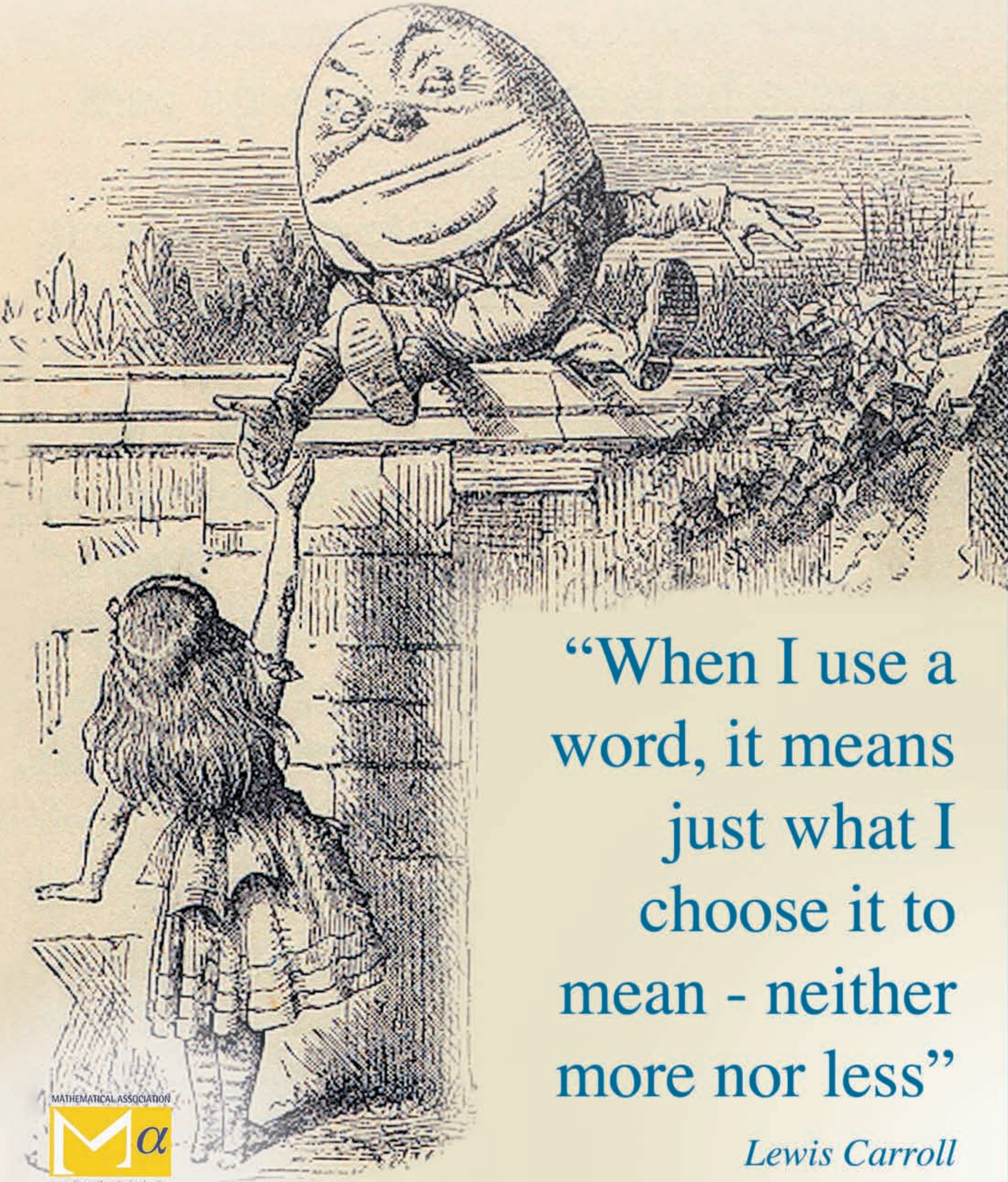
Equals

mathematics *and* special educational needs

ISSN 1465-1254

Vol.10 No.2



"When I use a word, it means just what I choose it to mean - neither more nor less"

Lewis Carroll

MATHEMATICAL ASSOCIATION
supporting mathematics in education

Equals mathematics and special educational needs

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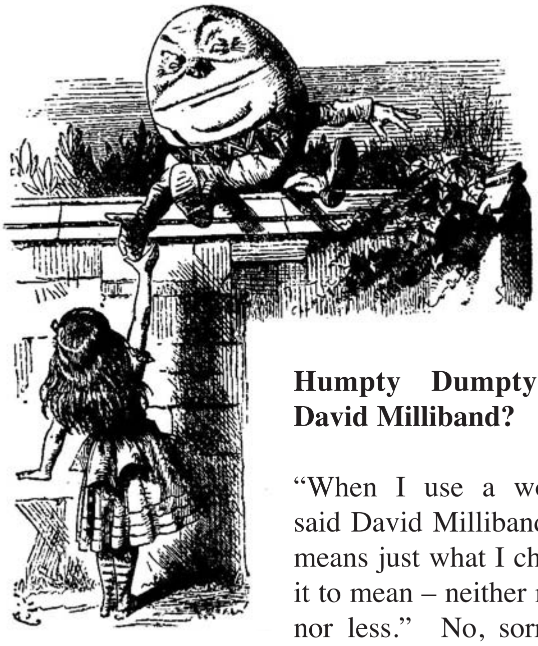
Published by the Mathematical Association, 259 London Road, Leicester LE2 3BE
Tel: 0116 221 0013 Fax: 0116 212 2835 (All publishing and subscription enquiries to be addressed here.)

Designed by Nicole Lagden
Printed by GPS Ltd. Unit 9, Shakespeare Industrial Estate, Watford WD2 5HD



Humpty Dumpty or David Milliband?

"When I use a word," said David Milliband, "it means just what I choose it to mean – neither more nor less." No, sorry, it was Humpty Dumpty who said that.[1] What David Milliband said was that 'personalised' does NOT mean 'individualised' when the Oxford English Dictionary, or any other dictionary for that matter, tells us that the two words are more or less synonymous. Alice, when responding to Humpty Dumpty, wonders whether you can make words have all these different meanings but he assures her that the aim is impenetrability and we have always suspected that is indeed the aim of politicians. However, the one thing teachers do not want to be, at least in the classroom, is impenetrable. The aim of the *Equals* team is to help teachers make their discourse more comprehensible and interesting to their pupils and to suggest materials and activities for their classrooms that make words and numbers come alive. Our view is that the more one can personalise, or individualise the programmes (choose which word you like), the better your pupils will learn. This message comes across most strongly in 'Take 4 Triangular Tiles'.

Special Needs London and more general CPD

Of course both pupils and teachers need listening to if they are to respond and develop in the most productive ways possible and in this issue you will see that the first four items are responses (as we promised) to the questions the *Equals* team were asked during and after our session at Olympia last autumn. There you asked us for useful equipment and Jane Gabb responds with two suggested lesson outlines. Further on, in the reviews, you will find Mark Pepper describing what he does with another piece of equipment. We believe it is important, in order to achieve penetrability of meaning, for teachers to continue to deepen their own understanding of elementary mathematics and Gerry Rosen's, Stewart Fowlie's, and Rachel Gibbons's articles all take a look at the underlying meaning behind some very simple activities. The descriptions of mathematics provided by Ian Evans and A. N. Whitehead may give us fresh insights of what mathematics really is. Tim Bateman on the other hand describes a course providing insight into the particular needs of a certain group of pupils.

Assessment

A third strand in this issue of Equals is assessment. A member of the QCA Assessment Team has given us an insight into the series of tasks they have been developing since 2002 for use in assessing those who seem to be making the slowest progress along the mathematical pathway. Here there seems to have been a real attempt to ensure that assessments made on the basis of these activities are formative and will be of help to teachers in personalising mathematics programmes for the pupils who are assessed in this way. However much many of us may regret the inflexible testing programme that has been introduced by government, we are all aware that formative assessment is the most essential element in effective teaching.

P. S. Win a prize

A reminder to be on the look-out for pieces of work you can enter for the Harry Hewitt Prize (see inside front cover).

[1] Lewis Carroll . *Through the Looking Glass and what Alice found there*, London:Macmillan, 1908 (first published 1871).

Did you know?

Only the patented version [of fluconazole, Aids drug] is sold in South Africa… it was 50 times the price of safe, effective generic versions…As a result of…massive protests 40 of the world's largest pharmaceutical companies have dropped their drug prices substantially…According to the UN more than 2m people have died of Aids-related illnesses this year. In South Africa 5m are infected and at least 150,000 a year are dying of Aids .

Zackie Achmat, S African Aids campaigner, "How to beat the epidemic" *The Guardian* 1.2.01

Take 4 Triangular Tiles:

Special Educational Needs - what are they? and how do we meet them?

Rachel Gibbons follows up some of the questions posed at the *Equals* presentation at Special Needs London last September. She suggests that before looking at How to teach we should explore the Why and What questions presented by our pupils. She explores an activity using 4 triangles to illustrate the point.

We promised to follow up queries that arose at our Special Needs London presentation last autumn. Preparing for that session made us revisit the aims of *Equals*. Reflection of this sort is an essential part of the team's continuing professional development, and something that all teachers should continually be engaged in. Our education should be continuous, a life-long enquiry, continuing those earliest questions framed by the infant:

Why …? What …? How …?

The questions we were asked at Special Needs London were mostly the how questions:

How do you teach X to Y?

But I suggest that is the final question, not to be tackled until after you have answered what? and why?:

What are the special needs of the children in front of us? and

Why should they learn topic Y, Z or W?

