between 12 - and 24 - hour clock times.
2. choose and use appropriate measuring instruments; interpret numbers and read scales to an increasing degree of accuracy.
3. find perimeters of simple shapes; find practically the circumferences of circles, being introduced to π as the ratio of circumference to diameter; find areas and volumes by counting methods (including the use of multiplication) and by other practical methods, e.g. dissection; describe and explain the methods they use when finding the areas of rectangles and triangles, and volumes of cuboids.

Handling Data

Pupils should be given opportunities to:

- Collect, represent and interpret data for a variety of identified purposes, including those that arise from their own questions.
- Use computers as a source of interesting data, and as a tool for representing and exploring data
- Consider early ideas of probability through practical activity and personal experience.

1 Collecting, Representing and Interpreting Data

Pupils should be taught to:

1. interpret tables used in everyday life; interpret and create frequency tables, including those for grouped discrete data
2. collect and represent discrete data appropriately using graphs and diagrams, including bar graphs, pictograms and line graphs; interpret a wider range of graphs and diagrams that represent data, including pie charts, using a computer where appropriate.
3. understand and use, in relevant contexts, the mode, median and mean as measures of average, and the range as a measure of spread.
4. draw meaningful conclusions from statistics and graphs, and communicate these using appropriate language; recognise why some conclusions can be uncertain or misleading.

2 Understanding and Using Probability

Pupils should be taught to:

1. develop early ideas of probability, by reflecting on experience and carrying out simple experiments; use a vocabulary that includes the words 'evens', 'fair', 'unfair', 'certain', 'likely', 'probably' and 'equally likely'.
2. understand that the probability of any event lies between impossibility and certainty, leading to the introduction of the probability scale from 0 to 1.



Order of Trail Activities

- 1 Fences**
Estimating, measuring length and costing.
- 2 Trees**
Estimating and measuring the age of trees.
- 3 Patterns and Shapes on Hillside Opposite**
Observing continuing pattern and calculating numbers in a sequence.
- 4 Numberline**
Activities to practice the four rules of number.
- 5 Geoboard**
Creating and recognising 2D shapes and common polygons.
- 6 Compass and Clinometer**
Use of compass to find N.S.E.W. or using eight points of compass. Use of clinometer to explore angles.
- 7 Stools**
Circumference, diameter and fractions using standard and non-standard units of measurement.
This is a convenient swap over place for groups but can also be used as a picnic area.

There will be quite a walk between the activities.
Children may like to count the number of paces, look for and count number of tree varieties.
- 8 Curved Gate**
Estimate height of each post and check by measuring.
- 9 Pooh Sticks 1**
Drop stick at first location and measure the time taken to travel 5 metre distance.
- 10 Lake**
Estimate and measure length around the lake using standard and non standard measurements.
- 11 Pooh Sticks 2**
Drop stick at second location. Measure time taken to travel 5 metre distance. Compare with earlier reading and suggest reasons for differences.
- 12 Steps**
Estimate number of steps then count. Estimate height of one step then measure, try to develop strategies for calculating the height of the flight of steps.
- 13 Paving Grid (or 'Chessboard')**
Develop use of co-ordinates using 8 x 8 grid.
- 14 Toilet Block Building**
Identification of 2D and 3D shapes, tessellated patterns, parallel, perpendicular horizontal and vertical lines.
- 15 Xylophone**
Making link between length of bar and quality and type of sound produced.



National Curriculum Programmes of Study

Fence Posts

Main Focus: Estimation and Measuring

Activities at the Fence Posts cover..

Using and applying maths - 1.1, 1.2, 1.3, 1.4, 3.2, 3.3, 3.4

Number - 2.4, 3.3

Shape, space and measures - 3.1, 3.2

Handling Data - 1.2

Extension Work in School could cover..

Using and applying maths - 2.1, 2.3

Number - 1.3, 2.1, 2.3, 2.4, 3.1, 3.3

Shape, space and measures - 3.1, 3.2

Handling data - 1.1, 1.2

Trees

Estimating and Measuring

Activities at the trees cover..

Using and applying maths - 1.1, 1.2, 1.3, 1.4

Number - 3.3

Shape, space and measures - 3.1, 3.2, 3.3

Handling Data -

Extension Work in School could cover..

Using and applying maths - 1.1, 1.2, 1.3, 1.4, 3.1, 3.2, 3.3, 3.4

Number - 3.3

Shape, space and measures - 3.3

Handling Data -

Based on exploring circumferences of circles.

Numberline

Main Focus : Four Rules of Number

Activities at the Numberline cover..

Using and applying maths - 1.3, 2.1

Number - 1.1, 1.2, 1.3, 2.1, 2.3, 2.4, 2.5, 2.6

Shape, space and measures -

Handling Data -

(Programmes of study will vary according to the ability of the children)

Extension Work in School could cover..

Using and applying maths - 1.3, 2.1

Numbers - 1.1, 1.2, 1.3, 2.1, 2.3, 2.4, 2.5, 2.6

Shape, space and measures -

Handling Data -

Geoboard

Main Focus : 2D Shapes and Co-ordinates

Activities at the Geoboard cover:

Using and applying maths - 1.1, 1.2, 1.3, 3.1, 3.2, 3.3, 3.4

Number - 2.2

Shape, space and measures - 1.1, 1.2, 2.1, 2.2

Handling Data -

Extension Work in School could cover..

Using and applying maths - 1.1, 1.2, 1.3, 3.1, 3.2, 3.3, 3.4

Number -

Shape, space and measures - 1.1, 1.2, 2.1, 2.2

Handling Data -

Through follow up work on geoboards



National Curriculum Programmes of Study

Lake

Main Focus : Area and Perimeter of Lake

Activities at the Lake cover..

