Guidance for Summer Numeracy Schools

Set 4

To support session 6
Informal mathematical activities

This section comprises eight units of informal mathematical activities. These units are intended for use in the 90-minute afternoon sessions of the summer numeracy school programme. The units give a brief outline of the activity, indicate the resources you will need and suggest timings. Some make links to the objectives from the *Framework for Teaching Mathematics*.

It is up to you to choose the most appropriate activities for the pupils attending your summer numeracy school.

Some games and activities are dependent on commercial software and other material. Where this is the case, we provide both details of the software and the material and where they can be purchased. The decision to use these rests with the summer school.

The units cover:

Unit	Activity	Objectives
4.1	ICT	will depend on the programs chosen
4.2	Cooperative games	will depend on the activities organised
4.3	Cooking	• use, read and write standard metric units for mass and capacity • know imperial units • know rough equivalents of pounds and kilograms, ounces and grams, litres and pints • suggest suitable units and measuring equipment • record estimates and readings from scales to a suitable degree of accuracy • solve simple problems involving ratio and proportion
4.4	Data handling	• solve a problem by extracting and interpreting data in tables, graphs, charts and diagrams
4.5	Mathematics trail	will depend on the clues used but could include: • recognise positions and directions • use the eight compass directions N, S, E, W, NE, NW, SE, SW
4.6	Educational broadcasts	will depend on the topics covered by the programmes selected
4.7	Visits and outings	will depend on the topics covered on the visits
4.8	Plans and models	• use, read and write standard metric units for length • convert smaller to larger units • know imperial units of measurement • suggest suitable units and measuring equipment to estimate length • calculate the perimeter and area of simple compound shapes

Resources

A list of the resource materials you will need is given for each activity. Other resources will be provided by the Summer Numeracy School. Details are given in the chart below.

Units	Resources provided with the unit	Resources to be provided by the summer school
4.1	none	• ICT suite including Internet access • software as selected
4.2	• Sheet 4.A: 'Towers of Hanoi' • Sheet 4.B: 'Frogs' • Sheet 4.C: 'Matchstick puzzles' • Sheet 4.D: 'Tangram egg' • Sheet 4.E: 'Chinese number jigsaw' • Sheet 4.F: 'River crossing puzzles'	• sports hall or playground • hoops, buckets (optional), bean bags, small balls (optional), target boards, large straws • 'Towers of Hanoi' made of sticks and foam rings
4.3	• Sheet 4.G: 'Recipes'	• access to food technology area • ingredients for chosen recipe • equipment such as scales, measuring jugs, spoons, whisks, rolling pins and cutting shapes
4.4	none	• sports hall, playground or local surroundings • catalogues for clothes and furniture • local transport timetables • magazines with television schedules • newspapers with weather tables, sports scores
4.5	none	• local surroundings, map of the local area • measuring equipment such as string and rulers, compass (optional)
4.6	none	• large-screen television, video recorder • educational videos with teachers' notes as selected
4.7	none	• bus hire information or local transport timetables and prices • information on maths trails and exhibitions at local museums and parks • information on school visits to local supermarkets
4.8	none	• tape measures, rulers, pencils, paper, thin card, glue

During your informal mathematics sessions, make the best use of the staff and resources available to you. You could organise the afternoon so that the pupils:

● all do the same activity on each day but in smaller groups

● work through a carousel of two or three activities, each for 30 to 45 minutes

● work through a carousel of two or three activities over a number of afternoons.

Since one of the aims of summer schools is to ease the primary–secondary transition, you may choose to make use of some of the school's specialist facilities such as:

● ICT suite

● art and textiles rooms

● design and technology suite

● sports hall or playing field

3

ICT

Size of class

up to 30 pupils,
depending on available ICT facilities

Resources

ICT suite including Internet access
one computer per pair of pupils
software as selected

Timing

30–60 minutes
(2 or 3 times per week)

Activities

It is essential that you explore what is available in the way of websites and software before the sessions start.

