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Report on visual interactive building blocks identified in current national mathematics curricula

Marta Turcsanyi-Szabo

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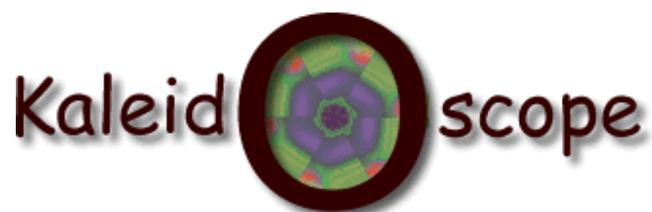
<https://telearn.hal.science/hal-00190148>

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Concepts and methods for exploring the



future of learning with digital technologies

D27.1.1 (Final)
**Report on visual interactive building blocks identified in
current national mathematics curricula**

Main author: Marta Turcsanyi-Szabo (ELTE)

Document classification : PU

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**WP27
04-06-2004**

KALEIDOSCOPE JERP
Building Visual Interactive Blocks for Tangible
Mathematics

Trail 1 Report
WP. Leader: Márta Turcsányi-Szabó

2004-06-04

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Main objectives

The main objective of this JEIRP is to:

- **document and analyse** partners' national mathematics curricula for children aged 8 to 12 with the goal to **identify and select** several elementary building blocks (tools, representations, gadgets or components),
- **prototype** them as interactive, tangible and visual programmable objects,
- **evaluate** how these building blocks could be used to author computer environments in which children would learn about mathematics concepts and relations in a highly interactive and visual way, and
- **explore feasibility** of this approach, the way how it could be scaled up and how educators in different countries could further develop its potential.

This report covers the finding of Trail 1

Trail 1 – Identifying examples of visual interactive building blocks in various national mathematics curricula for children aged 8 to 12 (WP leader: Marta Turcsanyi-Szabo)

We specify an agreed framework for the procedure by which candidate examples from each National Curriculum are identified. In the second phase, that framework is applied. The third phase will be one of negotiation in which the candidate items will be analyzed for common components of international relevance, resulting in deliverable D1 – Report on visual interactive building blocks identified in current national mathematics curricula.

Phase1: Framework for identifying levels of attainment with numbers

Here we found that most of the attainment targets are quite similar to that found in the UK description, thus we built our identification framework accordingly:

Level 1

Pupils count, order, add and subtract numbers when solving problems involving up to 10 objects. They read and write the numbers involved.

Level 2

Pupils count sets of objects reliably, and use mental recall of addition and subtraction facts to 10. They begin to understand the place value of each digit in a number and use this to order numbers up to 100. They choose the appropriate operation when solving addition and subtraction problems. They use the knowledge that subtraction

is the inverse of addition. They use mental calculation strategies to solve number problems involving money and measures. They recognise sequences of numbers, including odd and even numbers.

Level 3

Pupils show understanding of place value in numbers up to 1000 and use this to make approximations. They begin to use decimal notation and to recognise negative numbers, in contexts such as money and temperature. Pupils use mental recall of addition and subtraction facts to 20 in solving problems involving larger numbers. They add and subtract numbers with two digits mentally and numbers with three digits using written methods. They use mental recall of the 2, 3, 4, 5 and 10 multiplication tables and derive the associated division facts. They solve wholenumber problems involving multiplication or division, including those that give rise to remainders. They use simple fractions that are several parts of a whole and recognise when two simple fractions are equivalent.

Level 4

Pupils use their understanding of place value to multiply and divide whole numbers by 10 or 100. In solving number problems, pupils use a range of mental methods of computation with the four operations, including mental recall of multiplication facts up to 10 10 and quick derivation of corresponding division facts. They use efficient written methods of addition and subtraction and of short multiplication and division. They add and subtract decimals to two places and order decimals to three places. In solving problems with or without a calculator, pupils check the reasonableness of their results by reference to their knowledge of the context or to the size of the numbers. They recognise approximate proportions of a whole and use simple fractions and percentages to describe these. Pupils recognise and describe number patterns, and relationships including multiple, factor and square. They begin to use simple formulae expressed in words. Pupils use and interpret coordinates in the first quadrant.

Level 5

Pupils use their understanding of place value to multiply and divide whole numbers and decimals by 10, 100 and 1000. They order, add and subtract negative numbers in context. They use all four operations with decimals to two places. They reduce a fraction to its simplest form by cancelling common factors and solve simple problems involving ratio and direct proportion. They calculate fractional or percentage parts of quantities and measurements, using a calculator where appropriate. Pupils understand and use an appropriate noncalculator method for solving problems that involve multiplying and dividing any three-digit number by any two-digit number. They check their solutions by applying inverse operations or estimating using approximations. They construct, express in symbolic form, and use simple formulae involving one or two operations. They use brackets appropriately. Pupils use and interpret coordinates in all four quadrants.

Level 6

Pupils order and approximate decimals when solving numerical problems and equations [for example, $x^3 + x = 20$], using trial and improvement methods. Pupils are aware of which number to consider as 100 per cent, or a whole, in problems involving comparisons, and use this to evaluate one number as a fraction or percentage of another. They understand and use the equivalences between fractions, decimals and percentages, and calculate using ratios in appropriate situations. They add and subtract fractions by writing them with a common denominator. When exploring number sequences, pupils find and describe in words the rule for the next term or n th term of a sequence where the rule is linear. They formulate and solve linear equations with whole number coefficients. They represent mappings expressed algebraically, and use Cartesian coordinates for graphical representation interpreting general features.

Level 7

In making estimates, pupils round to one significant figure and multiply and divide mentally. They understand the effects of multiplying and dividing by numbers between 0 and 1. Pupils solve numerical problems involving multiplication and division with numbers of any size, using a calculator efficiently and appropriately. They understand and use proportional changes, calculating the result of any proportional change using only multiplicative methods. Pupils find and describe in symbols the next term or n th term of a sequence where the rule is quadratic; they multiply two expressions of the form $(x + n)$; they simplify the corresponding quadratic expressions. Pupils use algebraic and graphical methods to solve simultaneous linear equations in two variables. They solve simple inequalities.

Level 8

Pupils solve problems involving calculating with powers, roots and numbers expressed in standard form, checking for correct order of magnitude. They choose to use fractions or percentages to solve problems involving repeated proportional changes or the calculation of the original quantity given the result of a proportional change. They evaluate algebraic formulae, substituting fractions, decimals and negative numbers. They calculate one variable, given the others, in formulae such as $V = Yr^2h$. Pupils manipulate algebraic formulae, equations and expressions, finding common factors and multiplying two linear expressions. They know that $a^2 - b^2 = (a+b)(a - b)$. They solve inequalities in two variables. Pupils sketch and interpret graphs of linear, quadratic, cubic and reciprocal functions, and graphs that model real situations.

Exceptional Performance

Pupils understand and use rational and irrational numbers. They determine the bounds of intervals. Pupils understand and use direct and inverse proportion. In simplifying algebraic expressions, they use rules of indices for negative and fractional values. In finding formulae that approximately connect data, pupils express general laws in symbolic form. They solve simultaneous equations in two variables where one equation is linear and the other is quadratic. They solve problems using intersections and gradients of graphs.

Phase2: Application of framework to collect data

Collection of a mass of items from International National Curricula within framework

Contributors:

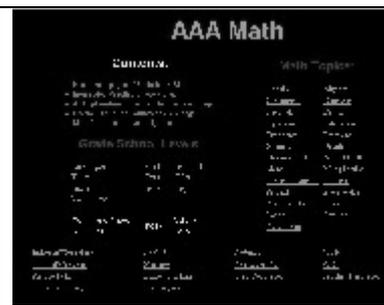
- Partner 1 – Comenius University, Bratislava, Slovakia (coord. Ivan Kalas)
- Partner 2 – Knowledge Lab, London, UK (coord. Celia Hoyles and Richard Noss)
- Partner 3 – Cnotinfor, Portugal (coord. Secundino Correia)
- Partner 4 – EL University, Budapest, Hungary (coord. Marta Turcsanyi)
- Partner 5 – Centre for New Technologies Research in Education (CeNTRE), University of Warwick, UK (coord. Dave Pratt)

The collection has been filtered and common elements identified for further processing. We however include a small collection of internet sites, where relevant material can be accessed.

Mathematical internet portals and sites



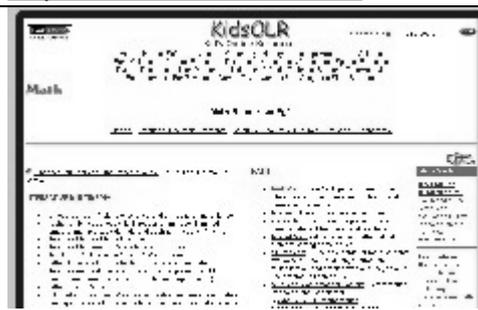
<http://www.superkids.com/>



<http://www.aamath.com>



<http://www.coolmath4kids.com/>



<http://www.kidsqlr.com/math/>



<http://www.math.com/>



<http://www.bbc.co.uk/education/mathsfile/index.shtml>



<http://www.funbrain.com/kidscenter.html>



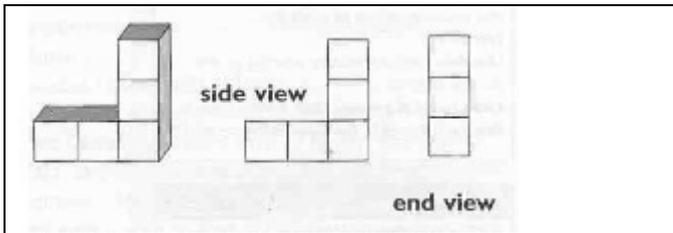
<http://www.logo.com/>

Phase3: Analysis of items for common components of international relevance

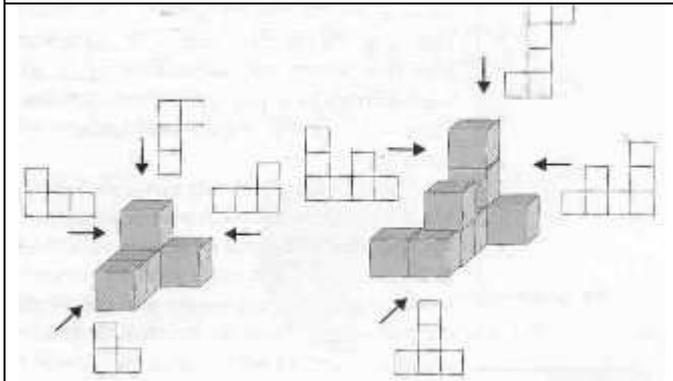
We studied and compared potential of building computer environments in which children can explore and discover basic mathematics concepts and relations. We studied all partners' national mathematics curricula for children aged 8 to 12 and identify examples of the common building blocks out of which current activities (pages or "screens") could be constructed.

This report contains a summary of visual interactive building blocks that we found to be accessible for applying into various national mathematics curricula for children aged 8 to 12. Levels indicate those identified in the framework. Items have been grouped by topics.

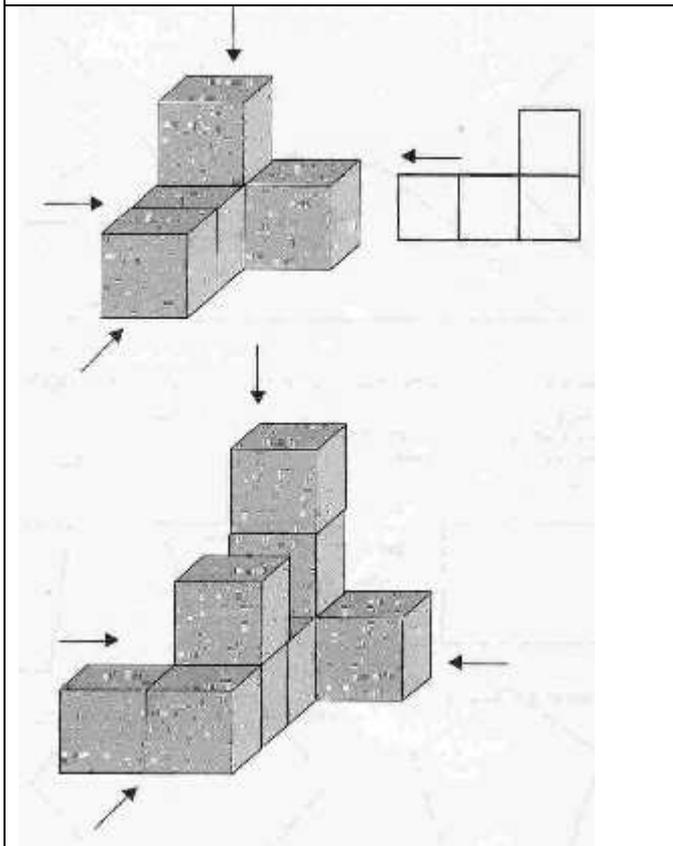
3D shapes



level 4.



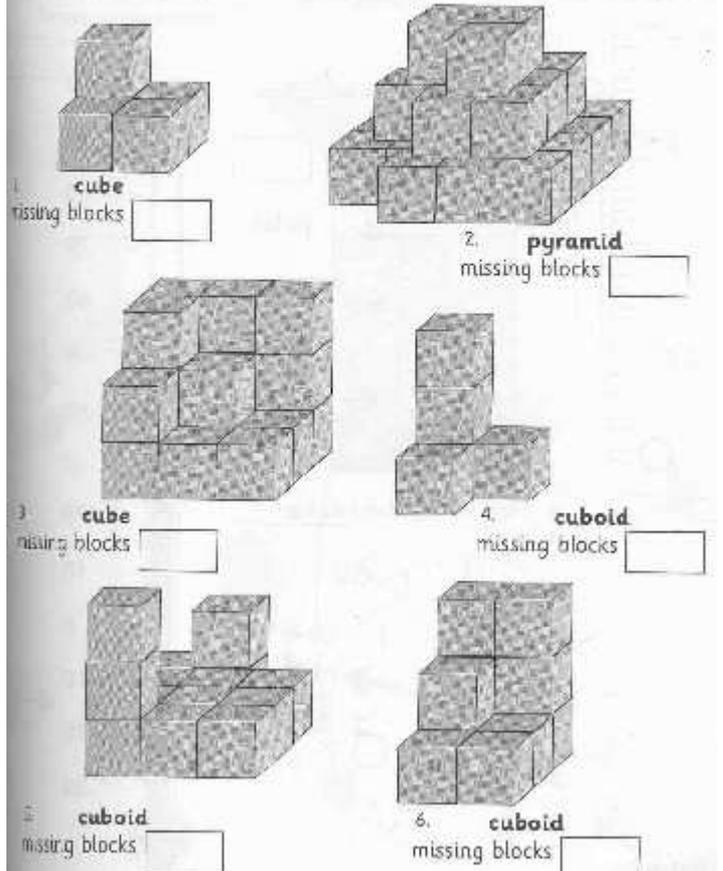
level 6.



level 6.

Unfinished buildings

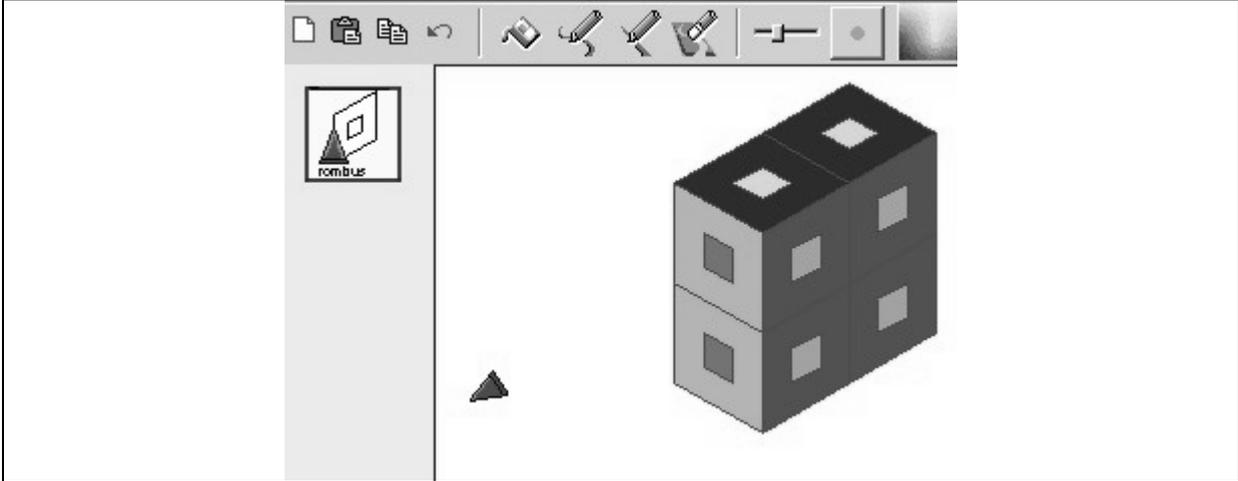
How many blocks are missing from these temple ruins?
They should be solid shapes.



level 4.

level 5.

Visualizing 3D shapes from 2D drawings.
Thinking about visual elements including form and space.
(Making drawings, getting experience by changing the viewpoint on a screen)



Animations

Animated shapes

- Cut out copies of these grids to make a flick book.
- Can you make the triangle spin around the ring?

level 6.