Using and applying maths - 1.1, 1.2, 1.3, 1.4

Number - 3.3

Shape, space and measures - 3.3

Handling Data -

Extension Work in School could cover..

Using and applying maths -

Number -

Shape, space and measures - 3.3

Handling Data -

Work in school could concentrate on discovering formulae for finding areas of rectangles and triangles, and work on perimeter:

Paving Grid (or 'Chessboard')

Maths Focus : Position and Grid Referencing

Activities at the Paving Grid cover..

Using and applying maths - 1.3

Number - 2.2

Shape, space and measures - 2.2

Handling Data -

Extension Work in School could cover..

Using and applying maths - 1.3

Number - 2.2

Shape, space and measures - 2.2

Handling Data -

Follow up work on maps, grids and referencing

Xylophone

Main Focus : Composing

Activities at the Xylophone cover..

Using and applying maths - 1.1, 1.2, 1.3

Number - 2.1

Shape, space and measures -

Handling Data -

Extension Work in School could cover..

Using and applying maths - 1.1, 1.2, 1.3

Number - 2.1

Shape, space and measures -

Handling Data -

Use a limited number of notes and a limited number of beats.



Numeracy Trail

After the Trail?

Follow up activities could include:

- Completion of unfinished work;
- Comparison of different approaches to tackling the tasks;
- A map of the trail;
- A survey of the most popular tasks;
- An evaluation of the trail itself;
- Display work generated by location based activities;
- A collection of further activities compiled by the trailers;
- Work designed by teachers as a direct result of pupil observation.

Possible follow up work in school (KS 2).

- Graphs/Charts etc. - favourite activity in trail comparing results of striding around lake - differences water speed
- Number line - devise own questions to be used on the number line
- Geoboard - record shapes made, try to make a given number of the same shape a grid of the geoboard. How many different shapes can you make if you can only use a certain number of posts? - e.g. 6.
- Pattern work - based on visual patterns, rotation and translation of shapes.
- Compass activities - use of map of trail to work on directions taken on the trail.
- Costing - this number (x) of posts were used in the making of the trail. If each tree makes 5 posts, how many trees were used? If the cost of each tree is (x), what was the cost of the posts for the trail?

Resources

The following equipment is kept at centre to be used by visiting schools.

1. Measuring tapes, 1 metre and 50 metre
2. Trundle wheels
3. Stop watches
4. Laminated number cards - for work with fraction shapes e.g. $\frac{1}{3}$ $\frac{2}{6}$ 50% 75% $-.75$ $-.5$ etc
5. Clinometers
6. Compasses
7. Lollypop sticks
8. Clip boards

The Maths Trail

There are three activities at the centre. These will allow the groups to be staggered at the start of the trail if you so wish. The trail can be followed in either direction and it is not necessary to complete all the activities.

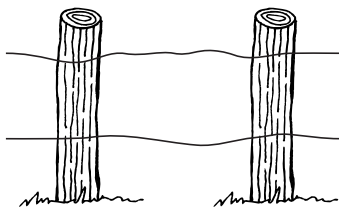
Activities at the centre...

Wooden Jigsaw puzzles, Bear height, Fractions

Teachers' notes

Fence posts

Discuss and then record on children's worksheets.



Mental Maths Activities

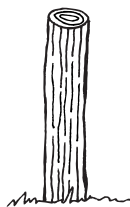
What is the distance between 3 posts, 10 posts, 25 posts etc.

Suggested Classroom Activities

Costing. For example, if 1 post costs... (choose own amounts depending on age/ability) how much will... (choose quantity) cost?

1. If one post costs £1.50 how much will 10 posts cost? 20 posts cost? 30 etc.

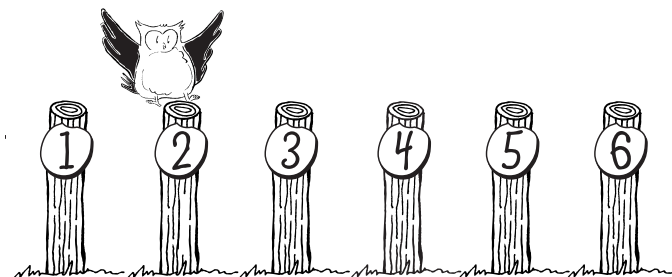
2. How much wire will be needed to make a fence 40m long using 3 strands of wire at 10p per metre?



Numberlines

The numberline is a very versatile activity that will provide the children with a practical experience.

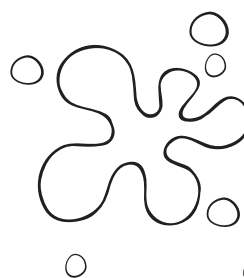
This activity can be used by both Key Stage 1 and Key Stage 2.



Suggested activities are by no means the only activities that can be used and teachers are able to develop and use this in anyway they wish.

Measuring water speed

Using two different areas the children will be encouraged to measure the speed of the water:



1. Pupils to be encouraged to think of a way they can measure the speed of the water:

2. Using a stopwatch, pupils can drop a piece of wood into the stream and time how long it takes for the wood to travel a certain distance.

3. Pupils to compare the speed that the wood travels in two different areas e.g. section of stream above the Mill Pond, and at the stream leading out of the lake.



Xylophone

Children or teacher selects number of notes e.g. A, D, E, F.

Children then compose a melody, limited by the number of beats, e.g. 12, 16. This will have to be brief due to time constraints.

Mental Maths Activities
Imagination is boundless

N.B. The numbers on the trail map correspond with the number at each activity location.