The **how** depends on the answers you give to the what and the why and also on the techniques and resources you have at your disposal. HMI when assessing a mathematics education project back in the 80s commented:

> 'The best teachers had **a detailed knowledge of**
> - **mathematics;**
> - **the material;**
> - **and the children;**
>
> they used this knowledge, together with sound judgement and some initiative, to select appropriate and valuable tasks for their pupils.'[1]

We feel that one question in our participants' lists: 'How do you teach multiplication to dyslexics?' has no sensible answer. The comments above suggest that a more appropriate series of considerations would be:

- Firstly, consider the child I have in front of me who, amongst a multiplicity of other characteristics, has been described as dyslexic - what are her capabilities, interests, expectations and achievements to date?
- Secondly, consider the materials that are available including not only the equipment, books etc., but your own understanding of the subject and the child's classmates;
- Thirdly, comes the mathematics – why mathematics? Which mathematics will be of interest/use to this particular child?

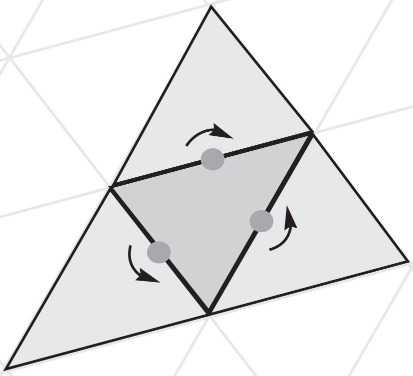
Use the national curriculum as a guide; it has been put together, after all, from earlier proven schemes by people with long years of experience in teaching the subject. But, because it is national, and therefore the lowest common denominator, adaptations have to be made for the particular set of insights, stumbling blocks, etc. found in each child. This is why in *Equals* we aim for a good proportion of articles about general good practice - effective ways of putting mathematics across to anyone anywhere. If children have extra difficulties outside the norm then they need that and much more. In other words, to teach children with special needs effectively you have to be an extra-special teacher. A teacher in a special school told me recently that someone had asked her why she had to have extra training to teach in a school of that sort. Their argument went that because the children she was teaching would not learn as much as other children, then surely, she would not have to know as much as a mainstream teacher. We would argue, however – as she did - that one has to have a clearer grasp of what one knows, a deeper understanding, both of the subject in hand and of the problems being encountered. This is necessary in order to see different ways of getting concepts across to children who have difficulties with learning.

To take an example, if a child has any kind of visual impairment, your presentation of geometry will have to change because the usual approaches involve **looking at** lines, curves, triangles, cuboids, and so on.

I once had, in a fully-sighted mainstream Year 11 class, one boy who had very little sight. The advice I was given by a senior colleague - whose views on education I usually respected - was to treat him like the rest of the class. Well, of course, I could have. But, if I had done, what would he have learned? How does one look at shapes if one has only partial or no sight? And what is one aiming to learn about them in mathematics lessons?

Perhaps it is worth looking at the triangle in more detail because one area of mathematics reported as causing difficulty was 2D and 3D geometry. A lot of experience through the senses does help to form the abstract concepts of geometry and it is useful in the example we are considering to see what the available equipment has to offer in the way of triangles that might help those who have sight problems. Pencil, paper and ruler are of course the first and most universally available materials. Drawing gives physical experience of straight lines and turning though angles of different sizes. If scissors are also handy then you can cut out triangles and move them around and turn them over. Then you can make a set of copies and do some tiling, seeing how they fits together. At this point the child with visual impairment can come in because he can handle triangles that are cut out. Is my set of triangles the same shape/size as yours? My set of triangles fit together exactly, does yours? And yours? And yours? … in other words, comparing experiences around the class is invaluable. The cut out triangles will be of use to the child who is partially sighted because his seeing will be through his fingers. For children who prefer to learn through kinesthetic experiences this approach will also be beneficial. It is useful to gather together sets of tiles, maybe shapes cut out of materials with different surfaces which can be distinguished by touch. The equipment about which Jane Gabb writes (also following up on the questionnaire responses) elsewhere in *Equals* 10.2 should prove useful to those with defective sight. We also need plenty of examples of 3D shapes. Perhaps we should be starting geometry for all with 3D shapes, not only for those who must handle rather than look; after all, we live in a three dimensional world.

Back to our triangles let's take 4 triangular tiles ready-made or cut out of cardboard, stiff card, vinyl or whatever is available. Let's begin to rotate these tiles through a half turn (180º) about the midpoints of each of their sides. To do this the non-sighted students could do with a stack of 4 tiles, 3 of which can be lifted off the pile and rotated into positions next to the original with matching sides touching as shown below:



The non-sighted student can now 'see' the triangles with their fingers, finding out

- what shape combining any one of these repeats with the original has made,
- what shape this combination of the original and its 3 repeats has made,
- what this tells us about the angle sum,
- whether this makes sense in the light of how they have been moved.

And what more can be found out about the relationships between shapes made by combining the four tiles? There are parallelograms to be found and similar triangles, there are sizes to compare – lengths and areas - and … I am sure you can think of much more. For, surely, education is a voyage of exciting exploration rather than the cold transmission of sets of rules.

to teach children with special needs effectively you have to be an extra-special teacher.

Perhaps you will complain that this does not begin to give enough specific answers to the 'how' question but maybe it takes us further with the 'what' and the 'why'. This can make us more generally effective teachers with a deeper understanding of a piece of mathematics, through a simple activity (for the teacher learns too when shapes are manipulated). This can give us a fresh view of some of the materials at our disposal, and a more detailed knowledge of the particular difficulties of the child in front of us.

Then we will be better equipped for our very exacting (but always exciting) task than we were last time round.

Which brings us to the consideration of some of the other questions asked in the questionnaire responses:

- How do you provide fun and inspiration?
- How do you engage them with mathematics?
- How does one move from concrete to abstract?

And this is where the teacher comes in. The excitement, the inspiration and the interest in abstraction must come first and foremost from **you**. Watching David Attenborough exploring the story of amber recently I was enthralled. Why? Well, I suppose I found it a fascinating subject to begin with. But what made it really inspiring was Attenborough's own excitement. So maybe the final questions for every teacher (whatever the subject in hand, whatever the characteristics and achievements of the children in the class) should be:

- How do **I** find fun and inspiration in this activity/exploration?
- How do **I** engage myself meaningfully in mathematics (or any other part of the curriculum)?
- How do **I** move from concrete to abstract?

And here is the rub. So many of us in the classrooms of today have been taught mathematics so badly ourselves that we have failed to catch the inspiration it has to offer. How can we catch the excitement? Perhaps these are questions we can explore further in a later issue of *Equals*.

[1] Team of HMI led by Gordon Barratt, The Secondary Mathematics Individualised Learning Experiment (SMILE) of the ILEA, 1975-6. 1977 (italics mine).

Fulham, London

Nick Peacey has provided the booklist distributed at the *Equals* Session at Special Needs London last autumn

SeNJIT

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Lessons Using Equipment

What resources can you use to make mathematics meaningful?
How do you get spatial concepts across?
How do you move from concrete to abstract?
Jane Gabb presents two lessons that provide some answers to these 'Special Needs London' questions.

Part 1
A lesson using Geostrips

Geostrips are available from many suppliers of mathematical equipment. Each set contains 68 plastic strips of various lengths with regular holes and a box of split pins to join them together. For a class of 30, 3 sets would be needed in order to give each pupil 6 strips.

Objectives:
Use correctly the vocabulary, notation and labelling conventions for lines, angles and shapes.
Identify parallel …….. lines;
Begin to identify and use angle, side and symmetry properties of triangles and quadrilaterals; solve geometrical problems involving these properties

Key vocabulary:
(1) quadrilateral, square, rectangle, rhombus, kite, parallelogram, trapezium, parallel lines, right angle
(2) triangle, isosceles, equilateral, scalene,

Oral/mental starter:
Behind the wall (see centre pages) exposing right angle of triangle. *What could this shape be? Are there any shapes it couldn't be? Why?*
Then expose acute angle of parallelogram and ask similar questions.

Main activity:
Activity using geostrips

Framework for teaching mathematics: Years 7, 8 and 9
Reference: Section 4, pp. 34, 178, 180

Resources: each pupil will need a set of 6 geostrips, 4 of equal length and 2 others, also equal but different from the first 4.
Activity: Introduce or revise parallel lines. On the board, demonstrate the notation for right angles, equal and parallel sides of shape. Show how a square made of geostrips turns into a rhombus.
Draw a square on the board and invite the pupils to come up to the board and label the shape using the notation you have demonstrated. List the attributes they highlight with the accompanying notation alongside.

Repeat with a rhombus if necessary. *If I made a rectangle and pushed it, what would it turn into?* Go through vocabulary (1), asking them to read and describe the shapes. Then they can experiment with a set of strips, sketching the results and labelling them with the name of the shapes and using notation as above.
Mini-plenary: Look at a few of their shapes, encouraging them to discuss properties with their partner in readiness for sharing them with others. Ask them to create a definition for their shape. Choose some pairs to give their definition and challenge the class to name their shape, perhaps making it as it is described so a visual support is available.

After the mini plenary, pupils can make up definitions of shapes they make to challenge their partner.

Differentiation: After the demonstration at the beginning of the main activity, ask how confident they feel about continuing using traffic lights or show of fingers (5= confident, 3= not sure, 1= need immediate help). Support those who are not confident. See reference sheet of quadrilaterals for those who need it.(page 25)
Early finishers: *How many different triangles can you make? Put them in sets of different types.*
Show vocabulary (2)
Plenary: ***What am I?*** **(Could use individual white boards for answers)**

I have 2 pairs of equal sides and 4 right angles.
I have 2 pairs of equal sides which are not opposite each other.
I have 3 sides, 2 of which are equal. What can you tell me about the angles?
I have 3 angles, all of which are equal. What size are the angles? What can you tell me about the sides?
Take down or cover up the vocabulary. Ask pupils to recall any word on the list and describe the shape or explain the term. You could also ask them to spell the word if appropriate.

Part 2:
A lesson using Poldyron or Clixi

Polydron and Clixi are also available from many suppliers of mathematical equipment. They are interlocking flat plastic shapes which can be connected together and then folded to make nets of a variety of 3D shapes. In this lesson only square shapes are used to make nets of a cube.