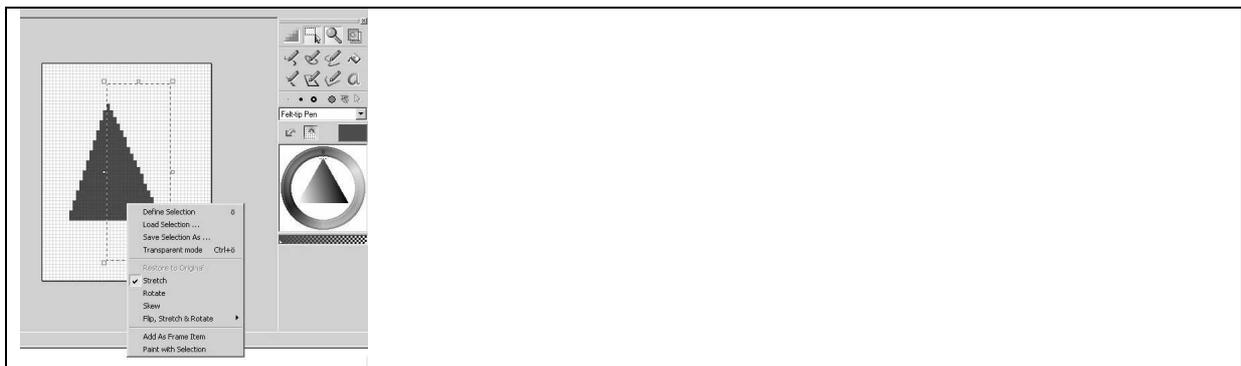
Multimedia shapes

level 6.

level 6.

Recognizing a shape which has been transformed or rotated.
 (Getting own experience with making such transformations.)

- Using graphic SW, like **LogoMotion**, **Paint**, **Paint Shop Pro**, **Corel Draw**



Bigger or smaller

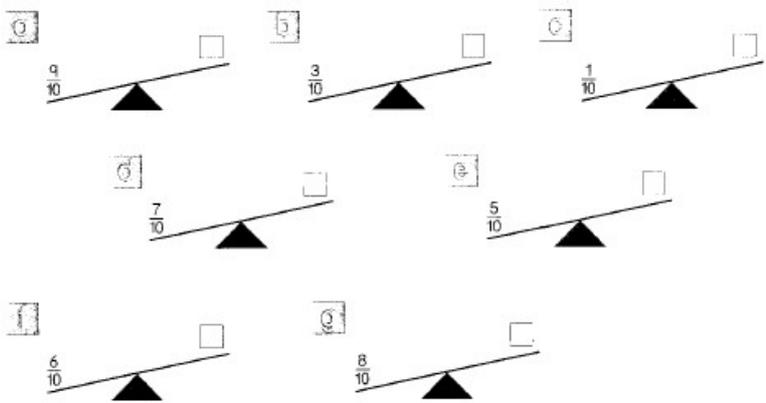
- calculate a given fraction of a given quantity [for example, for scale drawings and construction of models, down payments, discounts] , expressing the answer as a fraction; express a given number as a fraction of another; add and subtract fractions by writing them with a common denominator; perform short division to convert a simple fraction to a decimal
- understand and use unit fractions as multiplicative inverses [for example, by thinking of multiplication by one-fifth as division by 5, or multiplication by six-sevenths as multiplication by 6 followed by division by 7 (or vice versa)] ; multiply and divide a fraction by an integer, and multiply a fraction by a unit fraction
- convert simple fractions of a whole to percentages of the whole and vice versa [for example, analysing diets, budgets or the costs of running, maintaining and owning a car] ,then understand the multiplicative nature of percentages as operators [for example, 30% increase on #150 gives a total calculated as $\$(1.3 * 150)$ while a 20% discount gives a total calculated as $\$(0.8 * 150)$]
- divide a quantity in a given ratio [for example, share #15 in the ratio of 1:2]

Bigger and smaller

1cm 2cm
3cm
level 3.



Write the decimal that will balance each see-saw.

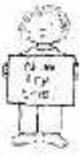


level 6.

Fractions on a pond

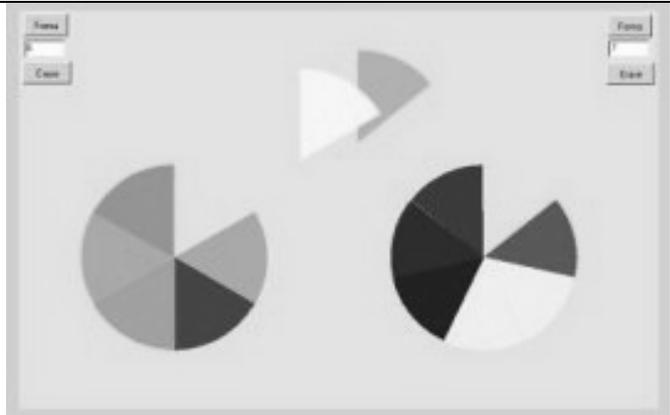
• Write the fractions and whole numbers in order.
Start with the smallest.

$\frac{3}{4}$	1	$\frac{1}{2}$			
$\frac{1}{2}$	$\frac{1}{4}$	0			
$\frac{1}{2}$	$\frac{3}{4}$	$\frac{1}{4}$			
$\frac{5}{10}$	$\frac{1}{4}$	$\frac{3}{4}$			
$\frac{3}{4}$	$\frac{1}{4}$	$\frac{2}{4}$			
$\frac{7}{10}$	$\frac{3}{5}$	$\frac{1}{5}$			
1	$\frac{5}{10}$	$\frac{1}{5}$			
$\frac{1}{5}$	$\frac{1}{2}$	1			

	$\frac{1}{4}$	$\frac{7}{10}$	$\frac{3}{5}$			
	$\frac{4}{5}$	$\frac{1}{2}$	$\frac{3}{10}$			

level 6.

Solve problems, recognize simple patterns and relationships, generalize and predict. Suggestions like “what if...”



Hello

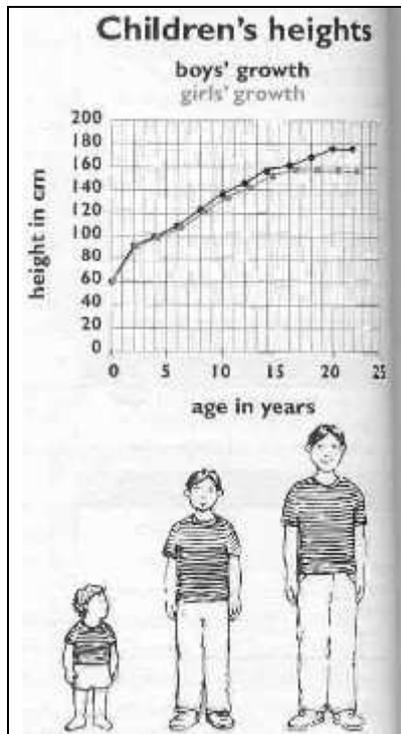
Hello

Hello
Hello

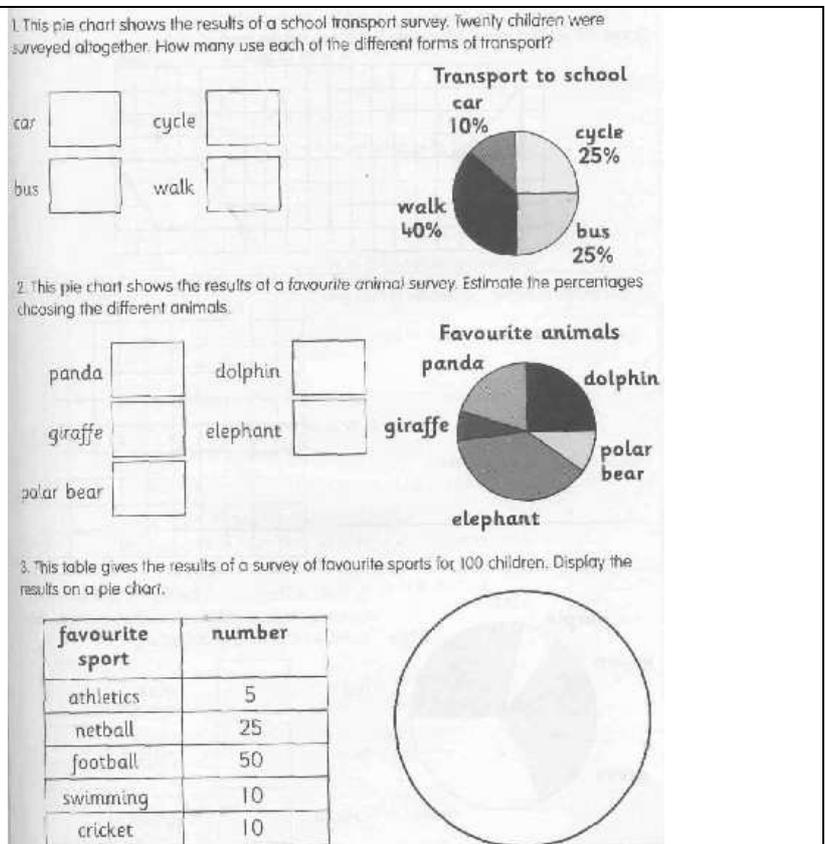
Making such writings by changing the font size.

Charts, pie-charts and graphs

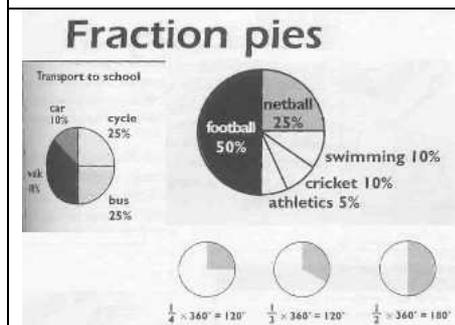
- use the conventions for coordinates in the plane; plot points in all four quadrants; recognise (when values are given for m and c) that equations of the form $y = mx + c$ correspond to straight-line graphs in the coordinate plane; plot graphs of functions in which y is given explicitly in terms of x [for example, $y = 2x + 3$], or implicitly [for example, $x + y = 7$]
- construct linear functions from real-life problems and plot their corresponding graphs; discuss and interpret graphs arising from real situations; understand that the point of intersection of two different lines in the same two variables that simultaneously describe a real situation is the solution to the simultaneous equations represented by the lines; draw line of best fit through a set of linearly related points and find its equation



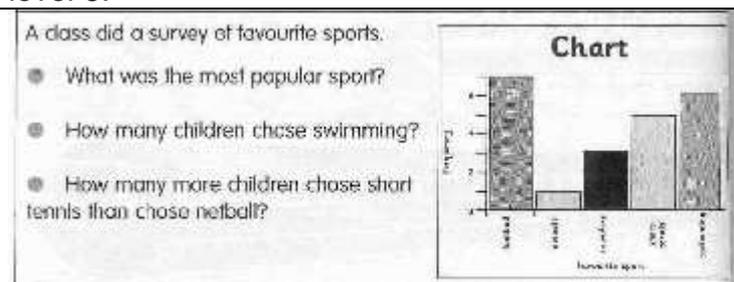
level 5.
level 6.



level 6.

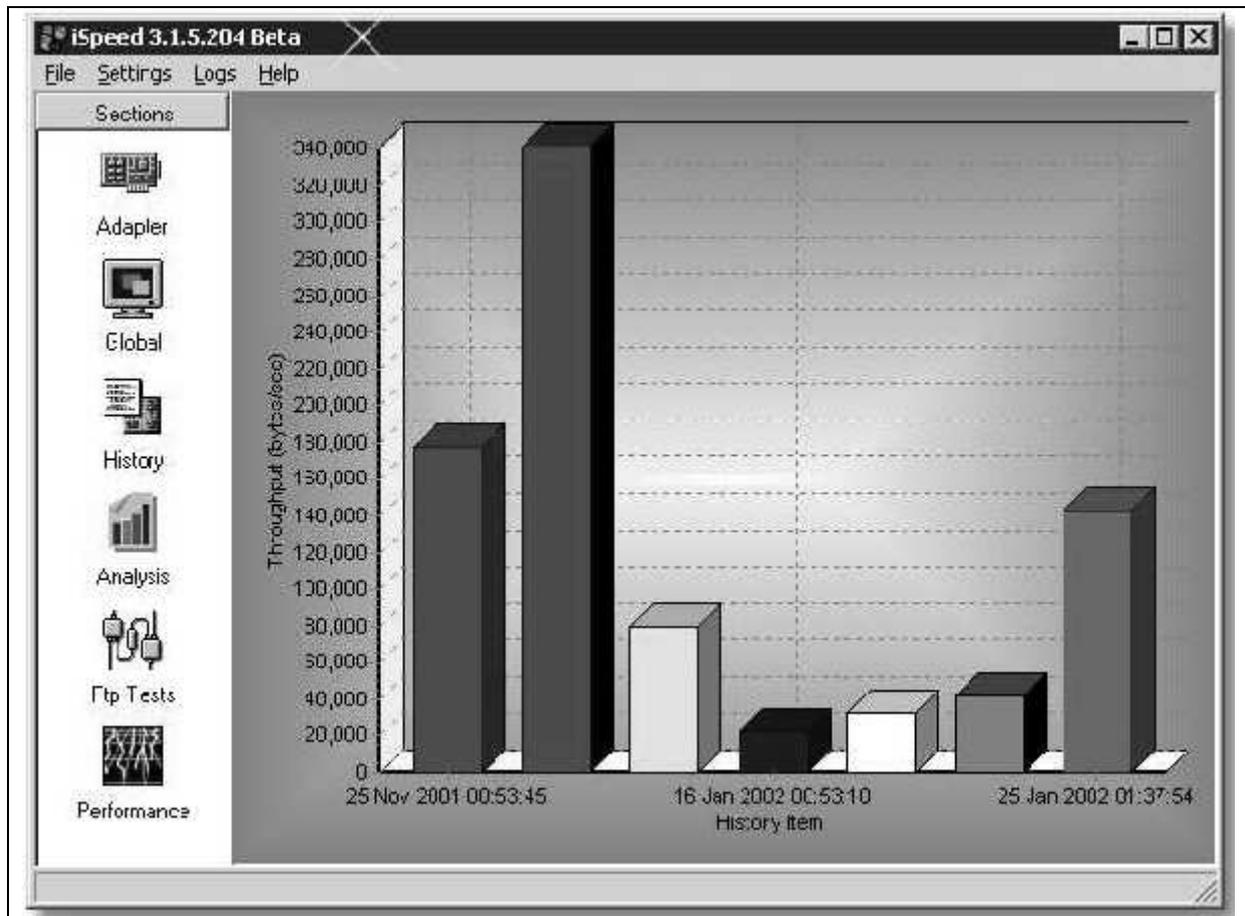


level 6.



level 3.

Analyze evidence and drawing conclusion.
(Using known data, geographical data...)



Coordinates, coordinate-systems

- use the conventions for coordinates in the plane; plot points in all four quadrants; recognise (when values are given for m and c) that equations of the form $y = mx + c$ correspond to straight-line graphs in the coordinate plane; plot graphs of functions in which y is given explicitly in terms of x [for example, $y = 2x + 3$], or implicitly [for example, $x + y = 7$]

Give the co-ordinates

The map records finds at an archeological dig.

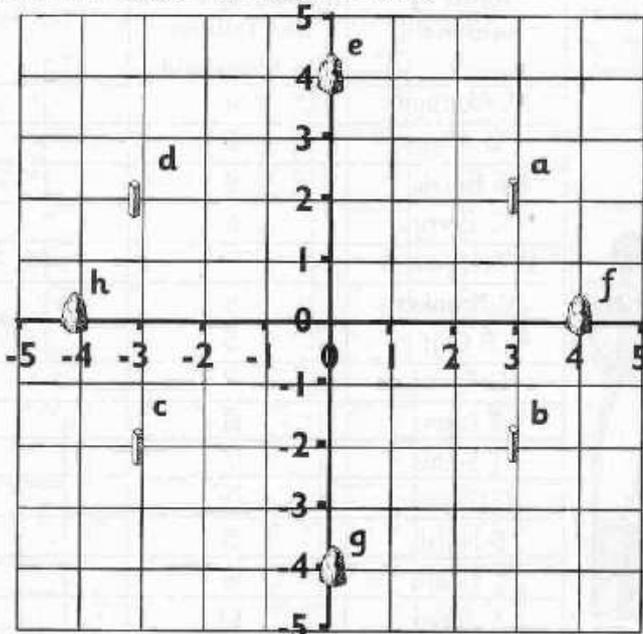
Record the co-ordinates of the finds in this table.

find	co-ordinates
brooch	
sword	
helmet	
fireplace	
pottery	
arrow head	
burial chamber	
necklace	

level 4.
level 6.

Where are you?

- This is an archaeologist's map of a prehistoric site.



Key

	Standing stone		Post-hole
--	----------------	--	-----------

- What are the coordinates of the post-holes? _____

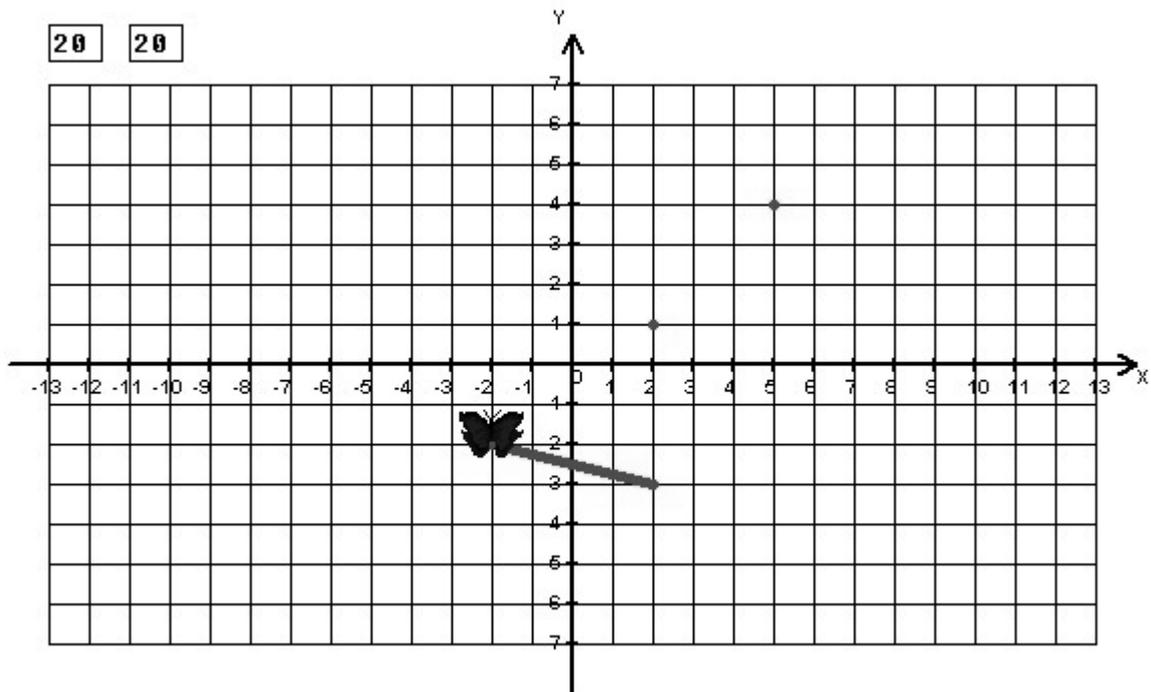
- What are the coordinates of the standing stones? _____

- Fallen stones are discovered at $(-2, -3)$, $(2, -3)$ and $(0, 3)$.
Plot their positions on the grid.
What shape do they mark out? _____

level 6.