Software

Zoombinis Maths Journey

Puzzles and problem-solving in an adventure context. Includes logical thinking and data organisation.

CD-ROM available from The Learning Company, Tilgate Forest Business Park, Elm Park Court, Brighton Road, Crawley, West Sussex RH11 9BP

tel: 01664 481563
website: www.mattelinteractive.co.uk

BBC Maths Workshop Series

Maths Number 82 activities, including odd and even numbers, equivalent fractions, decimal, fraction and percentage equivalents.

Maths Calculations 60 activities covering four operations including the relationships between them.

Maths Measures, Shape and Space 65 activities including length, mass, capacity, time, 2D and 3D shapes, reflective symmetry, coordinates.

Available from Logotron, 124 Cambridge Science Park, Milton Road, Cambridge CB4 0ZS.

tel: 01223 425 558
website: www.logo.com

The Crystal Rain Forest 2000

CD-ROM mathematics adventure with two levels of difficulty. Introduces and develops LOGO, angles, distances, estimation, problem-solving.

Available from Sherston Software Ltd, Angel House, Sherston, Malmesbury, Wiltshire SN16 0LH.

tel: 01666 843 200
website: www.sherston.com

Objectives
- will depend on the programs chosen

MicroSMILE software

Properties of Number (Pack 4) Six programs which explore factors, multiples, rules and so on.

Coordinates (Pack 5) Five programs dealing with coordinates in one quadrant to four quadrants.

Mathematical Puzzles (Pack 6) Eleven logical puzzles.

Available from The SMILE Centre, Isaac Newton Centre,
108A Lancaster Road, London W11 1QS

tel: 020 7598 4841
email: smile@rmplc.co.uk

DLK MathsWork software

Total of 52 programs, which can be networked at a reasonable cost. Includes:

— **Addmate** for practice with number bonds to 20

— programs for shape and space and data handling

— problem-solving programs such as **River Crossings** and **Matchstick**.

Available from DLK, 6 Waveney Close, Burton upon Stather,
North Lincolnshire, DN15 9DT.

tel: 01724 720 982
email: sales@dlk.co.uk
website: www.dlk.co.uk

Websites

www.bbc.co.uk/education/revisewise/maths

Sections on number, data handling and shape, space and measures – activities, fact sheets and tests.

Also has a 'Game Zone', which contains maths problems.

www.bbc.co.uk/education/megamaths

Activities for times table practice encouraging accuracy and speed.
Includes different levels and speeds with word puzzles as well as number practice.

www.nrich.maths.org.uk

Variety of puzzles and games plus links to other maths websites.

www.mathyear2000.org

A 'Puzzle of the Day' and mathematical games.

Cooperative games

Resources

Sheet 4.A: 'Towers of Hanoi'

Sheet 4.B: 'Frogs'

Sheet 4.C: 'Matchstick puzzles'

Sheet 4.D: 'Tangram egg'

Sheet 4.E: 'Chinese number jigsaw'

Sheet 4.F: 'River crossing puzzles'

sports hall or playground

hoops, buckets (optional), bean bags, small balls (optional), target boards, large straws

'Towers of Hanoi' made of sticks and foam rings

30–40 mins

Whole Class

Warm-up activities

> How many pupils are here today?
>
> Shake one arm in the air. How many arms?
>
> Shake both arms. How many arms now? How many fingers?
>
> Stand on one leg. How many toes in the air?
>
> Get into groups of five. How many groups? How many left over?
>
> Get into groups of two. Any left over? What does this tell us? How many groups?

Depending on which tables you have been learning, do similar exercises with those numbers.

Ask the pupils to get into groups of four, five or six. Say a number and ask the group to make that number of contacts with the floor. For example:

— '8': the group must have 8 feet on the floor (some may have to stand on one leg!)

— '16': the group will need to put hands (or fists) or heads on the floor to make the number of contacts up to 16

— '24': the group will need to use fingers to make 24 contacts with the floor.

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Objectives
- will depend on the activities organised

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Scoring games

The games should be supervised by staff or volunteers.