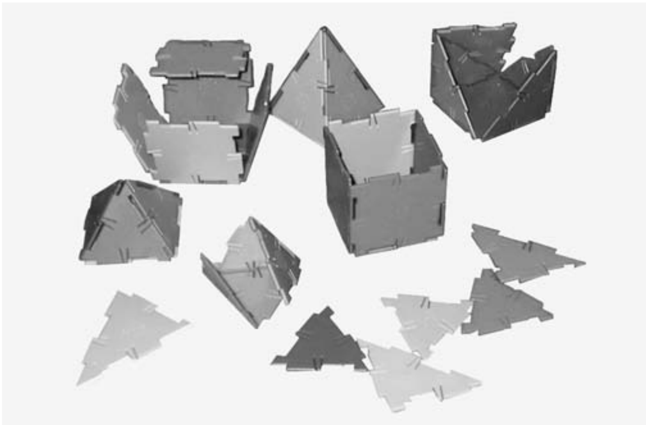
Objectives:
Use 2-D representations to visualise 3-D shapes and deduce some of their properties.
Identify different nets for an open cube.

Key vocab: edge, face, vertex, vertices, net, 3-D shape, cube, cuboid, prism, pyramid, tetrahedron

Reference:
Framework for teaching mathematics from Reception to Year 6 Section 6, p.105
Framework for teaching mathematics: Years 7,8 and 9 Section 4, p. 222

Oral/mental starter:
(Pupils have individual white boards)*What can you tell me about the numbers on an ordinary dice?* [Numbers 1-6. Opposite numbers add up to 7] *On your white board, sketch the net for a cube.* You may need to demonstrate this on the board. *Choose one face to be 5. Write the numbers on the other faces so that when it's folded up, opposite sides add up to 7.*

Main activity
Resources: 5 squares of poydron or clixi for each pupil,. Extra squares need to be available for early finishers and next activity. Large squared paper for class display (or squared board.)
Activity 1: Demonstrate how to use polydron/clixi to make an open cube, then open it out to show the net. Invite a pupil to draw the net on the squared grid at the front. *How many squares will you need to make an open cube? Which square will be the base when it's folded up to make an open cube?* Colour in the base. Give out 5 squares of polydron/clixi to each pupil. With these they try to make as many different nets as possible. When anyone has found a new net they draw it on the "class" record at the front. (see page 2 for teachers' reference of all the nets of open and closed cubes.) There will need to be discussion about what constitutes a 'new' net when reflections are found or nets are presented in different orientations. (The 8 nets are distinct in that they are not reflections or rotations of each other.)
Mini-plenary: *Look at the different nets. Which square forms the bottom of the cube?*
Activity 2: Looking at 3D shapes in more detail. Use a cube to explain the vocabulary face, edge, vertex. Give them another polydron/clixi square so they can make a closed cube. *How many faces? edges? vertices?*



Differentiation: After the demonstration at the beginning of the main activity, ask how confident they feel about continuing using traffic lights or show of fingers (5= confident, 3= not sure, 1= need immediate help). Support those who are not confident. Ask less able to put their net onto the class sheet first.
Early finishers: If any find the 8 nets quickly, give them another square and ask how many nets they can find for a closed cube (there are 11) see page 25.

Plenary
Key questions: *What shape am I describing?*
(1) *It has 6 faces which are all the same.*
(2) *It has 4 triangular faces.*
(3) *It has 6 faces which are all rectangles.*
(4) *It has 5 faces – 2 are triangles, the others are rectangles.*
Invite pupils to pick out a 3D shape and then try and match it to its name. *What else can you tell me about this shape? Can you use the vocabulary (indicate edges and vertices) to tell us about it?*

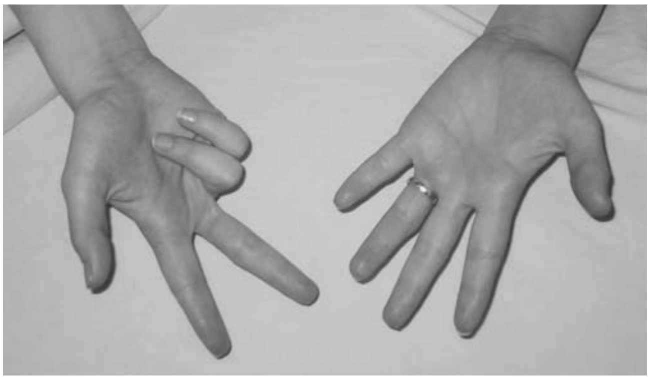
Royal Borough of Windsor and Maidenhead

Pages from the Past

What is mathematics?

not enough fingers

A recent conversation reported to *Equals* by **Ian Evans** between a mother and her 5 year old daughter passing a maths classroom in the High School:



Mother: Do you know what maths is?

Daughter: Yes, its things like 12 plus 11, which is really difficult, because you don't have enough fingers.

'Tis here, 'tis there, 'tis gone'

Alfred North Whitehead (1861-1947) was an English mathematician and philosopher who, from the mid 1920s taught at Harvard and developed a comprehensive metaphysical theory. In his Introduction to Mathematics, he wrote, in 1911, of its abstract nature - its 'not enough fingers' aspect.

The study of mathematics is apt to commence in disappointment. The important applications of the science, the theoretical interest of its ideas, and the logical rigour of its methods, all generate the expectation of a speedy introduction to processes of interest. We are told that by its aid the stars are weighed and the billions of molecules in a drop of water are counted. Yet, like the ghost of Hamlet's father, this great science eludes the efforts of our mental weapons to grasp it-" 'Tis here, 'tis there, 'tis gone " -and what we do see does not suggest the same excuse for illusiveness as sufficed for the ghost, that it is too noble for our gross methods.

The reason for this failure of the science to live up to its reputation is that its fundamental ideas are not explained to the student disentangled from the technical procedure which has been invented to facilitate their exact presentation in particular instances. Accordingly, the unfortunate learner finds himself struggling to acquire a knowledge of a mass of details which are not illuminated by any general conception. Without a doubt, technical facility is a first requisite for valuable mental activity: we shall fail to appreciate the rhythm of Milton, or the passion of Shelley, so long as we find it necessary to spell the words and are not quite certain of the forms of the individual letters. In this sense there is no royal road to learning. But it is equally an error to confine attention to technical processes, excluding consideration of general ideas. Here lies the road to pedantry.

[My] object [here] … is not to teach mathematics, but to enable students from the very beginning of their course to know what the science is about, and why it is necessarily the foundation of exact thought as applied to natural phenomena. …

The first acquaintance which most people have with mathematics is through arithmetic. That two and two make four is usually taken as the type of a simple mathematical proposition which everyone will have heard of. Arithmetic, therefore, will be a good subject to consider in order to discover, if possible, the most obvious characteristic of the science. Now the first noticeable fact about arithmetic is that it applies to everything, to tastes and sounds, to apples and to angels, to the ideas of the mind and to the bones of the body. The nature of the things is perfectly indifferent, of all things it is true that two and two make four.

Thus we write down as the leading characteristic of mathematics that it deals with properties and ideas which are applicable to things just because they are things, and apart from any particular feelings, or emotions, or sensations, in any way connected with them. This is what is meant by calling mathematics an abstract science. …

It is natural to think that an abstract science cannot be of much importance in the affairs of human life, because it has omitted from its consideration everything of real interest. It will be remembered that Swift, in his description of Gulliver's voyage to Laputa, is of two minds on this point. He describes the mathematicians of that country as silly and useless dreamers. … Also, the mathematical tailor measures his height by a quadrant, and deduces his other dimensions by a rule and compasses, producing a suit of very ill-fitting clothes. On the other hand, the mathematicians of Laputa, by their marvellous invention of the magnetic island floating in the air, ruled the country and maintained their ascendancy over their subjects. Swift, indeed, lived at a time peculiarly unsuited for gibes at contemporary mathematicians. Newton's Principia had just been written, one of the great forces which have transformed the modern world. Swift might just as well have laughed at an earthquake.

This possibility of disentangling the most complex evanescent circumstances into various examples of permanent laws is the controlling idea of modern thought.

But a mere list of the achievements of mathematics is an unsatisfactory way of arriving at an idea of its importance. It is worth while to spend a little thought in getting at the root reason why mathematics, because of its very abstractness, must always remain one of the most important topics for thought. Let us try to make clear to ourselves why explanations of the order of events necessarily tend to become mathematical.

...we endeavour to imagine the world as one connected set of things which underlies all the perceptions of all people.

Consider how all events are interconnected. When we see the lightning, we listen for the thunder; when we hear the wind, we look for the waves on the sea; in the chill autumn, the leaves fall. Everywhere order reigns, so that when some circumstances have been noted we can foresee that others will also be present. The progress of science consists in observing these interconnections and in showing with a patient ingenuity that the events of this ever-shifting world are but examples of a few general connections or relations called laws. To see what is general in what is particular and what is permanent in what is transitory is the aim of scientific thought. In the eye of science, the fall of an apple, the motion of a planet round a sun, and the clinging of the atmosphere to the earth are all seen as examples of the law of gravity. This possibility of disentangling the most complex evanescent circumstances into various examples of permanent laws is the controlling idea of modern thought.

Now let us think of the sort of laws which we want in order completely to realise this scientific ideal. Our knowledge of the particular facts of the world around us is gained from our sensations. We see, and hear, and taste, and smell, and feel hot and cold, and push, and rub, and ache, and tingle. These are just our own personal sensations: my toothache cannot be your toothache, and my sight cannot be your sight. But we ascribe the origin of these sensations to relations between the things which form the external world. Thus the dentist extracts not the toothache but the tooth. And not only so, we also endeavour to imagine the world as one connected set of things which underlies all the perceptions of all people. There is not one world of things for my sensations and another for yours, but one world in which we both exist. It is the same tooth both for dentist and patient. Also we hear and we touch the same world as we see.