To use and draw maps, plans at a range of scale.
(Finding places in maps, plans, coordinates...)

Battleships games, treasure hunts



x, y: 2 2

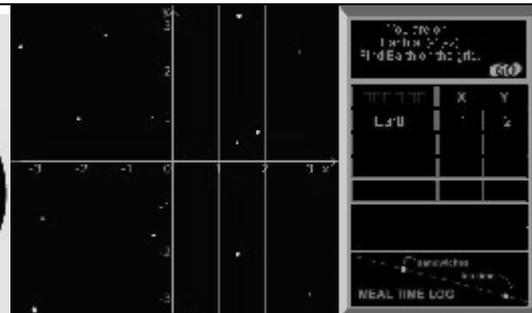
Planet Hop

You are travelling through deep space and you are a bit hungry. Find the co-ordinates of the four planets on the grid, then find the equation of the line which you have created.



Choose a level and click Start.

1 2 3 Sound:On Start



<http://www.bbc.co.uk/>

Counting

Counting

- a) count reliably up to 20 objects at first and recognise that if the objects are rearranged the number stays the same; be familiar with the numbers 11 to 20; gradually extend counting to 100 and beyond

Number patterns and sequences

- b) create and describe number patterns; explore and record patterns related to addition and subtraction, and then patterns of multiples of 2, 5 and 10 explaining the patterns and using them to make predictions; recognise sequences, including odd and even numbers to 30 then beyond; recognise the relationship between halving and doubling

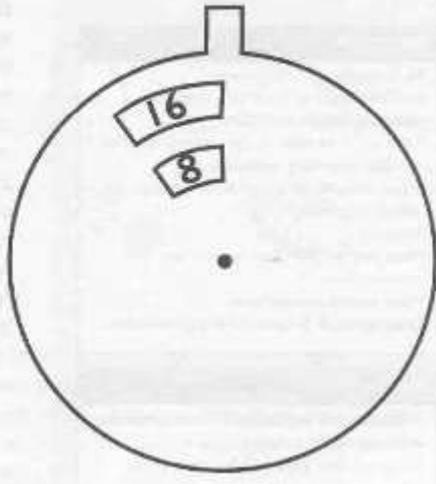
The number system

- c) read and write numbers to 20 at first and then to 100 or beyond; understand and use the vocabulary of comparing and ordering these numbers; recognise that the position of a digit gives its value and know what each digit represents, including zero as a placeholder; order a set of one- and two-digit numbers and position them on a number line and hundredsquare; round any two-digit number to the nearest 10.
- d) use a calculator for calculations involving several digits, including decimals; use a calculator to solve number problems [for example, $4 \times 7 = 343$]; know how to enter and interpret money calculations and fractions; know how to select the correct key sequence for calculations with more than one operation [for example, $56 \times (87 - 48)$]

Number necklaces			
	T	U	
	<input type="text"/>	<input type="text"/>	one
	<input type="text"/>	<input type="text"/>	ten
	<input type="text"/>	<input type="text"/>	
	<input type="text"/>	<input type="text"/>	
	<input type="text"/>	<input type="text"/>	

level 1.

Doubling machine



level 2.

Number necklaces

	T	U	
	<input type="text"/>	<input type="text"/>	one
	<input type="text"/>	<input type="text"/>	ten
	<input type="text"/>	<input type="text"/>	
	<input type="text"/>	<input type="text"/>	

level 1.

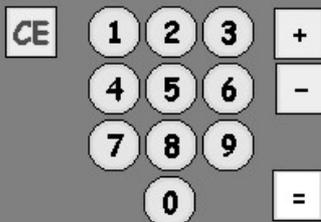
T	U	'1, 2, 3, 4, 5, 6, 7'
T	U	'plus 1, 2, 3...'
T	U	'regroup 10'
T	U	'...4, 5, 6, 7, 8 so 7 + 8 = 15'

level 3.

level 5. - calculator

Making some tests. Getting own experiment. Trying things out, using visual ways to see the outcome.

$$35 + 15 = 50$$



What is the length of the red line in centimeters?

- 1) 10.50 centimeters
- 2) 12 centimeters
- 3) 14.50 centimeters
- 4) 8 centimeters

FUNBRAIN.COM
Correct Incorrect
0 0
Harder - Easier - Games

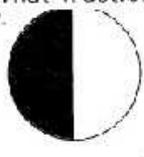
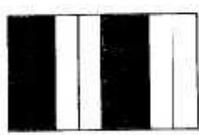
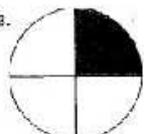
Start Over

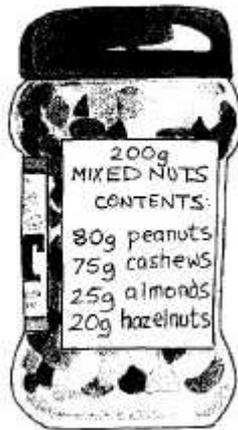


<http://www.funbrain.com>

Fractions

- understand unit fractions [for example, one-third or one-eighth] then fractions that are several parts of one whole [for example, two-thirds or five-eighths] , locate them on a number line and use them to find fractions of shapes and quantities
- understand simple equivalent fractions and simplify fractions by cancelling common factors; compare and order simple fractions by converting them to fractions with a common denominator, explaining their methods and reasoning
- recognise the equivalence between the decimal and fraction forms of one half, quarters, tenths and hundredths; understand that 'percentage' means the 'number of parts per 100' and that it can be used for comparisons; find percentages of whole number quantities, using a calculator where appropriate
- recognise approximate proportions of a whole and use simple fractions and percentages to describe them, explaining their methods and reasoning
- solve simple problems involving ratio and direct proportion
- use fraction notation; understand equivalent fractions, simplifying a fraction by cancelling all common factors; order fractions by rewriting them with a common denominator
- use ratio notation, including reduction to its simplest form and its various links to fraction notation
- recognise where fractions or percentages are needed to compare proportions; identify problems that call for proportional reasoning, and choose the correct numbers to take as 100%, or as a whole.
- understand that 'percentage' means 'number of parts per 100' and use this to compare proportions; interpret percentage as the operator 'so many hundredths of' [for example, 10% means 10 parts per 100 and 15% of Y means 15 one-hundredths * Y] ; use percentage in real-life situations [for example, commerce and business, including rate of inflation, VAT and interest rates]

<p>What fraction of each shape is coloured? What fraction of each shape is not coloured?</p> <p>7. </p> <p>8. </p> <p>9. </p> <p>10. </p> <p>11. </p> <p>12. </p> <p>13. </p> <p>14. </p> <p>level 6.</p>	 <p>There are 180 children at Mill Road School.</p> <p>60 children have packed lunches. What fraction of the whole school is that?</p> <p>135 children walk to school. What fraction is that?</p> <p>36 children are aged 5 or younger. What fraction of children are more than 5 years old?</p>
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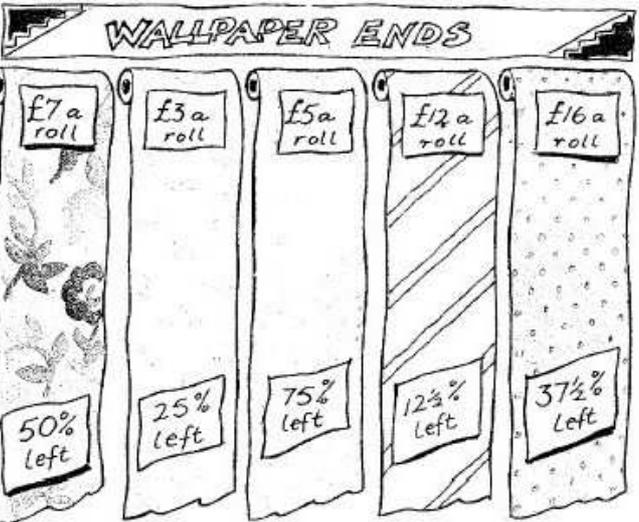
Make the numerator and denominator as small as you can.

What fraction of the total mass is each kind of nut?

Make up some other problems like these.

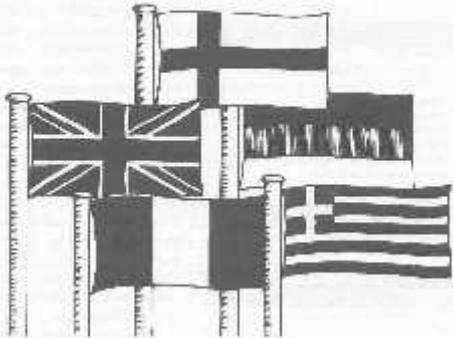
level 6.

level 6.



level 6.

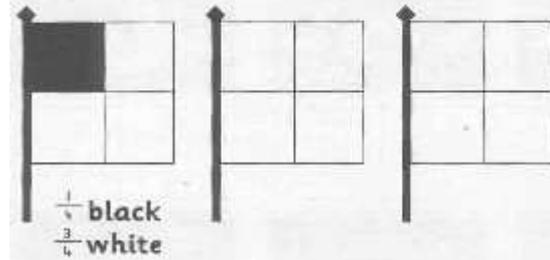
Fraction flags



level 3.

Fraction flags

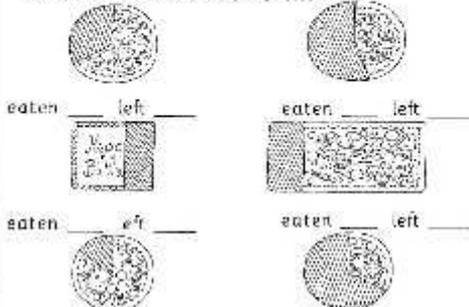
- Shade the squares to design different flags, using two colours.
- Record the fractions as shown under the first flag.



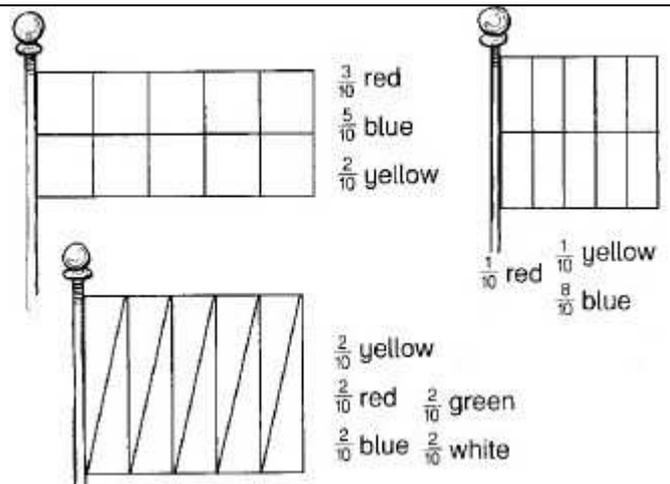
level 3.

A fraction left

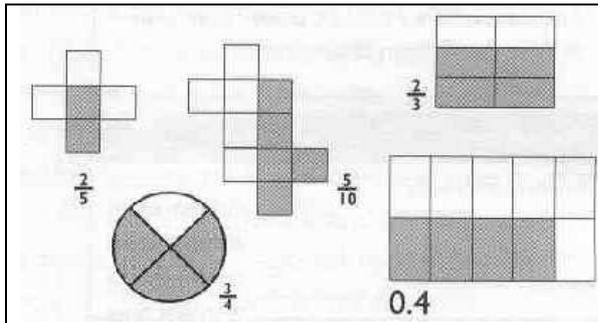
• What fraction of each cake or pizza do you think has been eaten? What fraction is left?



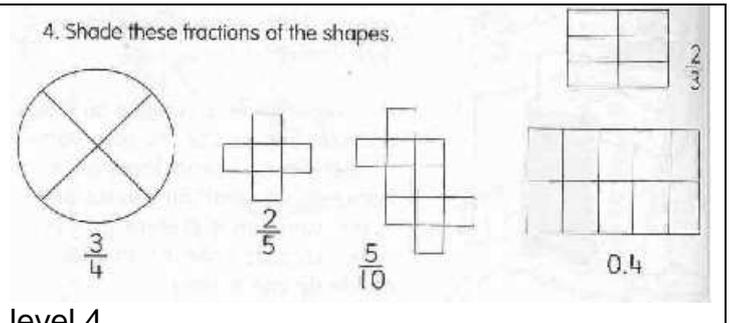
level 6.



level 6.



level 4.



level 4.

Fruit fractions

Cut these fruits into halves.

Cut these fruits into quarters.

level 2.

• Continue these patterns.

- $\frac{1}{4} = \frac{2}{8} = \frac{3}{12} = \frac{4}{16} = \dots = \dots = \frac{7}{28}$
- $\frac{1}{5} = \frac{2}{10} = \dots = \dots = \dots = \dots = \frac{7}{35}$
- $\frac{1}{10} = \frac{2}{20} = \dots = \dots = \dots = \dots = \frac{7}{70}$

level 6.

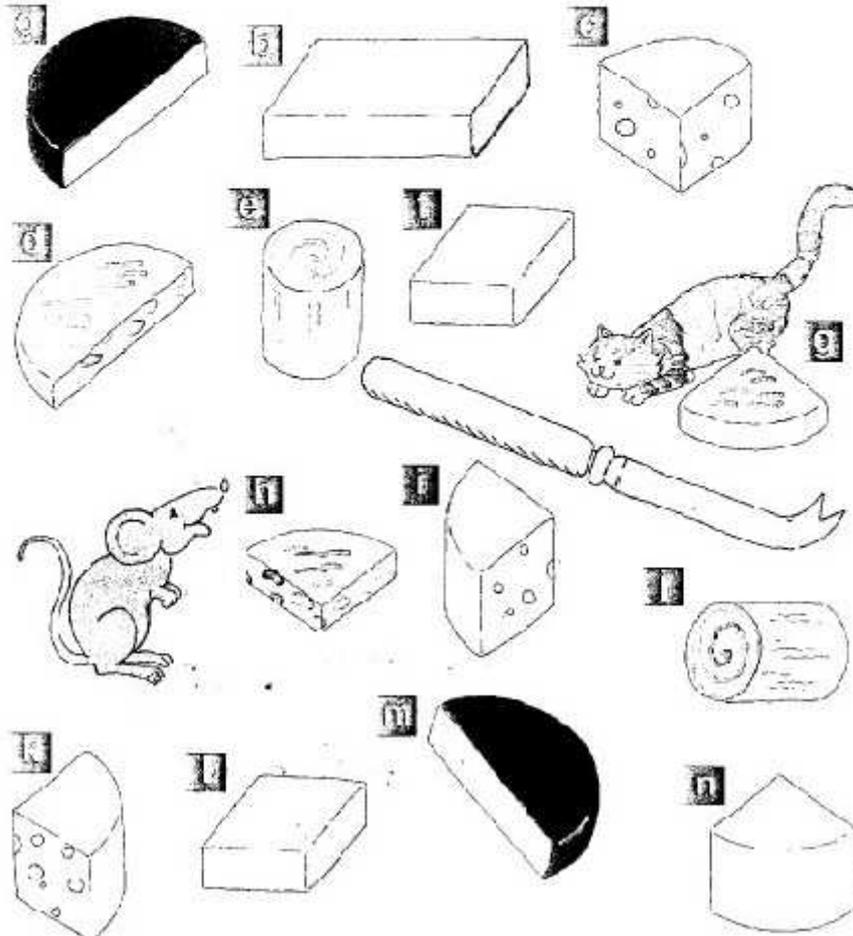
Making one whole

Key
idea

Two halves or four quarters make one whole.

Match the halves and quarters to make whole cheeses.
Write the letters that make each whole cheese like this:

a and m
 $\frac{1}{2}$ and $\frac{1}{2}$ make 1 whole.



level 6.

Discount fares

- Bus and train companies offer discounts on standard fares.
Complete these fare tables.

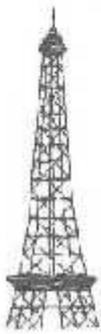
London return, full fare £100

fare type	discount	saving	fare
Standard	-	-	£100
Young person	50%	£50	£50
OAP	25%	£25	
Weekend	10%		
Early booking	20%		
Last minute	75%		
Family rail card	40%		



Paris return, full fare £200

fare type	discount	saving	fare
Standard	-	-	£200
Young person	50%	£100	
OAP	25%	£25	
Weekend	10%		
Early booking	20%		
Last minute	75%		
Family rail card	40%		

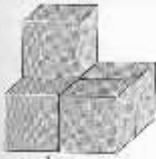


level 5.

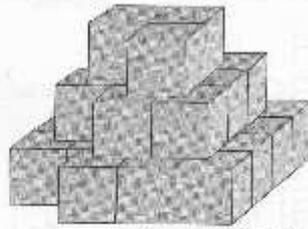
level 6.

Unfinished buildings

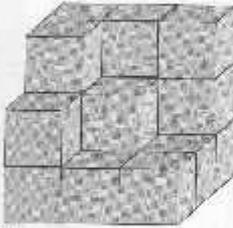
How many blocks are missing from these temple ruins?
They should be solid shapes.