Numbered buckets or hoops on the floor

Each pupil throws three bean bags and adds up his or her score.

Target board with different numbers

Pupils throw small balls or bean bags onto the target board.

Give the pupils a score to aim for, such as 10, or any even number, or any odd number.

Discuss with them how they could do this.

Keep a record of scores to use for data handling later.

Games in which each pupil wears or holds a number

Each pupil wears one of the numbers 1–30, or 1–10.

In a circle

Everyone stands in a circle. Say a category such as 'multiples of 3'. All those who have a number which is a multiple of 3 run into the centre. Then give another category, such as 'even numbers'. Pupils in the middle whose number doesn't correspond to the new category go back to their places. Those whose numbers *are* in the new category stay – and any new pupils join them in the middle. Pupils who are not in the right place are 'out'.

In a line

Draw a line at the back of the hall for everyone to stand on. Draw a parallel line for the finish line. Call out similar commands to those in the circle activity above. This time pupils take a jump or a step forward if their number corresponds to the category. The winner is the first to reach the winning line.

Special activities for last afternoon event

Make five or six large puzzles for groups to work on together. Spread them out in a large circle. Each puzzle will need a teacher or volunteer to supervise. Groups visit each puzzle in turn, spending about 15 minutes at each puzzle site. Organise a points system for each activity and reward the winning team with vouchers or similar.

Examples of puzzles for these special activities are given on Sheets 4.A–4.F.

Cooking

Size of class
up to 15

Timing
approximately 60 minutes

Resources
Sheet 4.G: 'Recipes'
access to food technology area
ingredients for chosen recipe
equipment such as scales, measuring
jugs, spoons, whisks, rolling pins and
cutting shapes

Language

pounds
ounces
pints
kilograms
grams
litres
millilitres
scales
estimate
accurate
mass
capacity
ratio
proportion

Introduction and organisation

Cooking is a very good practical mathematical activity, involving pupils in measuring mass, capacity and time.

If you make the biscuits, you will need access to an oven. The peppermint creams, however, do not need cooking. Ensure that all work surfaces are spotlessly clean.

Ask the pupils:

> What would we have to do if we wanted to make 50 peppermint creams?
> Or 32 biscuits?
> What about 70 peppermint creams? Or 28 biscuits?
> How would we have to change the quantities in the ingredients to make two biscuits and four peppermint creams for each person in the group, including the teachers?

Objectives

- use, read and write standard metric units for mass and capacity
- know imperial units
- know rough equivalents of pounds and kilograms, ounces and grams, litres and pints
- suggest suitable units and measuring equipment
- record estimates and readings from scales to a suitable degree of accuracy
- solve simple problems involving ratio and proportion

Peppermint creams
makes 25 sweets

- 225 g (8 oz) icing sugar
- 1 egg white
- few drops of peppermint essence

Beat the egg whites until they form peaks.

Add the icing sugar until a stiff paste is formed, then add a few drops of peppermint essence.

Knead the paste lightly and roll it out to about half a centimetre thick.

Stamp out 1 inch (or 2.5 cm) rounds using a plain cutter.

Leave the mints to dry for about 24 hours.

Biscuits
makes 16 biscuits

- 110 g (4 oz) butter
- 50 g (2 oz) caster sugar
- 175 g (6 oz) plain flour
- caster sugar for dredging