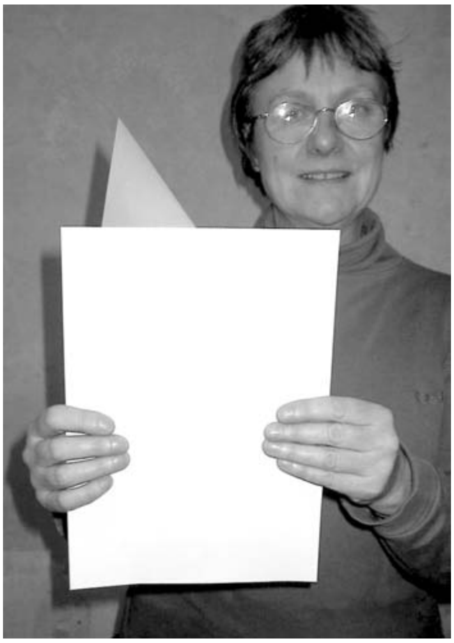
But when we have put aside our immediate sensations, the most serviceable part from its clearness, definiteness, and universality of what is left is composed of our general ideas of the abstract formal properties of things; in fact, the abstract mathematical ideas mentioned above. Thus it comes about that, step by step, and not realising the full meaning of the process, mankind has been led to search for a mathematical description of the properties of the universe, because in this way only can a general idea of the course of events be formed, freed from reference to particular persons or to particular types of sensation. For example, it might be asked at dinner "What was it which underlay my sensation of sight, yours of touch, and his of taste and smell" the answer being "an apple."

But in its final analysis, science seeks to describe an apple in terms of the positions and motions of molecules, a description which ignores me and you and him, and also ignores sight and touch and taste and smell. Thus mathematical ideas, because they are abstract, supply just what is wanted for a scientific description of the course of events.

This point has usually been misunderstood, from being thought of in too narrow a way. Pythagoras had a glimpse of it when he proclaimed that number was the source of all things. In modern times the belief that the ultimate explanation of all things was to be found in Newtonian mechanics was an adumbration of the truth that all science as it grows towards perfection becomes mathematical in its ideas.

Behind the Wall

Conducting discussion about shapes that are only gradually shown to pupils from behind a 'wall' is simple but effective as **Jane Gabb** explains.



The activity requires - and, with practice, develops - good questioning by the teacher. A great feature of this activity is that it allows differentiation as you go : starting with a given objective in mind you can adjust the questions when higher order thinking emerges, or adjust to any difficulties pupils seem to have. You could use the shapes provided on the centre spread or others of your own designing.

How to use behind the wall with different age groups:

Objectives by year (Key objectives in bold)	**Suggested activities & questions**
Year 2 objectives: **Use the mathematical names for common …2-D shapes** **Sort shapes and describe some of their features**	• Behind the wall - any shape with a right angle. Show a right angle **Ask:** *What could this hidden shape be? Why do you think it might be a ….? Could it be a triangle? A circle? A pentagon?*
Year 3 objectives: Classify and describe …2-D shapes **Identify right angles**	• Behind the wall - any quadrilateral (except a rectangle). Show one of the angles – not a right angle. **Ask:** *If I tell you that this is a quadrilateral, what can you tell me about it? Could it be a square? Why (not)? What about a rectangle?* • Show the right angle from the right-angled triangle. **Ask:** *What can you tell me about the hidden shape? Could it be a square? Why do you think that? Is there anything else it might be? Suppose I tell you it is not a quadrilateral – what might it be?*

Objectives by year (Key objectives in bold)	Suggested activities & questions
Year 4 objectives: Describe and visualise ..2-D shapes Recognise equilateral and isosceles triangles **Classify polygons**	• Behind the wall - any triangle. Show one of the angles – not a right angle. **Ask:** *What can you tell me about this shape? Might it be an equilateral triangle? Why do you think that? Could it be an isosceles triangle? Could it be a quadrilateral? What do you think? Do you agree with …?*
Year 5 objectives: **Recognise properties of rectangles** Classify triangles (isosceles, equilateral, scalene), using criteria such as equal sides, equal angles, lines of symmetry Identify, estimate and order acute and obtuse angles	• Behind the wall - any quadrilateral. Show one of the angles – not a right angle. **Ask:** *What sort of angle is this? How do you know? Could the hidden shape be a rectangle? A square? Why not? Could it be a triangle? What kind of triangle could it be?*
Year 6 objectives: Classify quadrilaterals, using criteria such as parallel sides, equal angles, equal sides. Recognise and estimate angles	• Behind the wall - any quadrilateral. Show one of the angles – not a right angle. **Ask:** *What sort of angle is this? About how big is this angle? What kind of quadrilateral might the hidden shape be? What couldn't it be? How do you know that?* Show another angle. *What do you think now? Why have you changed your mind? Can you be sure now?*
Year 7 objectives: Use correctly the vocabulary for lines, angles and shapes. Begin to identify and use angle, side and symmetry properties of triangles and quadrilaterals	• Behind the wall - any shape. Show one of the angles. **Ask:** *What do you think this shape is? Why do you think that? Could it be anything else?* *Do you agree? Could it be a ……..? Why? Why not? Why can't it be a …….?*

Royal Borough of Windsor and Maidenhead

Did you know?

Half the single mothers in Britain according to [a recent study] have no educational qualifications at all... At a minimum wage of £4 an hour a single mother working 35 hours would earn £140 a week. The average cost of a child-minder, according to the same study, is £86.50 a week.
Shirley Williams *Guardian* 11.02.98

In the last 10 years 2,000,000 children were killed in war. Britain is the 3rd largest arms exporter in the world.
Peace Pledge Union 1999

Behind the wall shapes – laminate and cut out.
Use with A4 card – hide most of shape
from pupils and gradually expose it,
asking questions at each
stage

From Simple Beginnings:
Stories about a 5 unit segment and a 3 unit segment
Part 1

Gerry (Gershon) Rosen begins to show how much mathematics is lurking within some simple arithmetic when it is tackled in a practical way

In the world of numbers
five and five make ten,
eight is five plus three
and
two is five minus three.

What could be simpler than that? But it turns out that these simple facts can reveal more mathematics than at first appears. Amazed? You shouldn't be! A novel is a classic if it can be read again and again, each time revealing different and more interesting aspects than before. The same is true of classic works of art. These examples echo spiral learning, returning to a familiar situation and discovering new things about it. Mathematical learning and discovery is also spiral.

One example of how much mathematics it is possible to achieve from very simple and familiar beginnings requires only the ability to repeatedly add and subtract the numbers **5** and **3**.

Each student received two folded pieces of paper as shown. The **bold black** line segment (5 units of length)we shall denote by the letter **b** and the **bold grey** line segment (3 units of length) by the letter **g**.

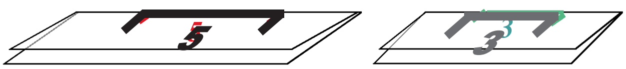


Diagram 1

Diagram 1

The Task: Mark off segments of the following lengths on given straight lines using the black and the grey segment as appropriate:

5 units, 3 units, 8 units, 10 units, 6 units, 15 units, 2 units, 1 units, 4 units, 7 units, 9 units, 11 units, 0 units. Label the ends of the segments with the 26 letters of the alphabet A, B, C….

Performing the Task: Students took to the task with enthusiasm, curious to find different combinations of the two given segments. They helped friends who were having difficulty, and, if they found more than one way of constructing a particular segment, they discussed which way was better. It is interesting to note that each task on the work sheet was, in general, solved independently of previous tasks.

Below are stories of some of the segments by 6^{th} and 9^{th} grades students and by teachers in junior and middle schools.

a) The story of the segment 8 units in length - part 1:
Right from the start the students grasped the idea that with two segments, the second segment begins at the same point that the first segment ends. To construct a segment of length 8 units all that is needed is to add the two segments, but should the second segment be drawn to the right or to the left of the first segment? and should the segments be drawn from right to left or from left to right?

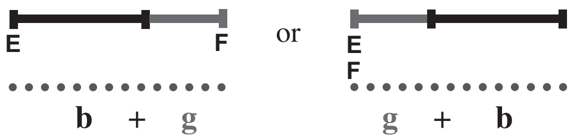


Diagram 2

The arguments given during the discussions and the "proofs" presented to each other showed that it does not matter which segment was drawn first or in which direction the segments were drawn –

i.e. a discussion on the commutative law on a binary operation.

They decided that, as with all things in mathematics, they should work on the principle of "left to right"

b) The story of the segment 2 units in length
The students knew that a two unit segment has to be formed by subtracting the three unit segment from the five unit segment. But how to draw it? They decided to draw one segment with the other one underneath it.. But which to draw first?

Galia and Lior both began by drawing the upper segment from left to right and placing the other segment under the first so that their right hand ends coincided.

Galia began by drawing the longer segment from left to right and then the shorter segment from right to left, beginning where the first segment ended. Lior used the same method but started with the shorter segment. Both stated that they had drawn MN to be 2 units. Galia remarked that she has drawn (5 – 3) whereas Lior maintained that he had constructed (3 – 5).

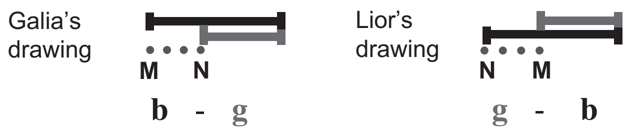


Diagram 3

Sandra drew both segments from left to right, one beneath the other from the same starting point.

Diagram 4

Class discussion had defined algorithms for addition and subtraction of segments and several pupils remarked that these were the same methods they used in first grade with Cuisinere Rods.

As a bonus the comparison of Galia and Lior's methods led to the intuitive result
$|5 - 3| = |3 - 5|$
despite the fact that the students had not yet been introduced **to the concept of the absolute value or directed numbers.**

Galia and Lior subtracted one segment from the other whereas Sandra constructed the difference between the two segments.

In later tasks the students decided to adopt each of the above as appropriate.

Leah suggested another method for constructing a 2 unit segment. She pointed out that 2 was also the difference between GH (10 units) and EF (8 units) and used Sandra's method.