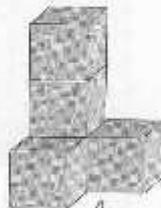
1. **cube**
missing blocks



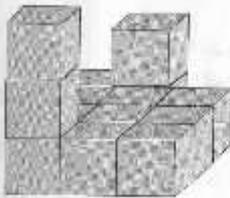
2. **pyramid**
missing blocks



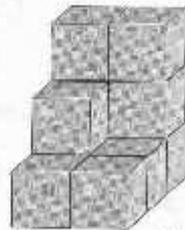
3. **cube**
missing blocks



4. **cuboid**
missing blocks



5. **cuboid**
missing blocks



6. **cuboid**
missing blocks

level 4.

level 5.

Understanding what fractions are.

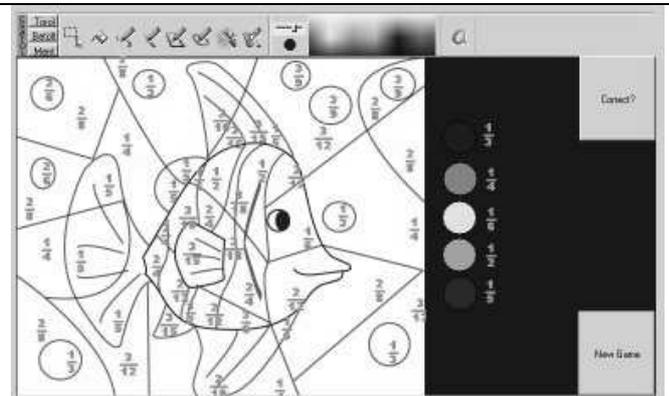
Make and justifying estimate of numbers and proportions.

Fractions microworld!

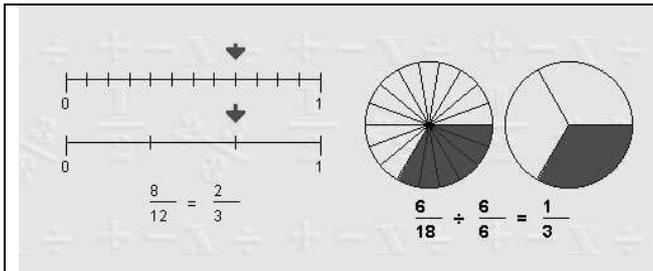
15	42	8	6
75	25	10	9
40	30	20	28
4	18	35	22

5/8 of 64 M&Ms are red.
2/9 of the 18 kids in the class play chess.
Laura is 30. Her sister is 2/3 of Laura's age.
She read 4/9 of 63 page book.

2/3 of 15 apples are green.
6/7 of 49 beads are red.
5/6 of 42 bottles have been recycled.
3/10 of John's 60 marbles are yellow.
They have eaten 3/8 of 16 donuts.
5/7 of 35 seeds have sprouted.
I have sent 3/7 of 21 flyers.
3/6 of 60 minutes have passed.
3/5 of 25 lbs of flour has been consumed.
2/3 of 33 geese have returned to the lake.
I have spent 3/4 of my \$100.
I have lost 1/4 of my 32 Lego pieces.



<http://www.dositey.com/math/mystery2.html>



<http://www.visualfractions.com/>

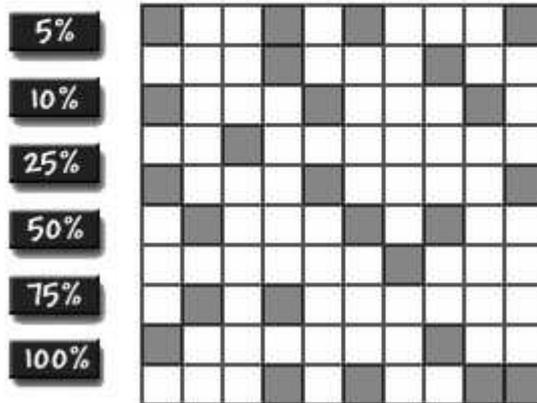
ADD BAR
 BREAK BAR INTO:
 PIECES
 FRACTIONS
 DECIMALS
 PERCENTS
 SHOW SIZES AS:
 FRACTIONS
 DECIMALS
 PERCENTS
 DEL BAR
 CLEAR

50%
1/6
0.4
1/2

<http://www.arcytech.org/java/fractions/fractions.html>

$$0.85 = 0.85 = 85\%$$

The grid below has 100 squares. Use the buttons to see different percents of the grid.



◀ Previous

Next ▶

<http://www.math.com/>

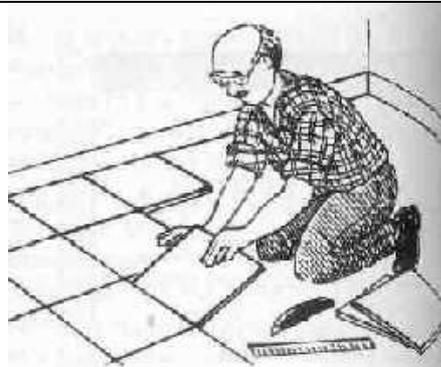
representation	number	Reduced
	$\frac{3}{6}$	$\frac{1}{2}$
	$\frac{1}{6}$	$\frac{1}{6}$
	$\frac{2}{8}$	$\frac{1}{4}$
	$\frac{3}{6}$	$\frac{1}{2}$

What belongs together?

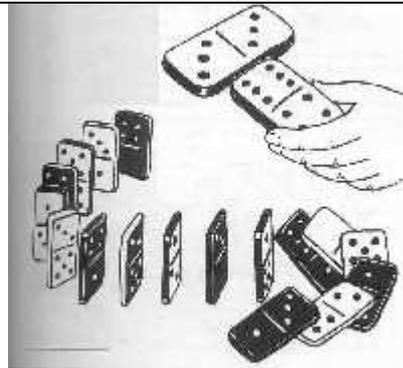
Games with numbers



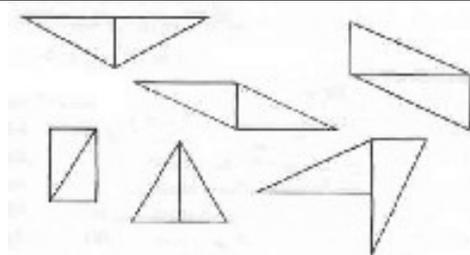
level 3.



level 3.
level 6.



level 1.



level 1.

● Place your counters at the start.
Roll the dice. Follow the instruction where you land.

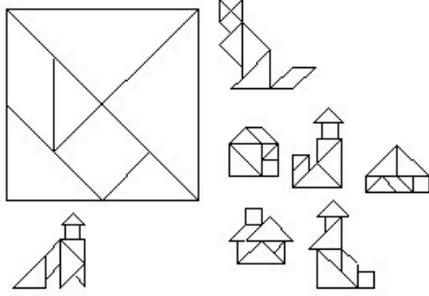
Board game 1

0 start	1	2 + 1	3	4 - 1
	8 + 3	7 - 4	6 throw again	5 + 4
	9 + 7	10 - 4	11 + 2	12 + 5
	16	15	14 + 3	13 - 4
	17 throw again	18 - 2	19	20 finish



level 2.

タンゲラム



level 3.

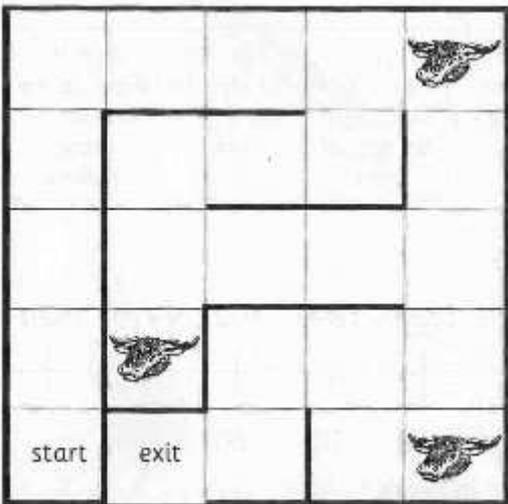
Board game 2

Place your counters at the start.
Roll the dice. Follow the instruction where you land.

start	1 throw again	2	3	4 +5	5	6 -3	7	8 +6	9	10 -5
	20	19 +7	18	17 -2	16	15 +10	14	13 -1	12 +4	11
	21	22 -8	23	24 +1	25 throw again	26 +7	27	28 -11	29	30 +3
	40	39 +12	38 -7	37 +5	36	35 -5	34	33 +7	32	31
	41	42 +4	43	44	45 +20	46 throw again	47 -2	48 -11	49	50 +15
	60	59 throw again	58 -3	57	56 -8	55	54 -24	53 +30	52 -3	51 -6
	61	62 +5	63 -11	64	65 +21	66 throw again	67 -5	68	69	70 +9
	80	79 +12	78	77 -13	76	75 -2	74 throw again	73 +4	72	71 -6
	81	82 +5	83	84	85 +3	86	87 -21	88 throw again	89	90 -50
	100 finish	99	98	97 +2	96 -11	95 throw again	94 -4	93	92 -5	91 -10



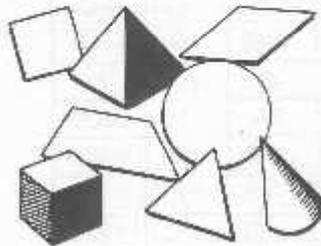
level 2.



level 2.

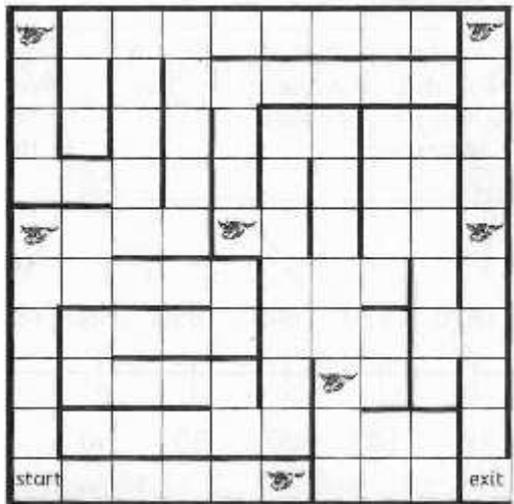
Mathematical crosswords

1. There are 12 shape words hidden in this grid. How many can you find?



s	d	a	r	h	o	m	b	u	s
t	r	a	p	e	z	i	u	m	a
e	r	k	u	p	i	s	c	j	u
r	t	y	t	g	p	y	p	a	
c	g	t	a	a	j	h	l	y	r
o	i	e	f	g	c	e	i	r	e
n	h	r	d	o	l	r	n	a	c
e	j	s	c	n	v	e	d	m	i
k	o	v	a	l	n	m	e	i	s
c	u	b	e	b	e	s	r	d	c

level 6.



level 2.

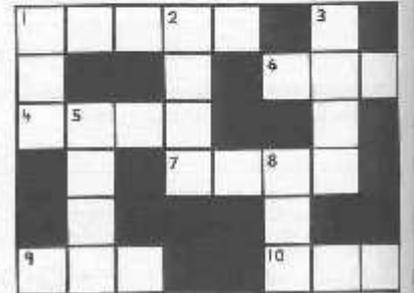
Mathematical crossword

Across

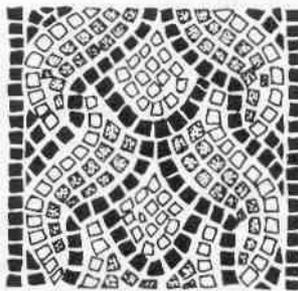
1. Next prime number after 5 (5)
4. Most common member of a set of data (4)
6. Third triangular number (3)
7. Three squared (4)
9. Horizontal line of cells on a grid (3)
10. The decimal number (3)

Down

1. The result of adding (3)
2. A number divisible by 2 (4)
3. Has length but no width (4)
5. Greek eight (4)
8. 2-D plan for a 3-D shape (3)

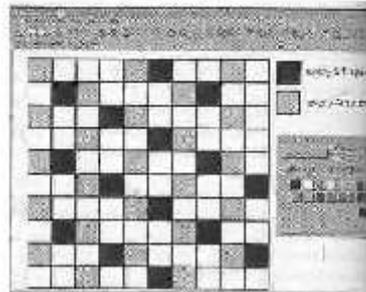


level 6.



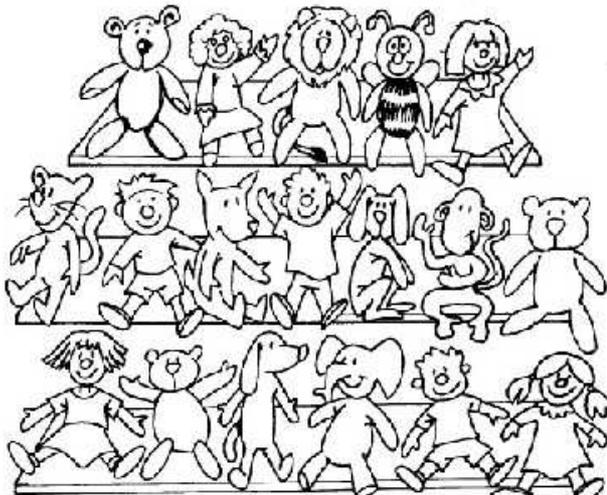
level 3.

Make a pattern



level 2.

Win the Cuddly Toy!

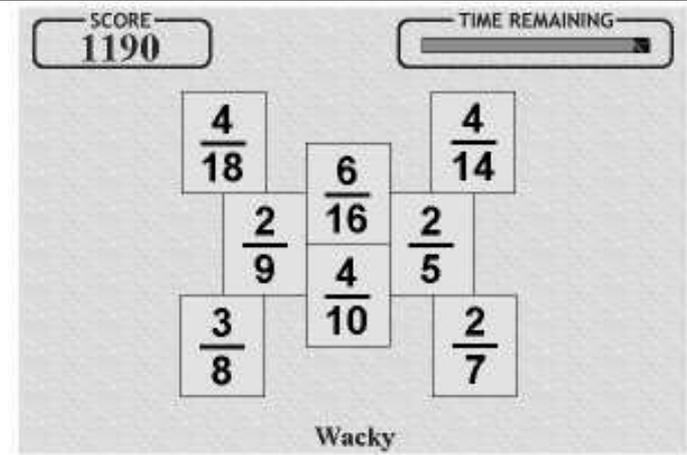


- Draw bow-ties on $\frac{1}{3}$ of the toys. $\frac{1}{3}$ of the toys have ice-creams with a flake. Draw them.
- Draw hats on $\frac{2}{3}$ of the toys. $\frac{2}{3}$ of the toys have red noses. Colour them.
- $\frac{2}{3}$ of the toys are holding ice-creams. Draw them.

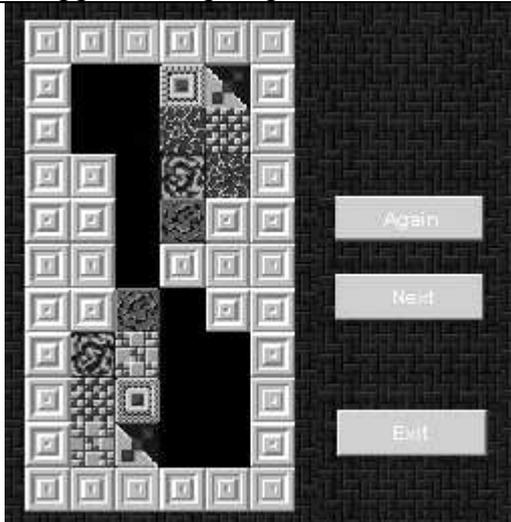
level 3. level 4.



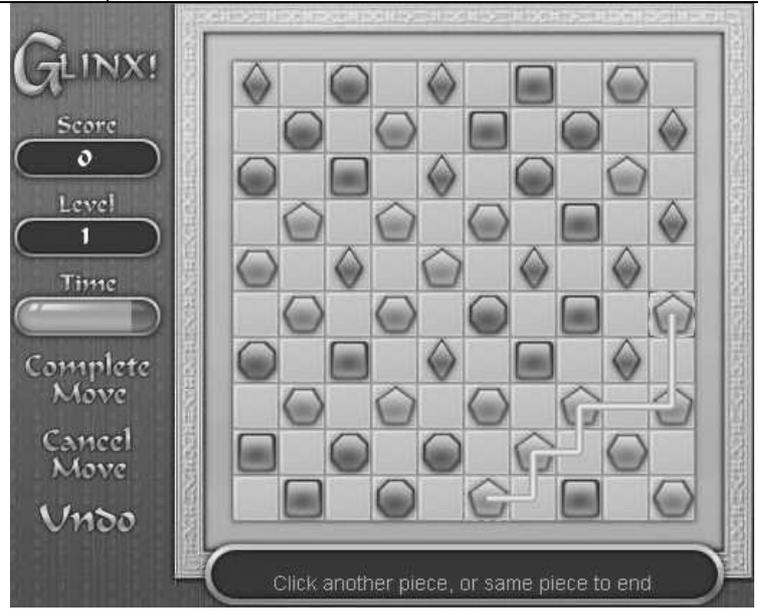
$((2-(3+5))/2)+3$ if this is smaller than 0 go left, if bigger than go right!



<http://www.learningplanet.com/sam/ff/index.asp>



Matching patterns. Seeing the different.



<http://www.superkids.com>

<u>68</u>		<u>61</u>	<u>49</u>
<u>95</u>			<u>53</u>
<u>63</u>	<u>81</u>	<u>47</u>	<u>70</u>

You find a large treasure chest filled with goodies.

Score: 135
Maps: 1 (Use Map)
Flashlights: 1
[Harder - Games](#)

One False Move

How to Play: Pick the smallest number on the game board and work your way up as you go through each room.
 • Use a map if you are lost.
 • Use a flashlight to zap away any ghost you come across.

	100 points		30 points
	75 points		10 points
	-50 points		50 points
	25 points		-5 points

<http://www.funbrain.com>

Geometry, angles

- set up simple equations [for example, find the angle a in a triangle with angles a , $a + 10$, $a + 20$]; solve simple equations [for example, $5x = 7$, $3(2x + 1) = 8$, $2(1 - x) = 6(2 + x)$, $4x^2 = 36$, $3 = z$], by using inverse operations or by transforming both sides in the same way
- use formulae from mathematics and other subjects [for example, formulae for the area of a triangle, the area enclosed by a circle, density = mass/volume]; substitute numbers into a formula; derive a formula and change its subject [for example, convert temperatures between degrees Fahrenheit and degrees Celsius, find the perimeter of a rectangle given its area A and the length l of one side]

<p>Find the angle</p> <ul style="list-style-type: none"> ● Use your protractor to measure these angles ● Label each angle acute or obtuse. <p>level 5.</p>	<p>level 6.</p>	<p>level 3. level 6.</p>
<p><i>Shooting chocolate balls into mouths using proper angles</i></p>		

Tiles

--	--

Numbers in life

- activities focused on the major ideas of statistics, including using appropriate populations and representative samples, using different measurement scales, using probability as a measure of uncertainty, using randomness and variability, reducing bias in sampling and measuring, and using inference to make decisions

Secret codes

Objectives	
Numeracy	
Know the number names and recite them in order to at least 20, from and back to zero. Read and write numerals from 0 to at least 20. Solve a given problem by sorting, classifying and organising information in simple ways.	
Literacy	
Practise and secure alphabetic letter knowledge and alphabetic order.	
Vocabulary	
sequence	
alphabet	
code	
order	
first, second...	a b c d e f g h i j k
match	1 2 3 4 5 6 7 8 9 10 11
	l m n o p q r s t u v w x y
	12 13 14 15 16 17 18 19 20 21 22 23 24 25

level 1.

Objectives Distance table

Numeracy

Solve problems in 'real life' involving measures.

Round any two-digit number to the nearest 10 and any three-digit number to the nearest 100.

Find the position of a square on a grid of squares with the rows and columns labeled.

Geography

Use appropriate geographical vocabulary.

Use maps and plans at a range of scales.

Study a range of places including the United Kingdom.

Links to QCA Geography Unit 6:

Investigating our local area.

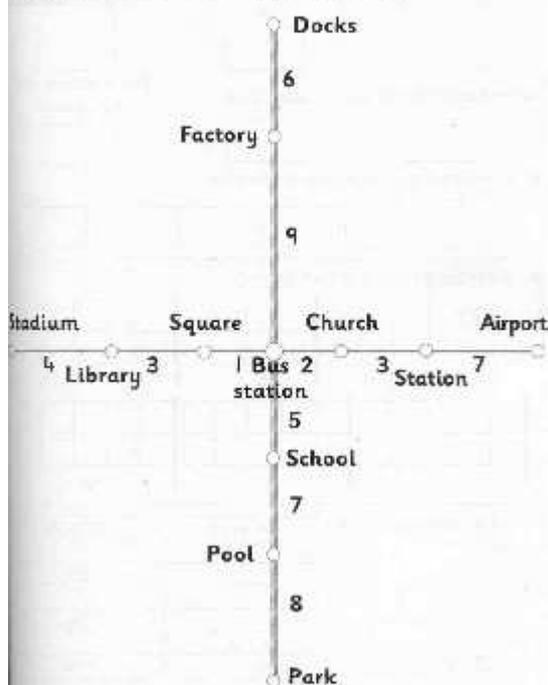


Vocabulary

mile
table
column
row
round up/down
nearest 10
nearest 100

level 3.

This map shows the city bus routes. The distances are in kilometres.

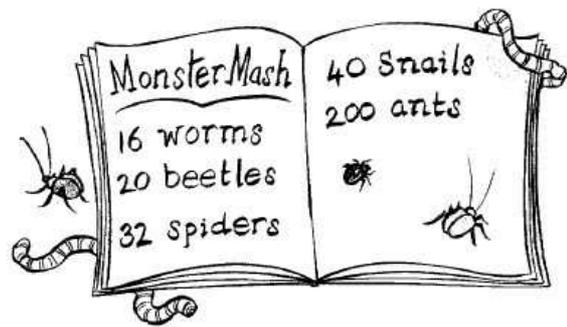


level 3.

The monster has a recipe for 4.

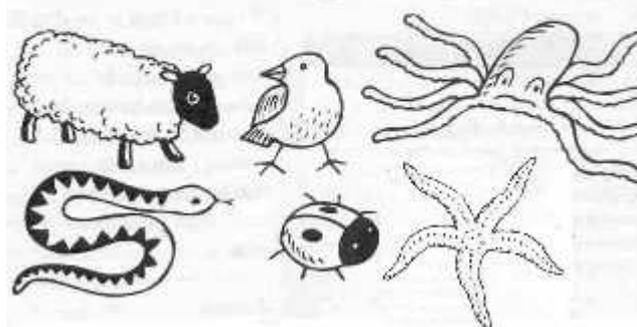
He wants to make enough for 1.

Find $\frac{1}{4}$ of each item.



level 2.

How many legs?



level 2.

Internet search



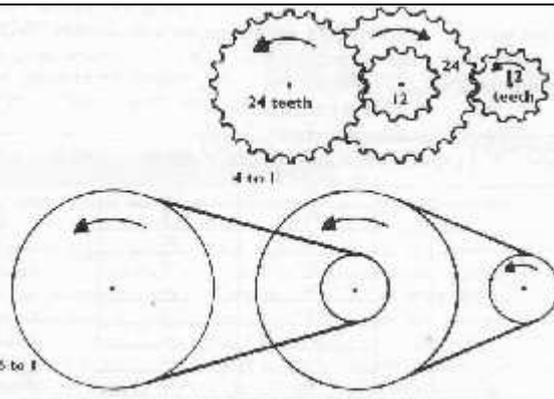
Introduce the lesson by listing some quadrilateral words on the board:

quadrilateral
parallelogram
rhombus
trapezium

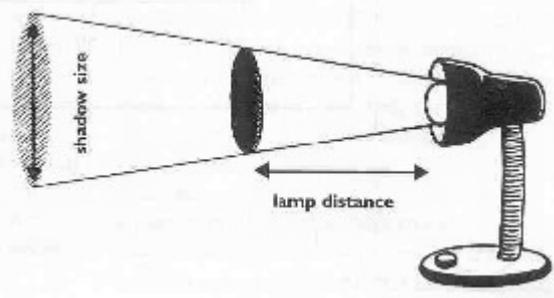
Explain that the children's task during this lesson is to use the Internet to research the meanings of these words, and to write a brief report on their findings including diagrams and definitions.

Set the children to work in pairs or small groups at computers. Discuss the use of Internet search engines and strategies for searching productively for the information required. If children have not done so before, demonstrate how to copy text and diagrams from web pages for pasting and editing in their personal word-processed reports.

level 6.



level 6.



level 6.



The planets

Sequence the planets in the blank tables.

planets in alphabetical order	distance from Sun in millions of km	size in km	surface temperature in °C (maximum)
Earth	149.6	12 756	55
Jupiter	778.3	142 800	-160
Mars	227.9	6794	25
Mercury	59.9	4878	430
Neptune	4496.7	49 500	-213
Pluto	5900	2284	-230
Saturn	1427.0	120 000	-150
Uranus	2869.6	51 800	-220
Venus	108.2	12 104	480

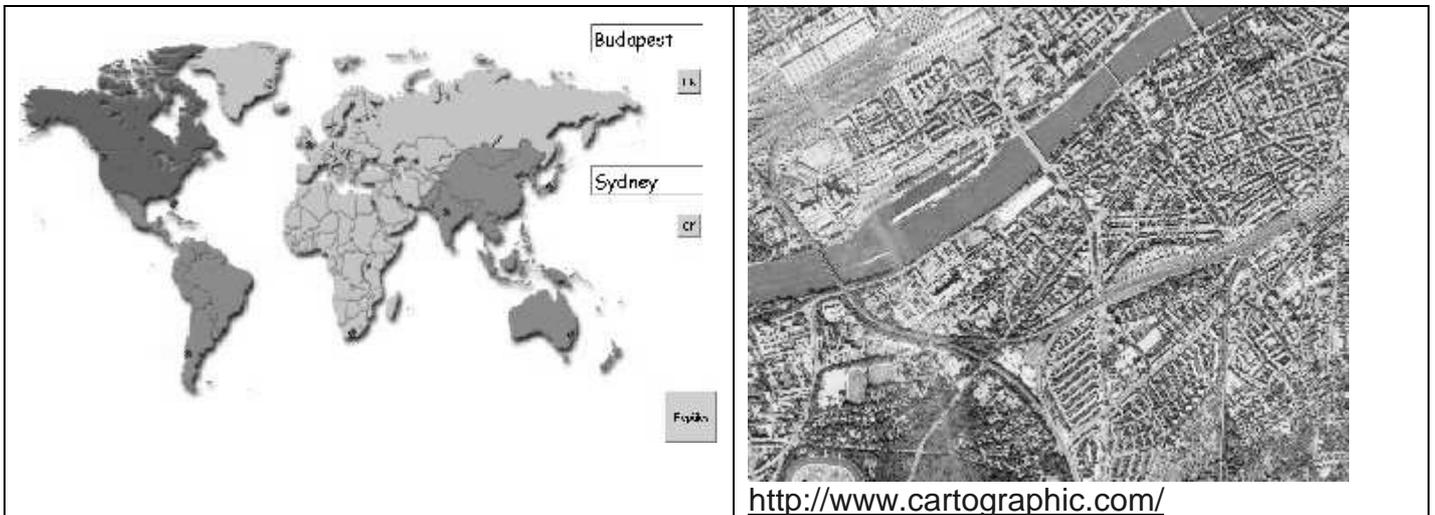


planets in distance order (ascending)	distance from Sun in millions of km	planets in temperature order (descending)	temperature in °C	planets in order of size	size (km)

level 5.

Solving lifelike problems, problems from real life, where mathematical knowledge is needed.

Counting prizes, measuring distance on maps, grouping thing...



<http://www.cartographic.com/>

Late Delivery

Help Postman Phil deliver to the right houses by finding the value of the expression written on each door. Dougal dog holds the value of "a" in each case.

Choose a level and click Start.

1 2 3 Sound:On Start

The illustration shows Postman Phil and Dougal dog standing in front of a house with several doors. The doors are numbered: No. 18, No. 76, No. 14, and No. 19. A door with the number 38 is also visible.

<http://www.bbc.co.uk/>

Train Race

Can you compare your mean, median and range? Help Pythagoras and Hypatia make their connecting trains.

Select either Pythagoras or Hypatia and then click Start.

1 2 3 Sound:On Start

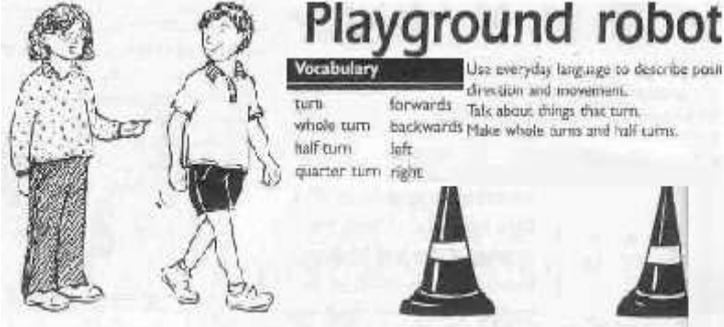
The illustration shows a train station with four trains labeled A, B, C, and D. A departure board is visible in the background with the following times:

Train	Time
A	1:00
B	1:30
C	1:50
D	1:00

Click on the trains to find out how long they took in their last five journeys. Enter the results in the table.

<http://www.bbc.co.uk/>

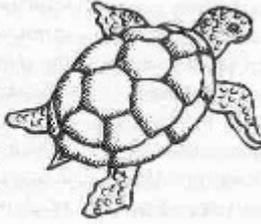
Logo



Playground robot

Vocabulary Use everyday language to describe position, direction and movement. Talk about things that turn. Make whole turns and half turns.

turn	forwards
whole turn	backwards
half turn	left
quarter turn	right

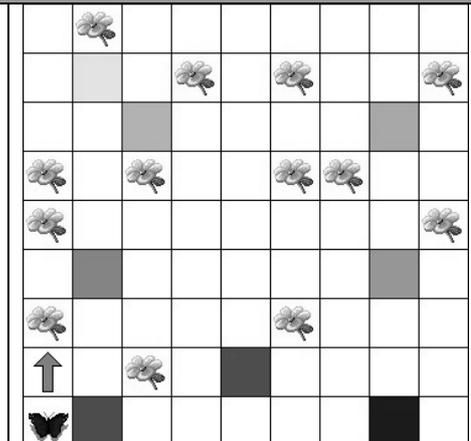
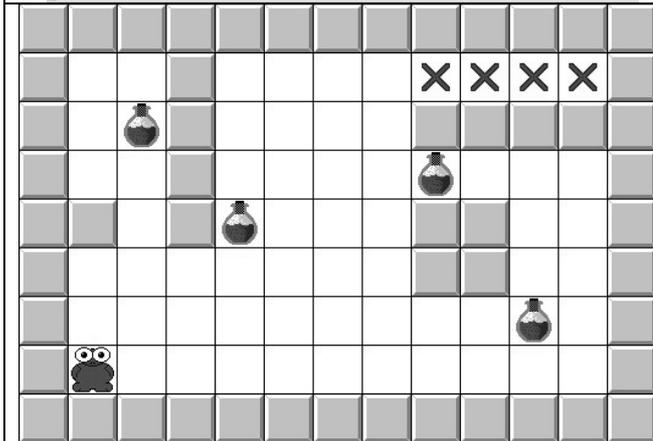
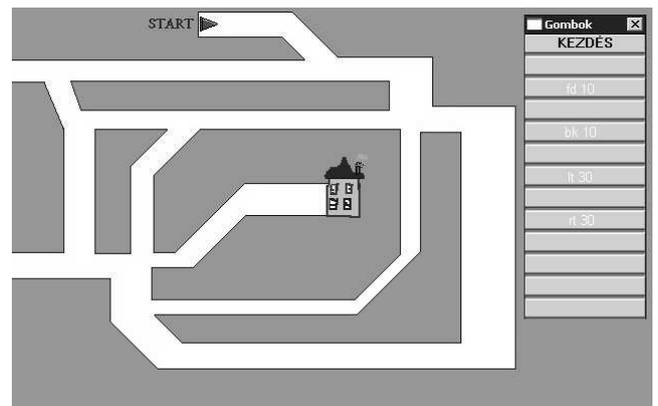
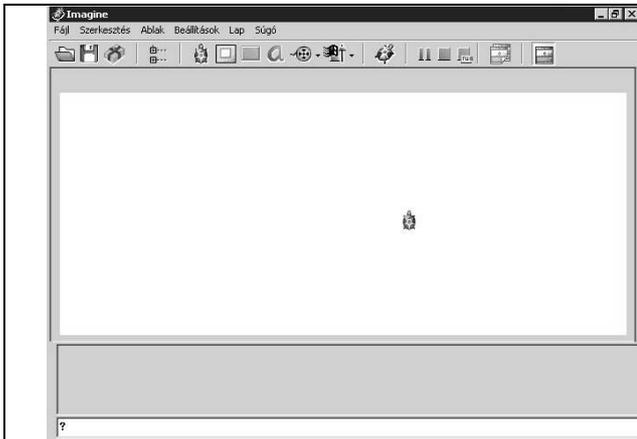


Forward 10
 Right 90
 Forward 10
 Right 90
 Forward 10
 Right 90
 Forward 10
 Right 90

level 4.

level 1.

Understanding relative directions, telling someone how to go somewhere in his view.
 Ordering angles, understanding them, drawing polygons...
 Estimating distances.



Money

Buy a ticket

	adult	child
Zone 1	40p	20p
Zone 2	60p	30p
Zone 3	80p	40p

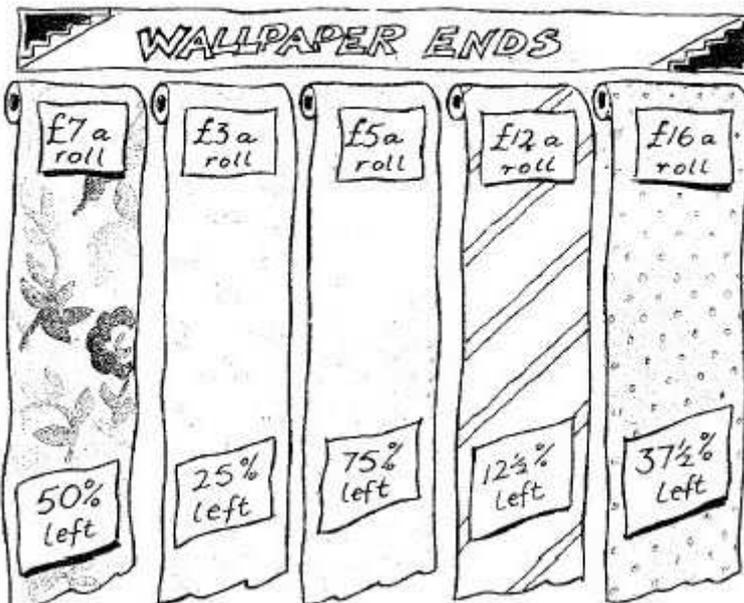
Find the fares for:

1. A child from Central to Church.
2. An adult from Central to Bridge.
3. A child from Central to Valley.
4. An adult and a child from Central to Tower.
5. An adult and two children from Central to Stadium.

level 3.

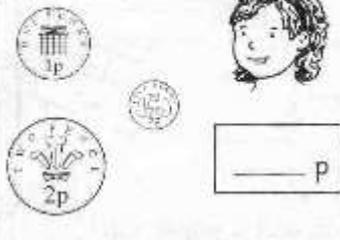
You can solve problems by finding percentages of quantities.

How much do you pay for each part-roll of wallpaper?



level 6.

● How much money does Sophie have?



● How much money does Sunita have?



level 1.

How many do we need?