Diagram 4

In effect Leah constructed (5 + 5) – (5 + 3) or in general (b + b) - (b + g) = b - g
Irad noted that it was possible to reduce Leah's extension to Sandra's solution by cancelling the two black segments that were underneath each other. He remarked that in this case the first black segments cancelled each other out. He illustrated the point with the following drawing:

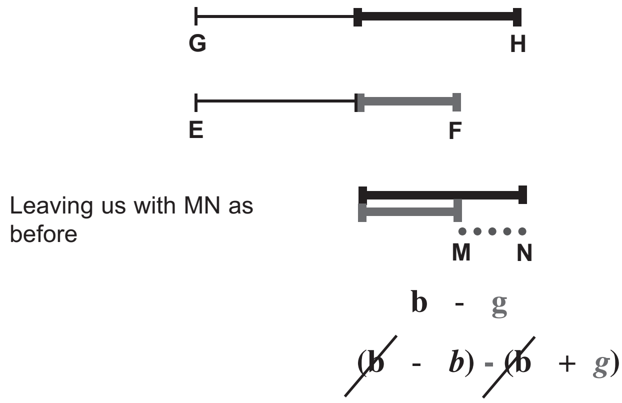


Diagram 6

It is worth noting that **Irad reached this conclusion from his drawing and not from any rules for manipulating algebraic expressions** such as eliminating brackets - minus sign before a bracket, etc.

During the discussion about the two-unit-segment Adam gave further thought to the previous task-drawing a segment whose length was 8 units. But this is another story to be told in the next issue of *Equals*.

Western Galilee Regional High School, Israel

Did you know?

The Cerne Abbas giant is carved in the chalk of the hill above the Sherborne road. The chalk lines are 2 feet wide and are seen for miles. His height is half that of the dome of St Paul's. He equals 30 tall men standing one on the other; each of his fingers measures 7 feet, and the club in his hand is 40 yards.
Arthur Mee, *Dorset* , London: Hodder & Stoughton, 2nd edition, 1967.

Number as a Quantity

Part 1

In the first of two articles, **Stewart Fowlie** argues that children's progress in early number should be understood in its complexity. There are counting, measurement and meaningful addition and subtraction. But there are also pitfalls. A series of activities may help to avoid these, all based on handling NUMBER as a QUANTITY

When a child begins to turn counting into adding, he learns that for example 3 + 2 = 5. His teacher may think he is adding two numbers together, but he is not: he is looking at three objects and two objects and realising that together they make a collection of five objects. He may use a thumb and two fingers to represent the three objects, and two more fingers to represent the two objects. If he has met a number line, he may think of moving 3 steps and then 2 steps, and develop the idea that all the steps must be the same length.

Of course the points representing 1, 2, 3 … on a number line don't *need* to be the same distance apart just as, on a chart showing successive stations on a railway, all that matters is that the names of the stations are in the correct order. The teacher is thinking ahead to learning to measure lengths with a ruler when the numbers must be equidistant.

When a syllabus asks for adding bonds up to ten, what the child is really expected to know is what sorts of things it is meaningful to put together. Thus you can put 3 boys and 2 boys together and get 5 boys, but if you put 3 boys and 2 girls together you get 5 children. If you put 3 boys and 2 books together all you get five of is things beginning with "B". In my experience children know that you cannot take 5 boys from 3 boys (though they may think 3 - 5 is 2), but will have never thought explicitly that whereas you can add 2 girls to 3 boys, you can't subtract 2 girls from 3 boys!

Never add without a context

I would like to suggest that children, as they move on from counting, should never simply be asked to add two numbers together without a context. If they are, they will always use the same model or procedure, and may not develop a full understanding of the concept of addition. For example, all children realise quite quickly that if you are asked to add a larger number to a smaller number you will get the same answer if you add the smaller to the larger (and that is easier to do), but it may not occur to them for example that to add 9 they could add 10 and subtract 1. What I would suggest is that they be invited to solve a problem which involves adding numbers of specific things together, If the teacher wants to ask a dozen questions to practice adding it can be done by giving a table with three columns headed perhaps "number of children in room" " number of children who come in" "number of children there now"

number of **children in room**	number of **children who come in**	number of **children there now**
3	5	?
4	7	?
---	---	--
2	?	9
8	?	3
-----	----	----
?	6	12
?	11	12
------	-----	----
?	10	3 *

First there might be a dozen examples where a value was given in each of the first two columns, an answer to be written in the last column. Then perhaps a dozen where a value was given in each of the first and third columns; then a dozen where a value was given in each of the second and third columns, and finally a dozen with the three types mixed up. Before these questions are attempted, an appropriate number of children in the class should come to the front, to be joined by the number representing those who come in .

This is to make sure the set-up is understood and be visualised. Thereafter any still having difficulty should be encouraged to use cards or counters to represent children. Incidentally, understanding will be enhanced if a few examples are included which are impossible to answer, when a cross should be written instead of an answer. Here an impossible situation would arise if there were fewer children in the room after some have come in than there were before, or if more have come in than there are then in the room: in the former case, it would mean that some had really left the room, in the latter, there is no reasonable explanation. No word or sign to do with adding or subtracting is needed at this stage

A similar exercise with the columns headed “Number of children in room” “Number of children who leave” and “Number of boys remaining” could be presented. The children will see this as quite a different situation. Notice that it never becomes apparent in this example why, if, for example, 8 - 3 is 5, then 8 - 5 is 3 .

Climbing up and down as a model for adding and subtracting

The situation of climbing upstairs might be used: the first column would be the number of steps first climbed, the second a further number of steps climbed, and the third how many have been climbed altogether. A further activity could be based on climbing up and then climbing down. Another might be based on the game “Pass the parcel” with the players arranged in a circle perhaps of five, so that passing the parcel 3 places and then 4 would be the same as passing it 2 places. One might even have a postman delivering letters to houses labelled 1, 3, 5, 7. . . along a street drawn at the top of the page. He delivers a letter to the 3rd house and then to the 4th house after that - what are the numbers of the houses he has delivered to? For the teacher always to use the same model would be as restricting as specifying none and thereby allowing the child to use the same model every time. Examples involving as wide a range of situations as possible should be considered .

After meeting several different situations of this sort, the children should have in their minds the concepts of what we call adding and subtracting, realising what the different situations they have met have in common. After these tasks have been completed successfully there can be meaningful discussion about how everyone got their answers. Only then it will be appropriate to give a name to something everyone knows how to do .

As a follow up, and to give a reason for introducing the +, - and = signs, the use of calculators could be invited to check answers. Where they had to be put in one of the first two columns this should be done by verifying that the number in the first column acted on appropriately by the number in the second column gave the number in the third column .

Here are a few more suggestions for topics:

- Having a few pennies and either being given a few more, or spending a few, and finding how much one then has .
- Change of 5p, 10p, 20p, 50p, £1 when article of different price is bought .
- Going up or down so many floors in a lift .
- Length of a line if one end is at say 6 on a ruler and the other end is at 9. (This is equivalent to how many steps it is from one number to another on a number line).
- Time now (only in exact hours) and what time it will be after so many hours .
- Weight of a birthday card and an envelope in grammes, or of a suitcase and its contents in kilogrammes .
- Temperature going up or down so many degrees .

What we want children to know and understand first is not so much a series of facts like 5 + 3 = 8 but rather to recognise whether or not such a fact is meaningful in a given situation. There are situations where some properties of number apply but not others. For example if people waiting in a queue are given numbered cards, adding two people’s numbers doesn’t mean anything, but subtracting the number of the person now being served from your number tells you how many people have to be served before it’s your turn. If you came 5th in a race for 10 people, how many people were slower than you? has answer 5, but the number faster than you is not 5 but 4. There are also many examples when subtracting doesn’t give the correct answer when you think it should. For example: when you are in your 7th year, are you 7 years old? How many birthdays have you had? If your 7th birthday was in 2003, in which year were you born?

What we want children to know and understand first is not so much a series of facts like 5 + 3 = 8 but rather to recognise whether or not such a fact is meaningful in a given situation.

Teachers’ awareness of the non-examples of addition and subtraction would help children realise the appropriateness of the operations. At what stage children could tackle and recognise non-examples is another issue!

Edinburgh

Teacher Assessment Using Practical Tasks

Whether to assess what pupils know prior to teaching a topic, or to indicate an overall level at the end of a key stage, practical tasks based on everyday objects are best. This is now fully endorsed by the QCA. **Helen Claydon** introduces a new official resource.

Background to the tasks

Since 2002, the Mathematics Test Development Team, under the remit from the National Assessment Agency at the Qualifications and Curriculum Authority (QCA), has been developing a series of mathematics tasks aimed at pupils achieving below the levels covered by the end of key stage tests. These tasks are designed to support teacher assessment of pupils working at levels 1 and 2 of the National Curriculum and cover different topics across the breadth of the mathematics curriculum. The tasks are practical in nature, to minimise reading demand for pupils, and are designed for administering to up to four pupils at a time. Each task activity takes about 30 minutes to complete.

The tasks may be used as tools for formative assessment to identify what pupils know, or misconceptions that they hold, prior to the teaching of a particular topic. Using the tasks in this way can help to inform future planning. The tasks may also be used as tools for summative assessment, either to assess what pupils have learnt after teaching on a specific topic or else in conjunction with other information to provide an indication of the overall level that the pupil has achieved at the end of a year or key stage.

Activities are intended to match the interests and maturity of pupils working at the target key stage. However, teachers may choose to use activities from a key stage different from their own. It is recognised that pupils working at levels 1 and 2 will have a range of different needs and it is not always possible to cater for all of these within a single activity. The activities are therefore intended to be used flexibly and may be adapted to suit the needs of individual pupils.

The tasks currently comprise a bank of 24 activities, available on the QCA website, intended for use at any time of the year with pupils in key stages 2 and 3. The QCA is looking to supplement this bank of activities over a number of years. As part of this process, two new activities will be available on the QCA website from March 2004. There are currently no plans to develop optional tasks for use in key stage 1, since assessment of pupils working at level 1 in year 2 remains statutory through the use of previously published tasks.