How much is each cake? _____

How many cakes are there in 3 packs? _____

How many packs do you need to give one cake each to 30 children? _____

How much would they cost altogether? _____

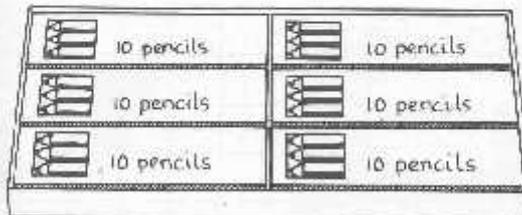


How much is each can? _____

Four children share a pack. How many cans do they have each? _____

How many cans are there in 2 packs? _____

How much do 2 packs cost? _____



How many pencils are there altogether in the carton? _____

Twenty children share all the pencils between them. How many do they each have? _____

If pencils cost 10p each, how much is a pack of ten? _____

How much is a whole carton? _____

level 3.

Discount fares

- Bus and train companies offer discounts on standard fares.
Complete these fare tables.

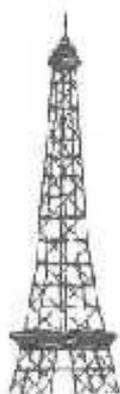
London return, full fare £100

fare type	discount	saving	fare
Standard	-	-	£100
Young person	50%	£50	£50
OAP	25%	£25	
Weekend	10%		
Early booking	20%		
Last minute	75%		
Family rail card	40%		



Paris return, full fare £200

fare type	discount	saving	fare
Standard	-	-	£200
Young person	50%	£100	
OAP	25%	£25	
Weekend	10%		
Early booking	20%		
Last minute	75%		
Family rail card	40%		



level 5.
level 6.

Shopping

How much are:

1. A paper clip and a ruler?
2. A pencil and a notebook?
3. A ruler and a rubber?
4. A pencil sharpener and a ruler?
5. A crayon, a ruler and a rubber?
6. A pencil sharpener, a notebook and a paper clip?

How much change do you get from 20p for:

7. A crayon?
8. A notebook?
9. A notebook and a pencil?
10. A ruler and a pencil sharpener?
11. A pencil sharpener, a notebook and a paper clip?

level 1.

From recognizing coins, values of coins, solving problems involving money... to counting prizes, VAT, sale prizes...

Amount of Sale: £0.58

Amount Paid: £0.75

FUNBRAIN.COM

Correct	Incorrect
0	0

Start Over



Games



£2:



£1:



£0.50:



£0.20:



£0.10:



£0.05:



£0.02:



£0.01:

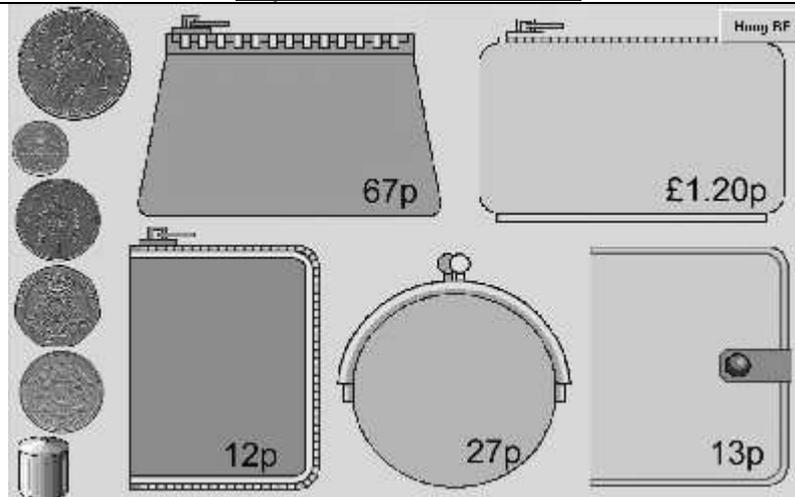
GO

Clear

Example: If the Amount of Sale is £0.65 and the Amount Paid is £0.80, the correct change is £0.15. To get it right, you would put a 1 in the £0.10 box and a 1 in the £0.05 box. You may also click once on the £0.10 coin and once on the £0.05 coin.



<http://www.funbrain.com>



Drag the needed money on each purse!

Music and math's

free number	length in mm	length + full string length	nearest simple fraction
12	324	$324 + 650 = 0.496$	$\frac{1}{2}$
7	434	$434 + 650 = 0.668$	$\frac{2}{3}$
5	488	$488 + 650 = 0.751$	$\frac{3}{4}$
4	520	$520 + 650 = 0.8$	$\frac{4}{5}$
full string	650	$650 + 650 = 1$	1

Background
 The ancient Greek mathematician Pythagoras believed that numbers could explain the mysteries of music, beauty and truth. In the case of music, he discovered that the musical scale can be explained with the help of simple ratios or fractions.

The frets on a guitar divide the length of a string into fractions. When the string is held down at the 12th fret, it is divided in half. The note played by the half-length string is one octave higher in pitch than the note of the full-length string. This is

length of chime bar in cm	ratio to longest bar	nearest simple fraction
30	$\frac{30}{30} = 1$	1
24	$\frac{24}{30} = 0.8$	$\frac{4}{5}$
20	$\frac{20}{30} = 0.67$	$\frac{2}{3}$
15	$\frac{15}{30} = 0.5$	$\frac{1}{2}$

level 5.
level 6.

level 5.
level 6.

From making rhythms, till understanding the mathematical context of music...
 Making own experiments.

<http://www.toysymphony.org/>

Number lines

- read and write numbers to 20 at first and then to 100 or beyond; understand and use the vocabulary of comparing and ordering these numbers; recognise that the position of a digit gives its value and know what each digit represents, including zero as a place-holder; order a set of one and two-digit numbers and position them on a number line and hundred-square; round any two-digit number to the nearest 10.
- solve simple linear inequalities in one variable, and represent the solution set on a number line
- use their previous understanding of integers and place value to deal with arbitrarily large positive numbers and round them to a given power of 10; understand and use positive numbers, both as positions and translations on a number line; order integers; use the concepts and vocabulary of factor (divisor), multiple and common factor

• Write the decimals on the clothes in order, starting with the smallest number.

1.

6.09 | 5.99 | 5.92 | 5.01 | 6.0 | 5.95 | 6.05

2.

4.09 | 5 | 5.04 | 5.02 | 4.06 | 5.1 | 5.09

level 6.

level 5.

Missing map

Someone has spilled coffee on the map!

Write in the missing distance numbers on the stains.

level 5.

• These frogs jump in **halves**.
Continue the lines to show where the frogs land.

• Draw an arrow to show half of the number in the circle.

1. $\frac{1}{2}$ of 64

2. $\frac{1}{2}$ of 80

level 4. - estimate

Number lines help to visualize bigger/smaller.
Recognizing contents, values of numbers, estimate values. Visualizing the estimated values.

The bird will help you solving the operation.

<http://www.visualfractions.com/>

Drag the cards onto the number line!

This rabbit jumps in halves. Where will it be, after 15 jumps?

Operating with numbers

Number operations and the relationships between them

- a) understand addition and use related vocabulary; recognise that addition can be done in any order; understand subtraction as both 'take away' and 'difference' and use the related vocabulary; recognise that subtraction is the inverse of addition; give the subtraction corresponding to an addition and vice versa; use the symbol '=' to represent equality; solve simple missing number problems [for example, $6 = 2 + ?$]
- b) understand multiplication as repeated addition; understand that halving is the inverse of doubling and find one half and one quarter of shapes and small numbers of objects; begin to understand division as grouping (repeated subtraction); use vocabulary associated with multiplication and division

Mental methods

- c) develop rapid recall of number facts: know addition and subtraction facts to 10 and use these to derive facts with totals to 20, know multiplication facts for the *2 and *10 multiplication tables and derive corresponding division facts, know doubles of numbers to 10 and halves of even numbers to 20
- d) develop a range of mental methods for finding, from known facts, those that they cannot recall, including adding 10 to any single-digit number, then adding and subtracting a multiple of 10 to or from a two-digit number; develop a variety of methods for adding and subtracting, including making use of the facts that addition can be done in any order and that subtraction is the inverse of addition
- e) carry out simple calculations of the form $40 + 30 = ?$, $40 + ? = 100$, $56 ? = 10$; record calculations in a number sentence, using the symbols +, -, *, division and = correctly [for example, $7 + 2 = 9$] .

Count on and back in tens or hundreds from any two- or three-digit number; recognise and continue number sequences formed by counting on or back in steps of constant size from any integer, extending to negative integers when counting back

- develop further their understanding of the four number operations and the relationships between them including inverses; use the related vocabulary; choose suitable number operations to solve a given problem, and recognise similar problems to which they apply
- find remainders after division, then express a quotient as a fraction or decimal; round up or down after division, depending on the context
- understand the use of brackets to determine the order of operations; understand why the commutative, associative and distributive laws apply to addition and multiplication and how they can be used to do mental and written calculations more efficiently
- use calculators effectively and efficiently: know how to enter complex calculations using brackets [for example, for negative numbers, or the division of more than

one term] , know how to enter a range of calculations, including those involving measures [for example, time calculations in which fractions of an hour need to be entered as fractions or decimals]

- use the function keys for reciprocals, squares, square roots, powers, fractions (and how to enter a fraction as a decimal); use the constant key
- understand the calculator display, interpreting it correctly [for example, in money calculations, and when the display has been rounded by the calculator] , and knowing not to round during the intermediate steps of a calculation.

$3 + 4 = 7$

$4 + 8 = \Delta$ | $6 + \Delta = 9$

level 2.

345
+29
14
60
300
374

$53 = 50 + 3 = 40 + 13$
 $-27 = 20 + 7 = 20 + 7$
 $20 + 6 = 2$

level 3.

Missing digits and signs

● A spider has blotted the ink! Write these number sentences correctly.

- $12 \text{ [] } 12 = 24$
- $25 + \text{ [] } = 43$
- $\text{ [] } - 19 = 40$
- $6 \text{ [] } 5 = 30$
- $\text{ [] } \div 10 = 20$
- $295 + \text{ [] } = 305$
- $97 \text{ [] } 69 = 28$
- $7 \text{ [] } 4 = 28$
- $\text{ [] } \div 7 = 5$
- $4300 \div \text{ [] } = 43$
- $\text{ [] } \div 2 = 80$
- $12 \text{ [] } 9 = 108$
- $100 \div \text{ [] } = 25$

level 4.

How many in a pack?

$6 \times 5 = 30$

$12 \times 1 = 12$

$6 \times 2 = 12$

$4 \times 3 = 12$

$5 \times 6 = 30$

$2 \times 3 = 3 \times 2 = 6$ $8 \times 5 = 5 \times 8 = 40$
 $4 \times 2 = 2 \times 4 = 8$ $10 \times 3 = 3 \times 10 = 30$
 $5 \times 3 = 3 \times 5 = 15$ $4 \times 10 = 10 \times 4 = 40$
 $4 \times 5 = 5 \times 4 = 20$ $5 \times 10 = 10 \times 5 = 50$

level 3.

Multiplying monster

● Stick the page onto card
 ● Cut out the monster's arms. Fix them to his body with a paper fastener. The arms should turn like a lever.
 ● Does the monster know the 3 times table?

level 3.

Arithmetic

Öszd el!

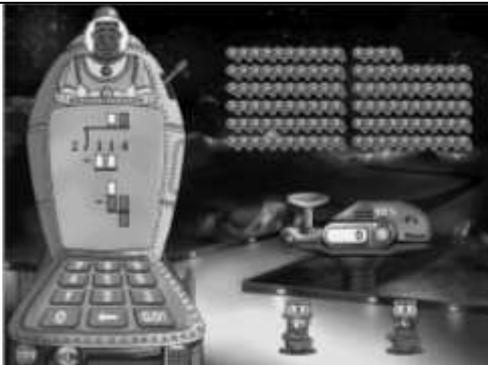
3 4 5 6 : 1 3 =

False
False False False False False
False
False False False
False False
False False False
False
False False False
False False
False False False
False
False False
False False

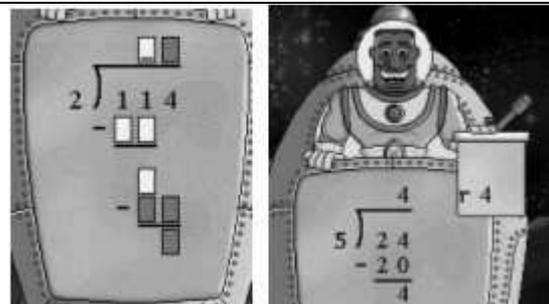
Worksheets on computer, where the child gets the result of his counting at the moment he writes in the solution.

Vond ki!

9	9	9
-	1	1
<input type="text"/>	<input type="text"/>	<input type="text"/>
False	False	False
False	False	False



http://www.riverdeep-learning.co.uk/online_demos/index.htm



http://www.riverdeep-learning.co.uk/online_demos/index.htm



Remember, when you multiply or divide an inequality by a negative number, you must reverse the inequality symbol.

Click on each equation to see how it is solved.

$$2x - 12 = 5$$

$$67 = 11n + 1$$

$$7 = 4 - 2y$$

$$-5x + 3x + 1 \geq -14$$

$$67 = 11n + 1$$

$$67 - 1 = 11n + 1 - 1 \text{ Step 1}$$

$$66 = 11n$$

$$\frac{66}{11} = \frac{11n}{11} \text{ Step 2}$$

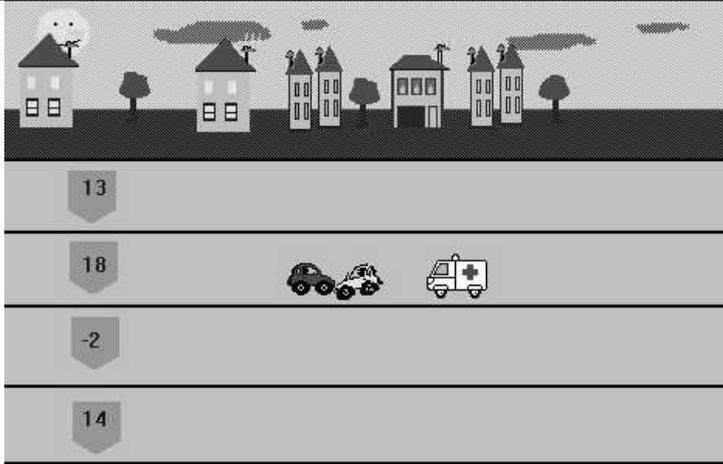
$$6 = n \text{ Solution}$$

$$n = 6 \text{ (it's standard to put the variable on the left side.)}$$

◀ Previous

Next ▶

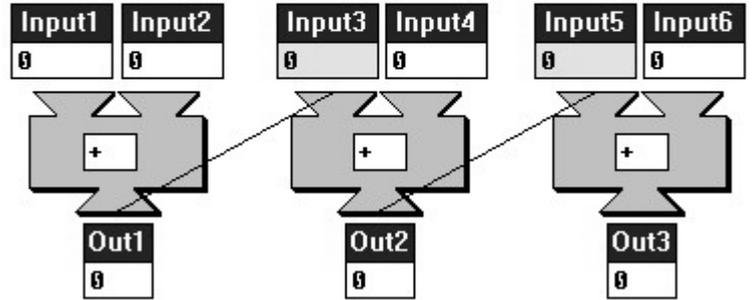
<http://www.math.com/>



Helyes sáv száma: 3 - 5 Út: 0 km
 Idő:  Sebesség: 40 km/h
 Legjobb eredmény: Nóra (10 km)

Solve the operation, and be in the good track!

MaxNum
20



Pin board

Pinboard

Use rubber bands to make these shapes on your pinboard
 & challenge yourself by making more shapes.

Reflect the triangle in the dotted line.

Reflect this shape in the dotted line.

Make shapes with the same area.

Translate this shape 5 spaces to the right.

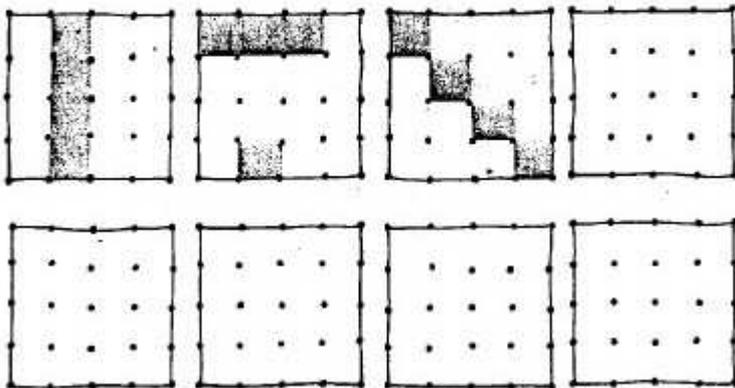
Reflect this shape in the dotted line.

Translate this shape 4 spaces to the right and 5 spaces up.

level 5.

Dot-to-dot fractions Dots and spots

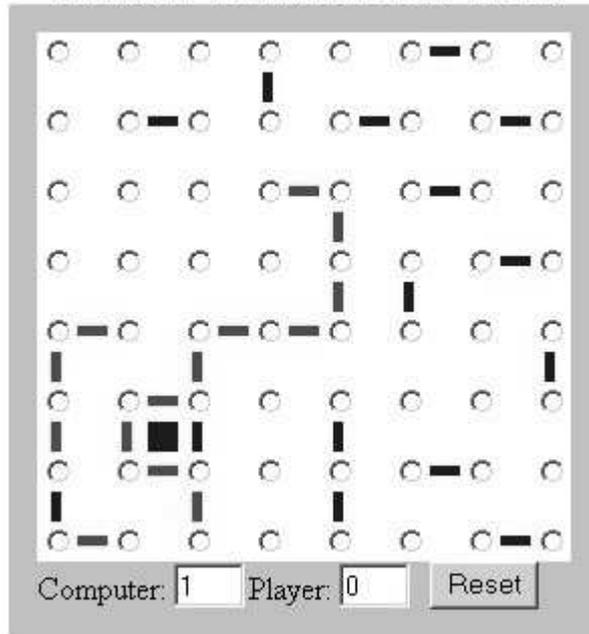
Find some other ways of colouring in $\frac{1}{4}$ of the grid.



level 5.

level 6.

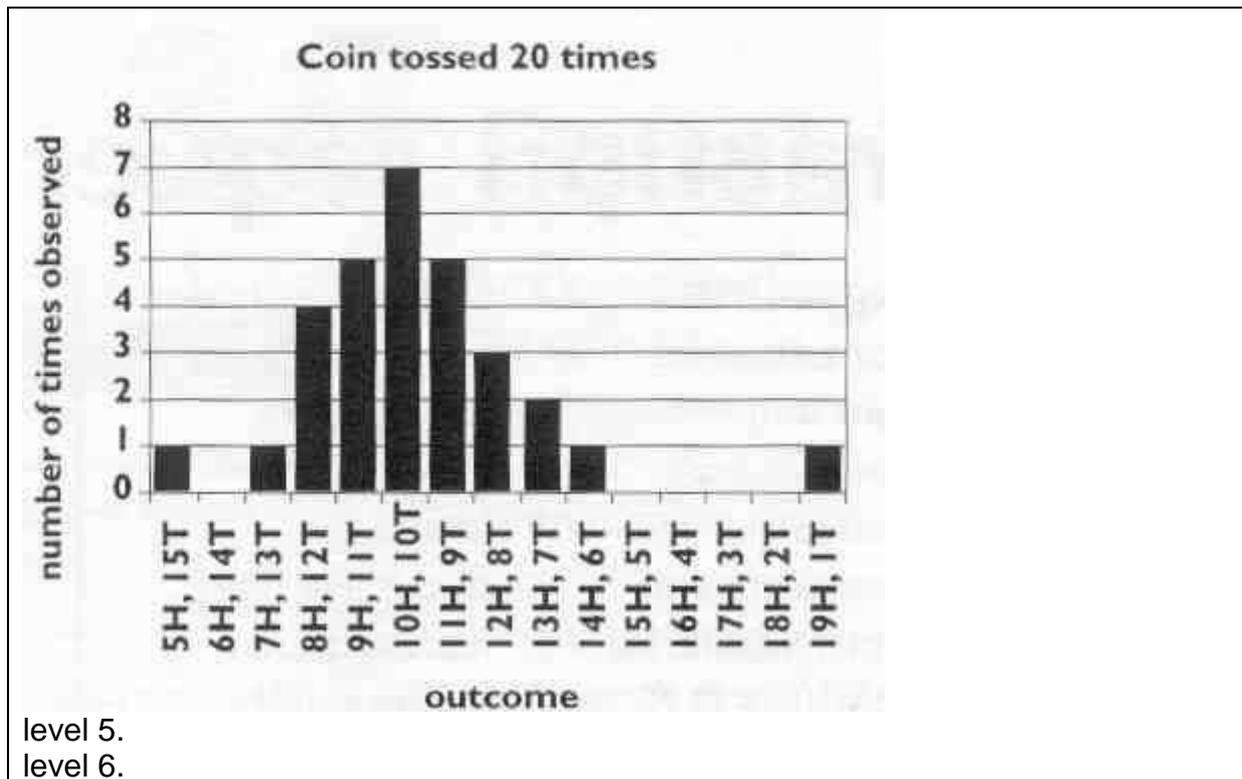
Classic Connect-the-Dots



<http://www.superkids.com>

Probability

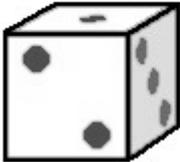
Activities focused on the major ideas of statistics, including using appropriate populations and representative samples, using different measurement scales, using probability as a measure of uncertainty, using randomness and variability, reducing bias in sampling and measuring, and using inference to make decisions



Making own tries. Tests, making simulations, and numerous experiments, to see the resolute...

Discuss the chance or likelihood of particular events. Learn and analyze evidence and draw conclusions.

Click on the speaking dice
to 'throw' it!

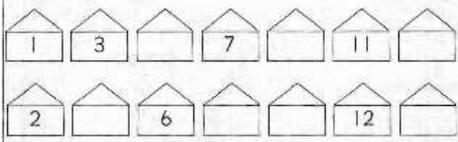
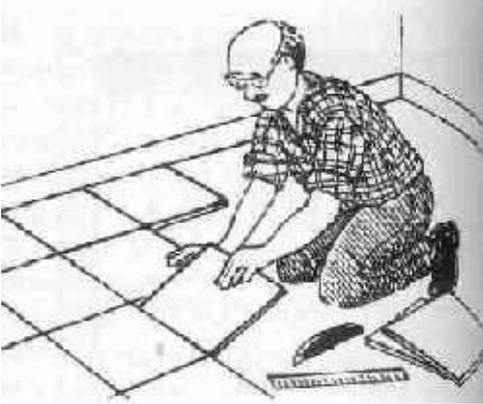


Total: **2**

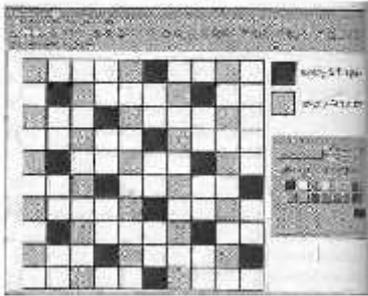
Sequences

Recognise and describe number patterns, including two- and three-digit multiples of 2, 5 or 10, recognising their patterns and using these to make predictions; make general statements, using words to describe a functional relationship, and test these; recognise prime numbers to 20 and square numbers up to 10×10 ; find factor pairs and all the prime factors of any two-digit integer

- generate common integer sequences (including sequences of odd or even integers, squared integers, powers of 2, powers of 10, triangular numbers)
- find the first terms of a sequence given a rule arising naturally from a context [for example, the number of ways of paying in pence using only 1p and 2p coins, or from a regularly increasing spatial pattern] ; find the rule (and express it in words) for the n th term of a sequence
- generate terms of a sequence using term-to-term and position-to-term definitions of the sequence; use linear expressions to describe the n th term of an arithmetic sequence, justifying its form by referring to the activity or context from which it was generated

<p>Name _____</p> <p>● Fill in the missing house numbers.</p>  <p>level 1.</p>	<p>• Continue these patterns.</p> <p>1. $\frac{1}{4} = \frac{2}{8} = \frac{3}{12} = \frac{4}{16} = \dots = \dots = \frac{7}{49}$</p> <p>2. $\frac{1}{5} = \frac{2}{10} = \frac{3}{15} = \frac{4}{20} = \dots = \dots = \frac{7}{35}$</p> <p>3. $\frac{1}{10} = \frac{2}{20} = \frac{3}{30} = \frac{4}{40} = \dots = \dots = \frac{7}{70}$</p> <p>level 6.</p>
 <p>level 3. level 6.</p>	
<div style="border: 1px solid black; padding: 5px;"> <p>7, 9, 11, 13, 15 (add 2) 1, 2, 8, 16 (multiply by 2) 5, 15, 25, 35, 45 (add 10)</p> </div> <p>level 3.</p>	

Make a pattern



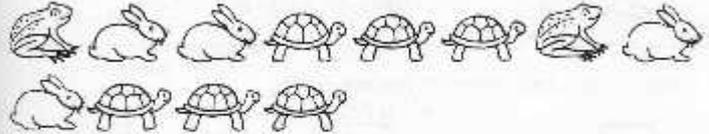
level 2.

One in every...

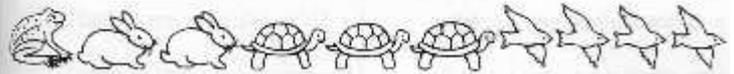
- Fill in the missing numbers.



1. There are _____ tortoises for every rabbit.
2. One in every _____ animals is a rabbit.



3. There are _____ rabbits for every frog.
4. One in every _____ animals is a frog.
5. One in every _____ animals is a rabbit.
6. One in every _____ animals is a tortoise.

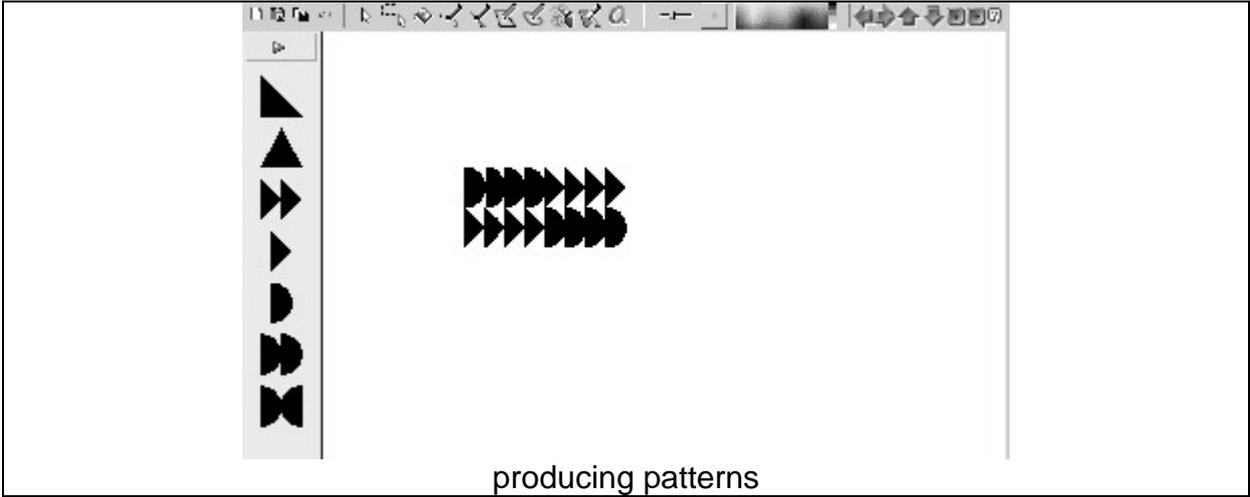


7. There are _____ birds for every rabbit.
8. One in every _____ animals is a frog.
9. One in every _____ animals is a rabbit.
10. Two in every _____ animals are birds.

level 4.

Making patterns, visual sequences, than number sequences...

This rabbit jumps in halves. Where will it be, after 15 jumps?



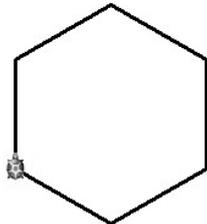
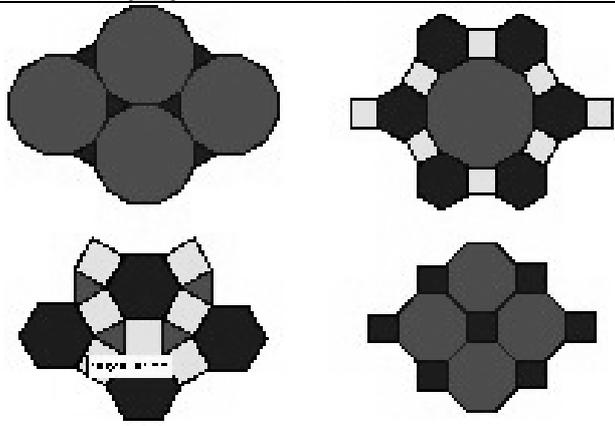
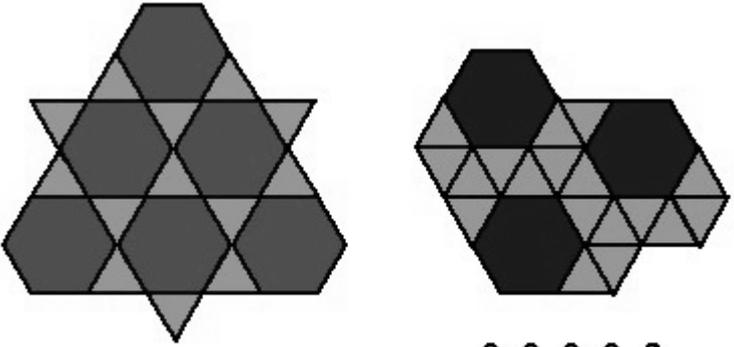
Shapes

Explore, identify, and use pattern and symmetry in algebraic contexts, investigating whether particular cases can be generalised further and understanding the importance of a counter-example; identify exceptional cases when solving problems; make conjectures and check them for new cases.

<p>Shape patterns</p> <p>circle, square</p>	<p>Sorting shapes</p> <p>Venn diagram</p> <p>Carroll diagram</p> <table border="1"> <thead> <tr> <th>symmetrical shapes</th> <th>not symmetrical shapes</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> </tr> <tr> <td></td> <td></td> </tr> </tbody> </table>	symmetrical shapes	not symmetrical shapes				
symmetrical shapes	not symmetrical shapes						
<p>level 1. Level 2.</p>	<p>level 2. level 3. level 4. – symmetrical, right angled</p>						
<p>Shape spotting</p> <p>level 1.</p>	<p>Shape spotting</p> <p>level 1. level 6. – ideal shapes</p>						

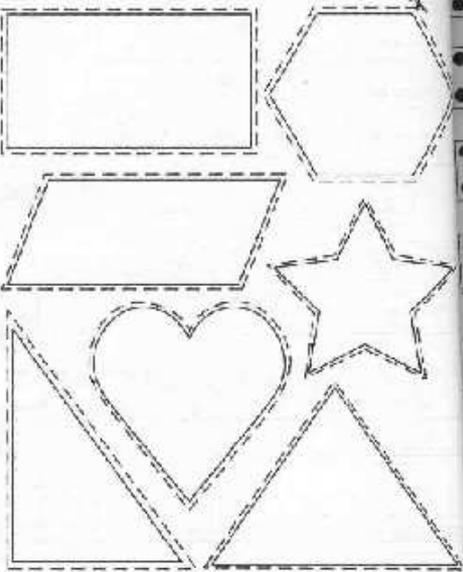
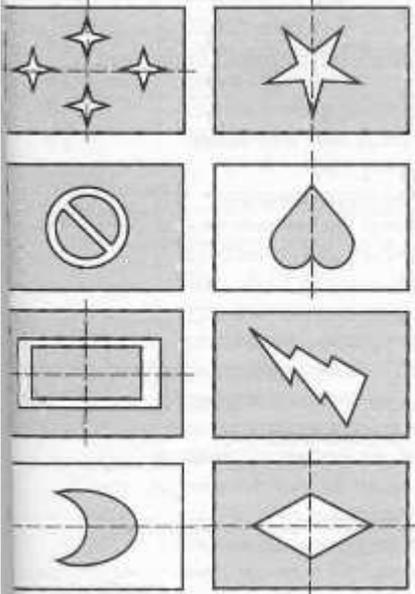
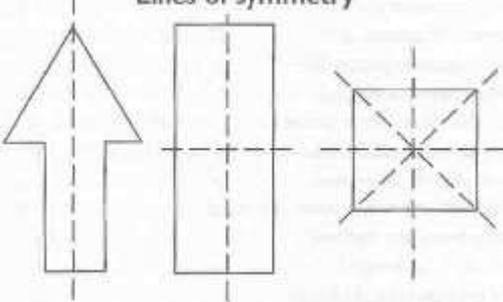
Learning the shape...

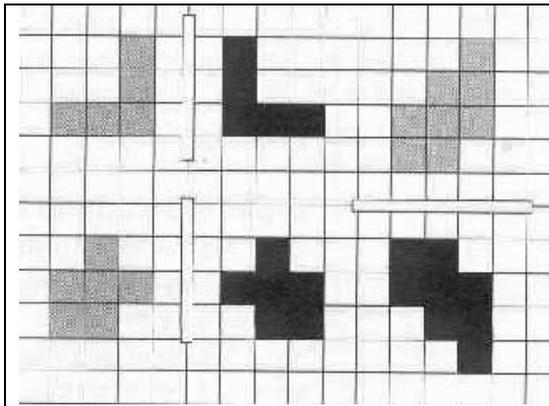
Learning to recognize different shapes, the name them, see the difference...

<p>1. If  +  = 1, what is  ?</p> <p>2. If  +  = 1, what is  +  ?</p> <p>3. If  +  = 1, what is  +  ?</p> <p>4. If  +  = 1, what is  ?</p> <p>5. If  -  = 1, what is  +  ?</p>	 <p>number of sides <input type="text" value="6"/></p> <p>length of each side <input type="text" value="90"/></p> <p>angle of turn <input type="text" value="60"/></p> <p><input type="button" value="draw shape"/> <input type="button" value="hide / show turtle"/></p> <p><input type="button" value="click to show rotation tools"/></p> <p>repeat 6 [fd 90 rt 60]</p>
 <p>http://www.coolmath4kids.com/</p>	 <p>3, 6, 3, 6</p> <p>3, 3, 3, 3, 6</p> <p>http://www.coolmath4kids.com/</p>

Symmetry

- explore, identify, and use pattern and symmetry in algebraic contexts, investigating whether particular cases can be generalised further and understanding the importance of a counter-example; identify exceptional cases when solving problems; make conjectures and check them for new cases
- explore, identify, and use pattern and symmetry in algebraic contexts [for example, using simple codes that substitute numbers for letters] , investigating whether particular cases can be generalised further, and understanding the importance of a counter-example; identify exceptional cases when solving problems

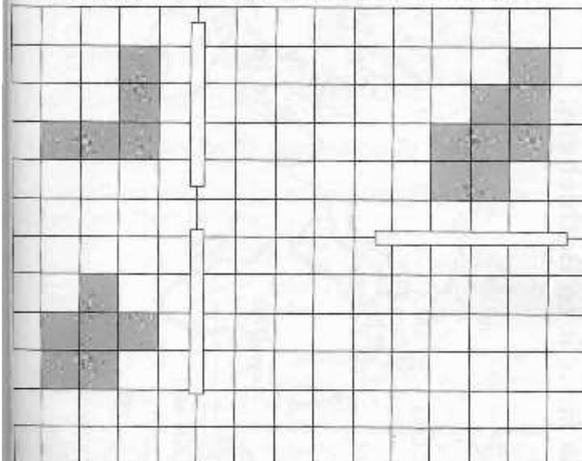
<p style="text-align: center;">Symmetry test</p> <ul style="list-style-type: none"> ● Which shapes are symmetrical? ● Cut out each shape and fold it in half to see.  <p>level 1.</p>	 <p>level 3.</p>
<p style="text-align: center;">Lines of symmetry</p>  <p>level 1. level 2.</p>	 <p>level 3.</p>



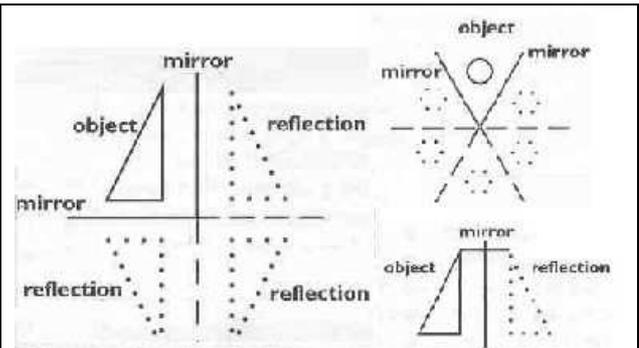
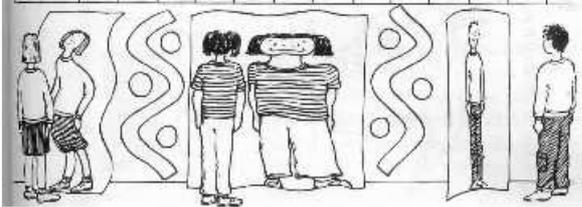
level 3.