Tasks that are based on objects from everyday life

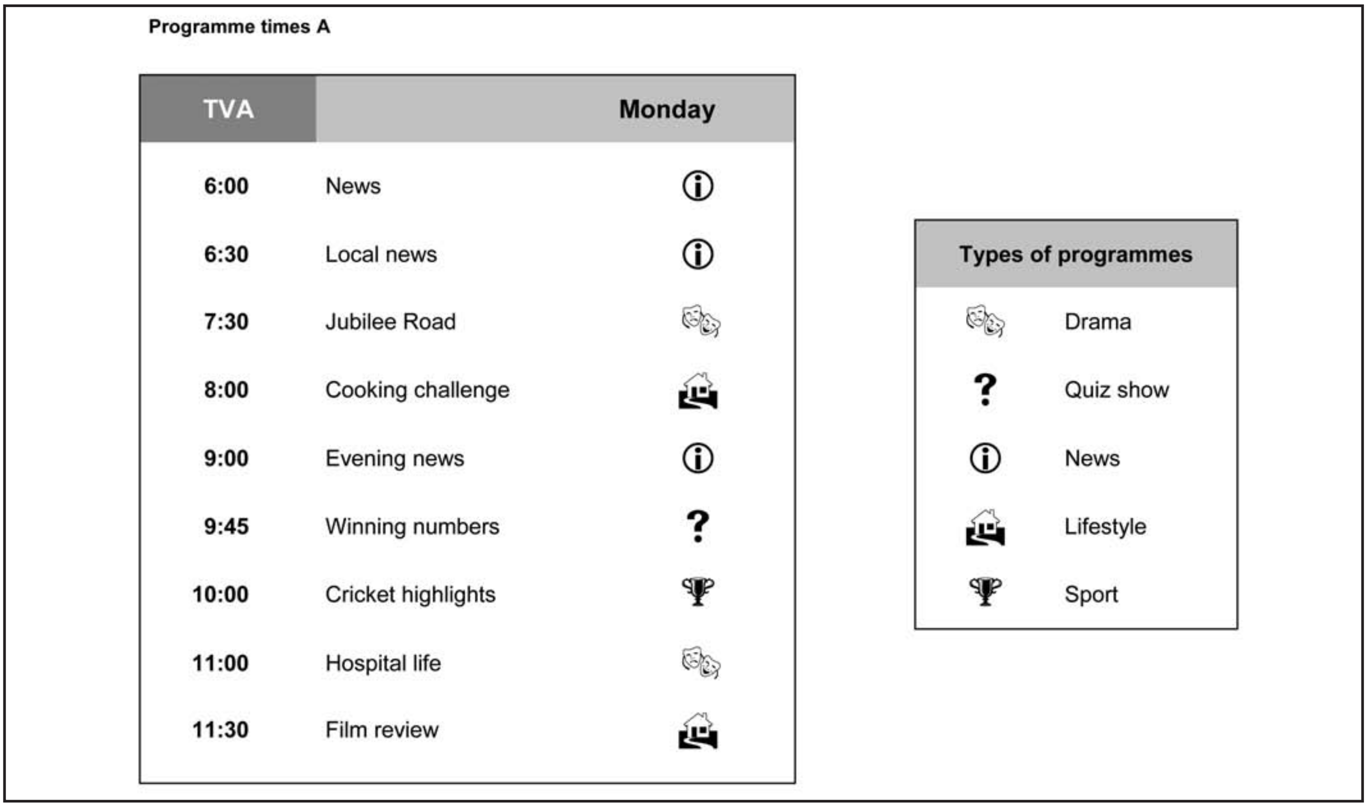
The new activities for 2004, one for key stage 2 and one for key stage 3, both target shape, space and measures and include elements of handling data. They make use of objects from everyday life as starting points. Feedback from trials of the activities showed that using familiar everyday objects resulted in high levels of pupil interest and engagement.

The key stage 2 activity *Everyday objects* uses familiar objects such as tissue boxes and tin cans to assess pupils' understanding of 3-D shape. The activity includes: describing and comparing properties of two given objects; sorting objects into two groups and stating the criterion for the sort; ordering and comparing the heights of 3-D objects; and identifying the number of faces and vertices of a given shape.

The key stage 3 activity *Programme times* uses simplified television schedules to assess pupils' understanding of time. The activity includes: understanding and using the vocabulary *first, last, before and after*; extracting information from a television programme list, by interpreting a key; identifying and reading digital 12-hour times; matching a digital 12-hour time to one shown on an analogue clock face; calculating the duration of a given programme; and finding a programme that lasts for a given duration.

Format of the tasks

Materials provided for each of the new activities include details of the assessment focus, administration instructions, *assessment record tables* on which to record and evaluate pupils' responses, descriptions of



Programme times resource sheet

typical performance for pupils working at levels 1 and 2 and resource sheets for pupils to use during the activity.

For ease of administration, the instructions for each part of the activity are presented on the same page or double page spread as the *assessment record table* (see example on page 20). The administration instructions include a suggested script in italicised text, which teachers are told they can reword if appropriate. A numbering system is used to enable teachers to switch easily between the administration instructions and *Assessment record table*. The *Assessment record table* details expected responses for each instruction from pupils working at levels 1 and 2, along with relevant *Programme of study* references. The table includes space to record the responses for a group of up to four pupils. The completed table may be used to contribute to a record of these pupils' achievements. Once the activity is completed, teachers are supported in making level judgements through the use of descriptions of typical performance for pupils working at levels 1 and 2.

Tasks as starting points for further activities

The tasks may be integrated into classroom teaching using the ideas or resources from the activities to provide starting points for other mathematical activities and investigations. These may target levels 1 and 2, or beyond. Teachers who participated in trials of the key stage 3 activity thought it was easier for pupils to read times than it would be to write them; this could provide a starting point for an extension activity. The teachers also identified that a problem for many children was to demonstrate sound understanding of time at level 3, ie moving beyond times that demonstrate understanding at level 2 such as *o'clock, half past* and *quarter past*; teachers may choose to develop related activities that specifically target level 3. In developing these and other activities teachers may choose to make use of the real television schedules that are found in newspapers and some magazines. As teachers are already aware, it would be possible to tailor the demand of such activities by selecting an appropriate television channel for each individual pupil. For example, some cable and satellite channels show mostly hour long programmes or a mixture of hour long and half hour long programmes, while other channels include a greater variety of programme durations. Suggestions for further topic areas that could be covered using television listing schedules as starting points include comparing programme durations, conversion between 12-hour and 24-hour clock times or hours and minutes, and surveys of favourite programmes or the number of hours of television watched each day, which would necessarily include recording and interpreting data.

The objects used for the key stage 2 Everyday objects activity could be used for activities involving designing packaging, examining and making nets, sorting and classifying shapes using Venn, Carroll and tree diagrams, weight, surface area, volume and capacity, money and shopping.

Teachers' opinions of the tasks

Teachers who participated in trials of the new task activities were given the opportunity to express their views either through the completion of questionnaires or by attending a teacher review meeting. Feedback on the structure of the tasks was generally positive and helped to inform the final layout. Some teachers commented that they were unsure how much support they could give to pupils. Unlike statutory tests, the optional and practical nature of these tasks means that teachers can offer as much support as they feel is needed to enable pupils to complete the activities, although teachers should take this support into account when evaluating a pupil's performance.

The teachers were positive regarding the content of the activities and their suitability for pupils working at levels 1 and 2 of the National Curriculum. They were sometimes surprised by the level of achievement demonstrated by their pupils on the shape, space and measures activities. Indeed, one teacher commented that when levelling pupils we tend to be influenced by their ability in Ma2 (Number), although they are often more able in Ma3 (Shape, space and measures). Using these tasks can help to demonstrate a pupil's varying abilities across the different topic areas.

Part 1: Vocabulary related to programme order

This assesses pupils' understanding of the vocabulary *first, last, before* and *after*.

Say to the pupils:
'*You are going to use your sheet to find some television programmes*'.

1.1 Say to each pupil in turn:
'*Show me the first* (or *last*) *programme on your sheet*'.
(You should alternate the question for each pupil.)

1.2 Then, for each pupil in turn, point to a programme near the middle of their sheet and say:
'*Show me the programme that comes just after* (or *just before*) *the programme I am pointing to*'.

1.3 For each pupil in turn, point to a different programme near the middle of their sheet and say:
'*Show me the programme that starts when this programme ends*'.

			Names			
Part	**What to look for**	**Level**				
1.1	Indicates the first (or last) programme on their sheet. (1.1 allows children to demonstrate performance at level 1 only.) (1/Ma3, 1d, 4a)	**1**				
1.2	Indicates the programme that comes before (or after) a given programme. (1.2 allows children to demonstrate performance at level 1 only.) (1/Ma3, 1d, 4a)	**1**				
1.3	Indicates the programme that starts when a given programme ends. (1.3 allows children to demonstrate performance at level 1 only.) (1/Ma3, 1d, 4a)	**1**				

Administration instructions

Teachers who trialled the activities with children who have special educational needs often considered that the activities were suitable to present to their pupils without a need for adaptations. Changes that were made for these pupils usually involved administering the tasks on a one-to-one basis, repeating or rephrasing instructions, or enlarging resource sheets.

In many classrooms, both activities generated a large amount of pupil discussion, which often extended beyond the content of the activities. The teachers felt that this had the benefit of camouflaging the key mathematical responses and therefore reduced opportunities for copying. Also, teachers commented that pupils who did not know the relevant mathematical vocabulary were not excluded, since they were able to participate in the task at a lower level using everyday language.

The activities described in this article can be downloaded from the QCA website at www.qca.org.uk/ages3-14/tests_tasks/.