Through the looking glass

Draw the reflections of the shapes in the mirrors. Use the grid to help.

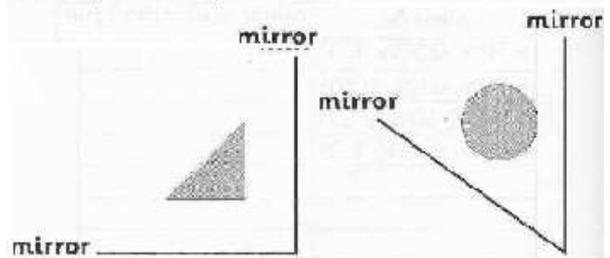


level 3.

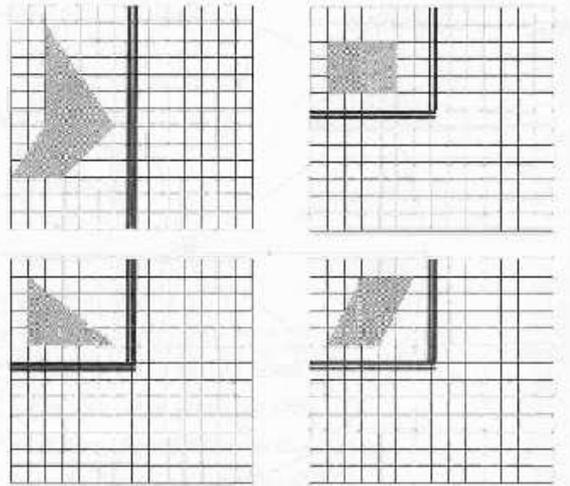


level 6.

Place two mirrors on the lines. Look at the triangle and circle in the mirrors. How many reflections can you see?

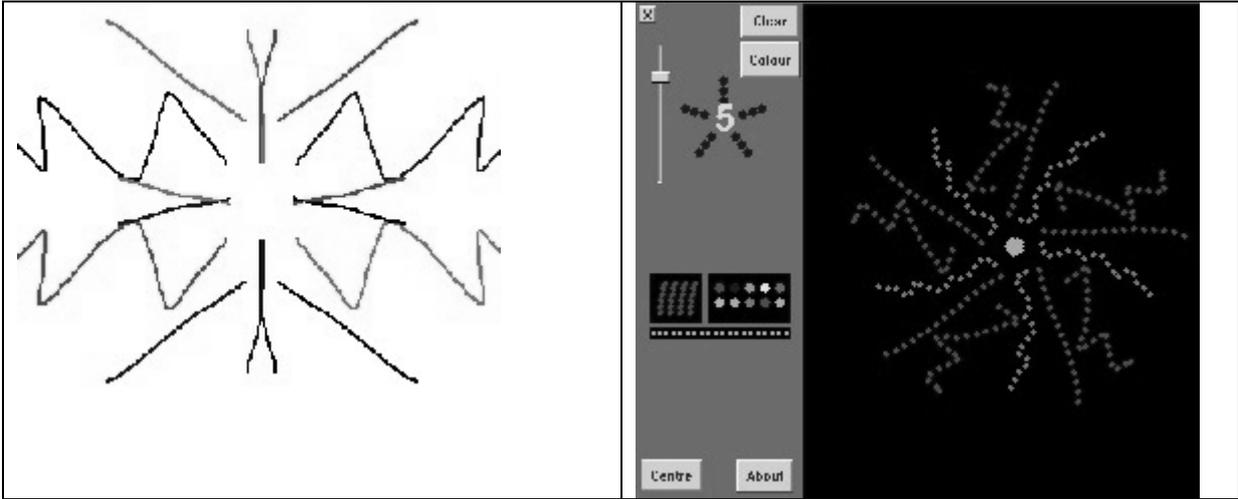


Draw the reflections of the shapes in the mirrors on the grids.



level 6.

Making experiments, playing games.



Temperature

What temperature?

● Look at the thermometer and write down the temperatures of:

boiling water <input style="width: 40px;" type="text"/>	melting ice <input style="width: 40px;" type="text"/>
a hot bath <input style="width: 40px;" type="text"/>	a cold winter's night <input style="width: 40px;" type="text"/>
the human body <input style="width: 40px;" type="text"/>	a deep freeze <input style="width: 40px;" type="text"/>
a comfortable room <input style="width: 40px;" type="text"/>	

● What is the highest temperature shown?

● What is the lowest temperature shown?

● What is the temperature difference between:

- boiling water and melting ice?
- a hot bath and the human body?
- a comfortable room and a cold winter night?
- melting ice and a deep freeze?
- boiling water and a deep freeze?
- a cold winter night and a deep freeze?

level 5.

level 4.

Measuring, and understanding different temperatures.

Celsius Fahrenheit átszámító

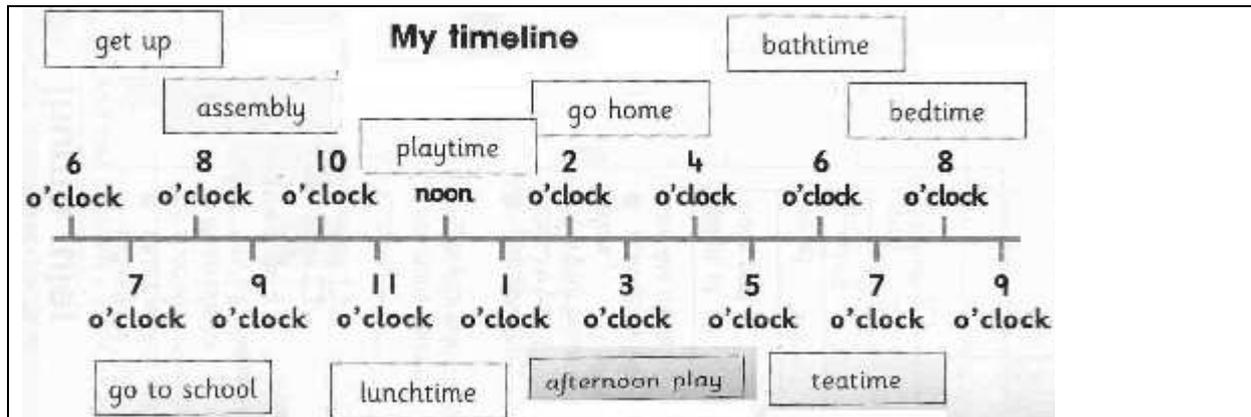
C → F

C F

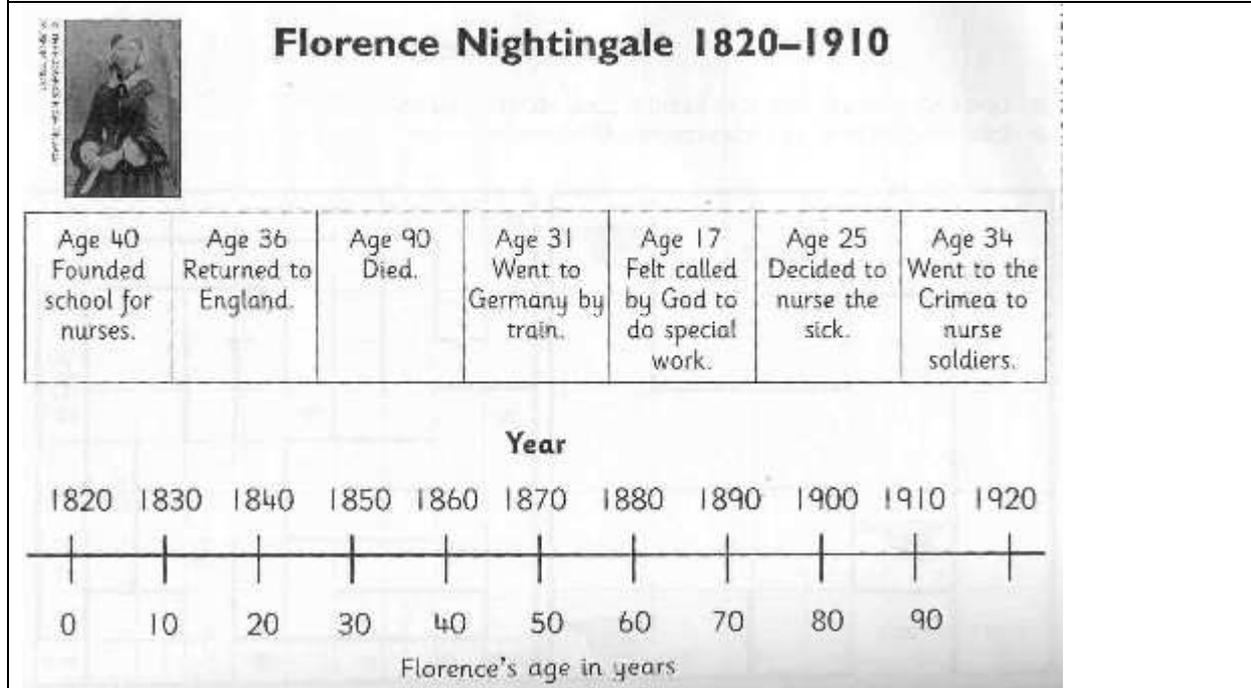
C ← F

What is it in Celsius, and what is it in Kelvin?

Time



level 1.



level 2.

level 3.

3. Write these times on the digital clocks.

:	:	:	:
---	---	---	---

level 1.
level 4.

☛ Fill in the gaps.

60 seconds = minut

minutes = 1 hour

hours = 1 day

days = 1 week

52 weeks =

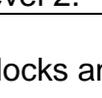
1 year = days



level 3.

Clocks and watches

☛ What times do these clocks and show? Fill in the gaps.

		<input type="text" value="8:00"/>	<input type="text" value="4:30"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
		<input type="text" value="10:30"/>	<input type="text" value="11:00"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
		<input type="text" value="3:30"/>	<input type="text" value="6:30"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
		<input type="text" value="5:00"/>	<input type="text" value="12:30"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

level 2.

From learning to know the time, and use clocks and watches till the using timelines like number-lines...

Click to stop clock



Words for math's

Problem solving

- approach problems involving number, and data presented in a variety of forms, in order to identify what they need to do
- develop flexible approaches to problem solving and look for ways to overcome difficulties
- make decisions about which operations and problemsolving strategies to use
- organise and check their work

Communicating

- use the correct language, symbols and vocabulary associated with number and data
- communicate in spoken, pictorial and written form, at first using informal language and recording, then mathematical language and symbols

Number words and numerals

● Write the numerals.

nineteen	<u>19</u>	twenty-seven	<u>27</u>
fifty-four	<u>54</u>	seventeen	<u>17</u>
seventy-six	<u>76</u>	thirty-eight	<u>38</u>
ninety-two	<u>92</u>	eighty-five	<u>85</u>
forty-seven	<u>47</u>	twenty-one	<u>21</u>

● Write the number words.

16	<u>sixteen</u>	11	<u>eleven</u>
24	<u>twenty-four</u>	33	<u>thirty-three</u>
62	<u>sixty-two</u>	49	<u>fourty-nine</u>
58	<u>fifty-eight</u>	99	<u>ninety-nine</u>
86	<u>eighty-six</u>	71	<u>seventy-one</u>



level 2.



level 1.

level 3. – shape words...

level 4. – numbers up to 10.000

Learning the words for mathematical things, numbers, expressions...

rectangle

circle

square

B D I O Z E P A R T X O E E S T R I A N G L E T G Q L D S S F M W X L M U U H M G E R E A J A L U F S O T C N G H O L P N R A E C E Q T A R E R T E M O D R L O P B U E X A L C C O G E E G N A F E A L D P A S C A H T N G H S G I R O X R O L T Y A A R S O M J L E N T S I N L L T U N I E Y P G G O I N E O I C E S N G L A T Z R K E P P U E N H O R F C W P P W G P S Q R T N L B I H R H C Z X R F E R H O M B U S L I K S W F C K V T G J R L W U C C N V	▲ ANGLE CIRCLE COMPASS CONGRUENT DEGREES EQUILATERAL HEXAGON ISOSCELES LINE PENTAGON POLYGON POLYHEDRA PROTRACTOR RECTANGLE RHOMBUS SHAPES ▼
'Geometry'	Time: 00:03 Found: 0/20
<input type="button" value="New Game"/> <input type="button" value="Solve Game"/>	
http://www.coolmath4kids.com/	

Evaluation

General comments

In certain areas of mathematics education – researchers have managed to build dynamic visual environments with a high level of interaction and visualization. Learners can formulate conjectures in such environments, test and modify them, building their own understandings step-by-step, they concretize their mathematics concepts into meaningful, richly-connected entities.

However most of the indicated environments are closed and their variability is very limited both to educators and students.

These theme ideas could be utilised in a more variable way if they would be open for manipulations and further variations. Furthermore, by providing flexible toy-like objects living in these virtual environments, that obeys the laws of their meaningful functionality, motivation of children would rise nearer to that of playful experiences and allow them to learn important concepts while being involved in a virtual tangible environment.

Documenting and analysing curricula from the developer's viewpoint

When analyzing partners' national mathematics curricula and school textbooks for children aged 8 to 12, we have had several interrelated goals in our minds:

- the main goal of the Trail 1, which is to identify and select concepts, common to different European mathematics education approaches and appropriate for being modelled as interactive building blocks,
- iteratively develop a kind of framework for their **classification, representation and description** as good candidates for general building blocks, useful and reusable in all or most of the approaches in elementary mathematics education,
- iteratively develop a **framework for their prototyping**, generalizing our previous experience with developing visual fractions Logo microworld within the Minerva CoLabs project.

Main observations of the CUB partner (here in the role of the developers of interactive interfaces for children to support their learning processes) within the Trail 1 are:

- all national curricula, math textbooks and other educational materials devoted to this age group are very similar (which supports our strong believe that common building blocks can be identified and prototype in a way useful for different teaching/learning approaches – this assumption will be further investigated in Trails 3 and 4),

- if there are any differences, they are most often (slightly) different sequencing of the topics, (slightly) different prioritizing, giving more space to certain concepts, techniques and skills,
- all educational materials try to be highly visual, colourful, amusing, well structured and balanced, well organized – from the “presentational” point of view as well as from the educational point of view,
- learning materials try to use different graphical items, colours, fonts, marks... etc. to increase the motivation,
- authors of the learning materials try to develop and apply certain “visual schemes” with the goal to facilitate learning processes. Identifying these schemes is very important for our further work within the Trail 2 (which is prototyping visual interactive building blocks as visual programmable objects) because they are closely interconnected with the way how the key mathematics concepts are presented and explored. In a way, these are different styles or settings for presenting concepts, relations, techniques etc. For example, a small squared coloured in red is always used at the place where children are supposed to insert some missing symbol, relation, value, object... etc. We think that these “settings” or styles of presentation are inseparable from the general visual objects or blocks,
- all learning materials tend to use as many as possible examples from real life. They present concepts and relations using cars, trains, boats, balloons, candies... etc. All of these objects however lack at least one part of the goal why they have been used – they are static, not moving, not “developing”, “building” etc.
- all educational materials try to present one concept within the environment of several other related concepts – already familiar to children. For example, when percentages are presented, they are immediately related to decimal fractions and/or ratios etc. Obviously, the goal is to give children complex picture of different representations of identical or related concepts,
- educational materials try (usually with modest efficiency) to present processes, sequences of actions, steps to be taken, actions, dynamic behaviours.
- As an example of such process we can find activities like:
- Position the frog on the number line at the value of 2.5,
- Taken that the frog can jump only by halves and it jumps now from left to the right, let it takes five jumps,
- Where on the number line the frog will end up?
- Such activities are extremely useful and important constituent of the whole learning process, however lack (at least partly) the main reason why they are being used – the dynamism which cannot be really exploited within static media,
- all educational materials are limited in the way how collaborative learning can be involved and exploited. They most usually address an individual learner. Also, the framework of the materials gives very limited space for dynamic, interactive explorations, learning by doing, learning by exploring – individually or within a group of learners.

Building on all of these observations we want to prototype several of mostly often used visual representations and “styles of presentation” to reach the goal of the Trail

2, which is Prototyping visual interactive building blocks as visual programmable objects. We plan to specify and prototype a kind of consistent design and functionality of visual building blocks so that the resulting format will offer high level of interactivity and flexibility.

Aftermath

All building blocks will then be prototyped and instantiated as interactive, manipulable and visual Imagine objects, which may – through their interactive features – support and enhance the process of learning. We will then examine how these prototypes could be used to author computer environments in which children learn about mathematics concepts and relations.