QCA Mathematics Test Development Team

Prof. G. Mesibov, TEACCH* and pupils with Autism Spectrum Disorders

After attending a three day Seminar, organised by the National Autistic Society, in Nottingham, **Tim Bateman** wants to 'spread the word' about TEACCH, a child-centred approach to educating pupils with Autism Spectrum Disorders (ASD).

In the 'early years' of the analysis of autistic behaviours, blame for the condition was attributed to parental rejection. Mothers were labelled as 'refrigerated', unable to give their children 'natural' levels of affection, and hence being 'responsible' for their children's development of an autistic condition. Fortunately, some analysts who believed this to be untrue, misleading and unhelpful to the parents involved, undertook research to try to establish that children with ASD had some form of neurological, developmental disorder.

They established that people with ASD had strong visually based skills but were weak in organisational skills. The researchers decided to utilise these findings and developed educational methods which create a highly organised, visually based structure to the pupils' learning. Activities are related to the special, narrow, interests that the child finds motivating. The learning is structured so that the pupils know:

a) **what** to do
b) **where** to do it
c) **when** it will finish and
d) **what** to do next.

These are not general 'schedules' (time tables to us), but are individualised at their level of understanding for each pupil. They range from detailed written lists containing subject, place, teacher-in-charge and time throughout a given day, to coloured cards with photographs of two activities.

Instructions are also given as to what is expected of the pupil on reaching the given place. These again range from details of written activities to coloured cards (the pupil's 'favourite' or known 'identifying' colour) each with a photograph of an activity. All these are to be found within a box at a known place within the classroom – the pupil's 'workstation'.

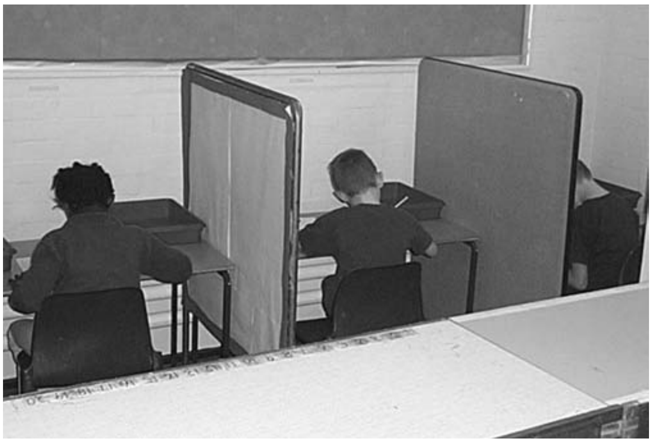
Some people have claimed that TEACCH methods are a type of behaviour modification. Professor Mesibov refutes this claim on the grounds that the methods devised for the TEACCH programmes are based on the primary learning principle of 'meaningful tasks'. The overall aim is make pupils independent of input or direct support from others through a long term structured approach based at the level of understanding that the pupil currently has.

The aim is to bring order and predictability to the over-loaded world of the pupil with ASD.

During the second day the emphasis of the seminar moved from the explanation of the methodology of structured teaching, to how it was used in supporting and developing pupils' communication and independence skills. This led to examples of how these could be utilised in social and leisure activities, and eventually to proving these skills to be so strongly absorbed by the individuals that they were able to work successfully in the 'outside world' of professional employment.

The use of schedules to enable people to follow a structured, familiar routine was seen to be effective and efficient in utilising the talents of people with ASD.

Professor Mesibov used several examples to establish the notion that the main difficulty that people with ASD have with communication is not simply a lack of language, but a lack of communicative intent.



People with ASD, in essence, do not see the point of talking.

The first steps in enabling the pupils to gain a greater degree of independence whilst still relying on their schedules are achieved through adding elements of choice and the idea that a change to the routine was 'Okay' if you knew it was going to happen.
To help to 'socialise the pupils the normal use of 'please', 'thank you', 'hello' and 'goodbye', was encouraged. It was pointed out that these very fundamental social initiations are cornerstones of how we create a positive rapport with people that we do not know and, in fact, how we maintain that established rapport with people that we do know. When you ask, use 'please'. When you receive, use 'thank you'. When you enter, say 'hello' and when you exit, say 'goodbye'. These are very structured, very simple, but also very important ground rules for those to whom initiating conversation is essentially pointless yet who need to interact with people in the outside world if they are to gain employment in the commercial sector.

It was good to see video footage of people with ASD, who had been educated using the TEACCH methods, working in a variety of commercial settings. They were examples of the most fundamental focus in education. They were acting independently. They were completing useful, meaningful tasks efficiently and effectively. Many employers were delighted with their efforts and their reliability. They did need support and understanding from the employers and, to some extent their tutors, but this, intrinsically, extends the understanding of autism in communities. Even the need for support should be seen in this positive light.

On the last day of the three-day seminar, Prof. Mesibov gave an overview of diagnosing autism. This is an extremely complex issue, and I would strongly advise anyone interested in this aspect of autism to consult an expert. However, I will outline some of the main points, as I saw them.

The Professor drew a line to represent the entire population (all people). At the right hand end he marked a subset in which he put people with Classic Autism.
12 attributes are used in an early diagnosis of Autism, 4 from each of the 3 parts of the Triad of impairment. If a child displays 6 or more of these attributes then they are deemed to 'display' classic autism. Those with less than 6 but more than 2 have 'atypical autism', and those with 1 or 2 of these '12' are often referred to as 'Aspergers', or those displaying mild forms of social communication impairment.
The term 'autistic', however, has other descriptions. 'Pervasive Developmental Disorder Not Otherwise Specified' is one of them. This, in essence, seems to mean 'a pervasive developmental disorder that is not any other known syndrome'. I don't like this idea at all, as it suggests that if there is anything 'wrong' with a person that you cannot classify as a known disorder, you can claim that the person is autistic, or at least a member of those who have ASD, or are on, or part of, the autistic spectrum. This idea may be relevant to the significant rise in numbers of especially young people who are 'diagnosed' as 'autistic'.

Professor Mesibov reminded us that Autism does not preclude any other syndrome.

Autism Phenotype subset of the whole population, members of which did not display any of the characteristics of autism. These were people who may be genetically predisposed to producing offspring who would be part of the set that displayed attributes consistent with them having Autistic Spectrum Disorders.

Before the final summary we were able to view a short video giving examples of how evidence of ASD might be accrued. PEPs[1] and AAPEPs[2] (an adult version) involved a series of tasks given to children of primary and secondary schooling age.

The efforts of those taking the tasks were classified as 'passed', 'emerging' or 'failed'. It should be acknowledged that those administering the tasks were given a considerable degree of discretion in using the term emergent. Credit was given to any recognisable attempt to comply with the task given.

It is hard to come away from a seminar such as this without a strong feeling of awe. Professor Mesibov is awesome in his handling of this complex educational issue, especially to such a diverse audience. He was still enthusiastic yet calm in his delivery after some 12 hours of speaking.

He was well supported by his colleagues from North Carolina and those attending from the National Autistic Association.

Queensmill School Fulham, London

* Treatment and Education of Autistic and related Communication handicapped Children

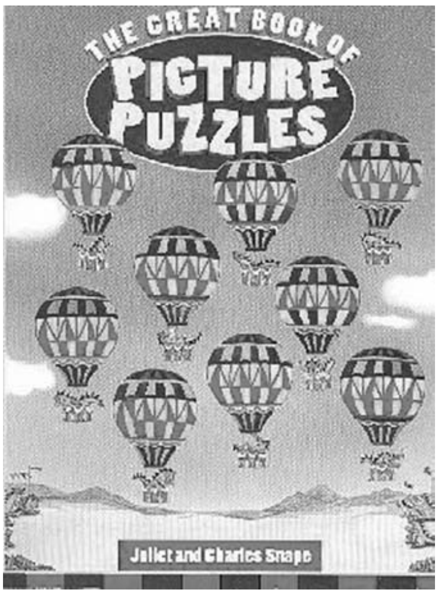
1. Psycho-Educational Profile
2. Adolescent &Adult Psycho-Educational Profile

Reviews

Review by Tim Bateman

Counting Mazes, Electric Mazes and the Great Book of Picture Puzzle; by Juliet and Charles Snape.

This trio of problem solving books are visually very stimulating, and, of course, mentally challenging.
The challenges vary in difficulty, between and within the books. The simplest, to my mind at least, are in the Counting mazes book.
This book is a good starter for problem solving.
The pictures are large and uncluttered. The writing is easy to read and the instructions are clear.
The topics are varied: counting and number recognition, shape, fractions, odds and evens, and plus one/two.
The Great Book of Picture Puzzles also has a varied package of mental challenges.



They are all well presented and use several concepts within mathematics. These range from mazes through volume and area to spatial awareness. Other pages are journey challenges. These are multi-task problems, and hence move the readers into the realms of data-base organisation if they are to be successful without repeating the journey.

The most visually stimulating book is ELECTRIC MAZES.
This book again gives varied challenges. The task set is common, find your way from A to B; but the visual challenges are wonderfully given. Each page gives at least one fresh problem, though the difficulty of where to start is often an annoying constant!

I recommend these books as mathematical stimuli suited to the primary age group, and above. At least they should be part of the school's mathematics section in the library. Better would be allocation to each class library. The ideal would be for them to be time-tabled as part of the 'Problem Solving' curriculum.

Queensmill School, Fulham, London

City dwellers urged to aid sparrows

Monitoring in St James's Park has seen sparrow numbers fall from around 2,500 in the 1930s to just eight at the last count - but there is no clear reason for the drop.... People can help sparrows by providing food in the winter and managing ...gardens in a way that means an abundance of insects in the spring.
The Informer 10.11.03

Review by Nick Peacey

The Curious Incident of the Dog in the Night-time by Mark Haddon, (Jonathan Cape 2003)

> 'Mr Jeavons said that I liked maths because it was safe. He said I liked maths because it meant solving problems, and these problems were difficult and interesting, but there was always a straightforward answer at the end. And what he meant was that maths wasn't like life because in life there are no straightforward answers at the end. I know he meant this because this is what he said.
> This is because Mr Jeavons doesn't understand numbers.'

Mr Jeavons is one of Christopher's teachers. Christopher is the narrator, hero, mathematical brain and great detective of this remarkable book.

Much has already been written about The Curious Incident of the Dog in the Night-time. You will probably know that Christopher has Asperger Syndrome and that the author has done everything possible to write the book in 'Asperger mode' and with empathy for Christopher's view, an extraordinary perspective on the ordinary.

The attempt on this perspective sometimes means the style is a little flat, with plenty of 'and', 'but' and 'so'.

> 'But I knew I was going to be sick this time so I didn't sick all over myself and I was sick onto the wall and the pavement, and there wasn't very much sick because I hadn't eaten much. And when I had been sick I wanted to curl up on the ground and do groaning.'

Then again, when you turn the page and find Christopher displaying yet another classic Asperger symptom you can feel you are attending a rather superior in-service session: examples of each part of the Triad of Impairment used in diagnostic testing for autism appear in the text, though they are not specified as such. I read The Curious Incident of the Dog in the Night-time commuting to work on bus and tube. The book was so enthralling that I rationed myself to reading it as a shield from mass transportation and was sad when it came to an end. Above all, it is a terrific story. Powerful characters and plenty of surprises await Christopher on his way to success through fears and uncertainties. The author's humanity, commitment to the celebration of difference and gentle sense of humour infuse the narrative.

As a further bonus for *Equals* readers, the hero's love of mathematics is also woven through the story, the design, (not least through the fine illustrations) and even into the chapter numbering. The author also gives an explanation of the Monty Hall Problem, not only in mathematical terms for the purist, but also in terms of a flow chart for those of us who think in pictures and words.

If you have read *The Curious Incident of the Dog in the Night-time*, it must nearly be time to read it again. If you haven't read it, please consider doing detecting with Christopher soon. You will not regret it.

Review by Mark Pepper

Extreme (ISBN 097 14 08370 Price £19.95)

I have played *Extreme* with several of groups of pupils and, despite initial reservations that it might be rather mundane, it has invariably proved popular.

The game consists of two sets of question cards and several counters. In one set, each card has a series of five questions on an area of mathematics such that question 1 is the easiest and question 5 is the most difficult. All cards in the other set are labelled with a cross on the back and a question on the front. Before starting, the cards are set out in two piles.

Players throw dice to move round the colourful game-board on a circular track made up of squares labelled either with a number from 1-5 or a cross. When a player lands on a number s/he is asked a question with that level of difficulty: if you land on a 3, you will be asked question 3 on the card on the top of the first pile. If you answer the question correctly you move the corresponding number of places.

If a player lands on a cross, s/he answers the question from the pile of cards with crosses on their backs. If the question is answered correctly, then the player keeps the card. The winner of the game is the player who wins an agreed number of cards and then crosses the finishing line first.

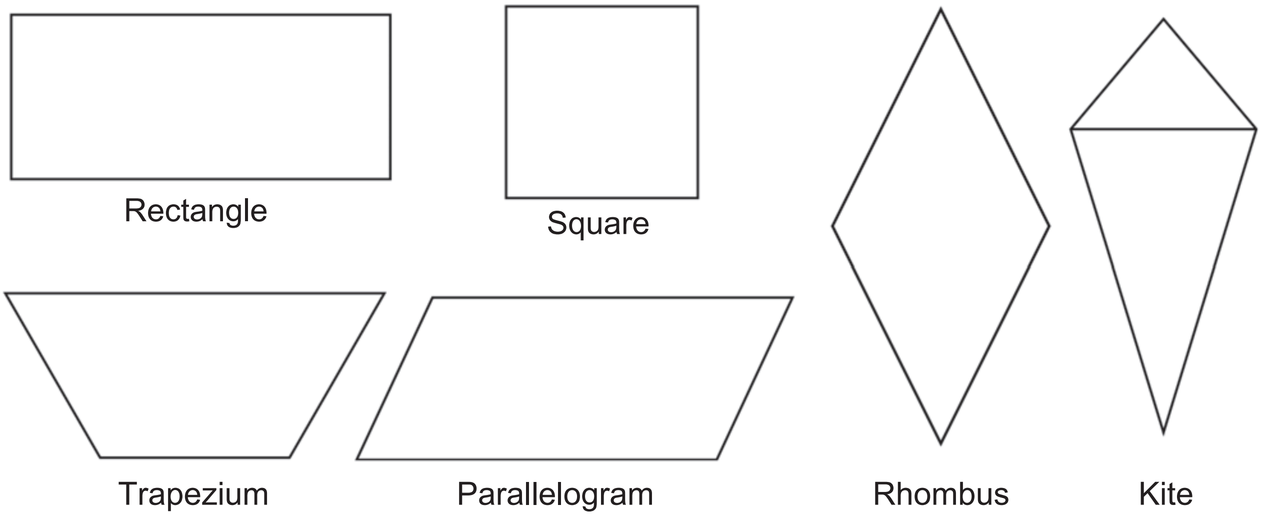
It is disappointing that the box is prominently marked with the words Age7+. This has a negative effect on students who are considerably older than 7 and yet the game is appropriate for them.

The cards cover a wide range of topics including decimals, fractions, square roots and rounding up. There appears to be a lack of consistency in the degree of difficulty of the questions. There are instances where question 1 of one area of mathematics is considered by my students to be as difficult as question 5 of a different topic.

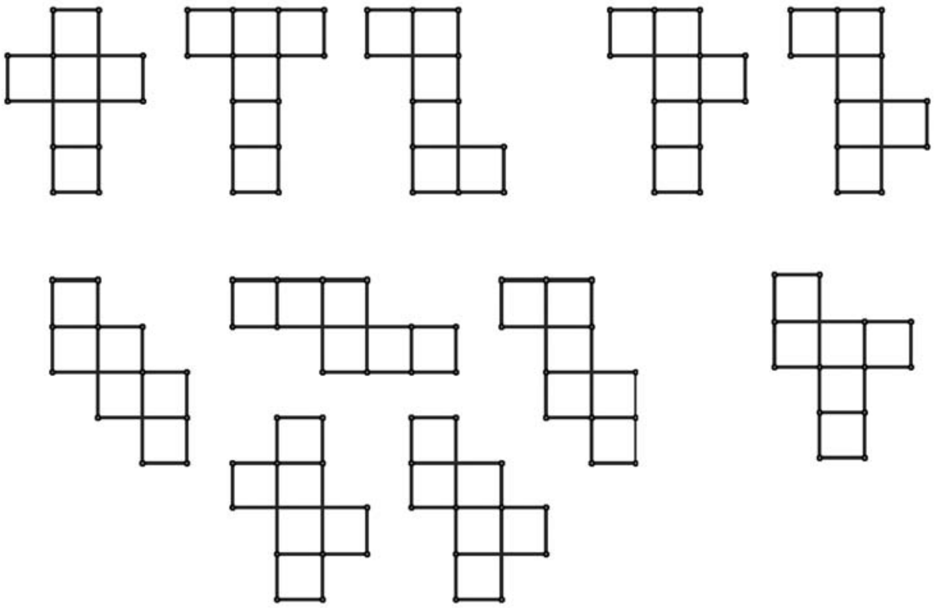
The game has the potential to be played in different contexts. At my school, which is a special school, I often use it as a mental mathematics starter in which small teams compete. The students are encouraged to give reasons for their answers, which often results in fruitful discussion. In a mainstream context, small groups of students could play the game independently. I strongly recommend this game for use in mainstream and special schools.

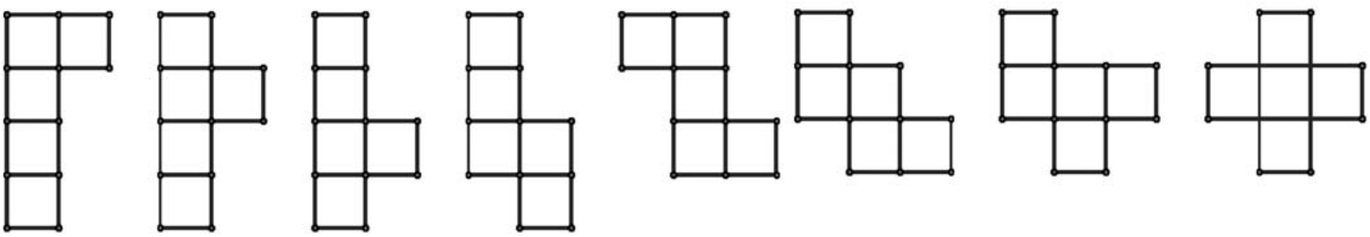
Linden Lodge School

Additional reference sheet (see page 6)



Nets of an open cube (see page 7)





Don't forget

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Celebrate the success in *Equals* – your pupil could win the Harry Hewitt prize - worth £25 - and a certificate.

HOW?

- Send to ***Equals*** a piece of work from your pupil that you and the pupil consider successful.
- Accompany it with an explanation of how it arose together with a description of the difficulties which the pupil has overcome in doing it.
- Give details of the pupil's age, year in school and the context of the class set or stream.
- Please send the original piece of work so that we can print it in *Equals*
- Entries must be submitted by 30 June 2004

Address for entries:

The Harry Hewitt Prize 2004,
Equals Editorial Team, 3 Britannia Road, London SW6 2HJ

e-mail: equals@chromesw6.co.uk

The winning pupil's entry will be printed in *Equals* with the teacher's commentary.

We are looking for any piece of work in mathematics that demonstrates success where a pupil has previously struggled. This might be anything from mastery of the simplest arithmetic algorithm to solving a problem or using a resource to understand a piece of mathematics or being motivated by a computer program to do something they wouldn't normally have attempted. We will publish all the best entries. All we ask in addition to the pupil's work is that you write a brief piece putting the work in context. We look forward to receiving your entry! The aim of *Equals* is to help teachers to reveal the excitement and applicability of mathematics to pupils who have in the past found it inaccessible and irrelevant.