Cream the butter, add the sugar and beat until light and fluffy.
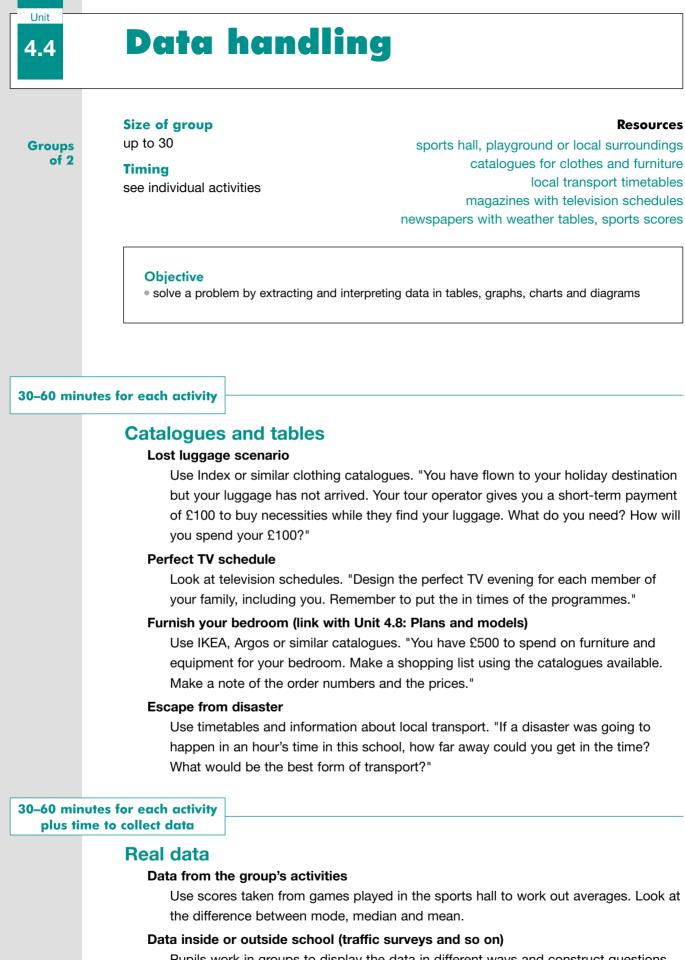
Mix in the flour and knead to form a ball.

Roll out on a lightly floured board until about half a centimetre thick.

Cut out with a 2 inch or 5 cm cutter and place on a greased baking tray.

Prick each biscuit twice with a fork and bake for 25 minutes at 300°C (Gas Mark 2).

These recipes are given on photocopiable Sheet 4.G.

Data handling

Size of group

up to 30

Timing

see individual activities

Resources

sports hall, playground or local surroundings

catalogues for clothes and furniture

local transport timetables

magazines with television schedules

newspapers with weather tables, sports scores

Objective

- solve a problem by extracting and interpreting data in tables, graphs, charts and diagrams

30–60 minutes for each activity

Catalogues and tables

Lost luggage scenario

Use Index or similar clothing catalogues. "You have flown to your holiday destination but your luggage has not arrived. Your tour operator gives you a short-term payment of £100 to buy necessities while they find your luggage. What do you need? How will you spend your £100?"

Perfect TV schedule

Look at television schedules. "Design the perfect TV evening for each member of your family, including you. Remember to put the in times of the programmes."

Furnish your bedroom (link with Unit 4.8: Plans and models)

Use IKEA, Argos or similar catalogues. "You have £500 to spend on furniture and equipment for your bedroom. Make a shopping list using the catalogues available. Make a note of the order numbers and the prices."

Escape from disaster

Use timetables and information about local transport. "If a disaster was going to happen in an hour's time in this school, how far away could you get in the time? What would be the best form of transport?"

30–60 minutes for each activity plus time to collect data

Real data

Data from the group's activities

Use scores taken from games played in the sports hall to work out averages. Look at the difference between mode, median and mean.

Data inside or outside school (traffic surveys and so on)

Pupils work in groups to display the data in different ways and construct questions for other pupils to answer about their data.

Information in newspapers (weather around the world and so on)

Pupils answer questions about relative temperatures, or sports scores or times.

Mathematics trail

Size of class
up to 30 pupils

Timing
30–60 minutes

Resources
local surroundings
map of the local area
measuring equipment such as string and rulers
compass (optional)

Groups of 4–6

Objectives
will depend on the clues but could include:
- recognise positions and directions
- use the eight compass directions N, S, E, W, NE, NW, SE, SW

Introduction and organisation

Explain to the pupils that they will be following a trail to look for mathematical objects, such as numbers and shapes, in their surrounding area.
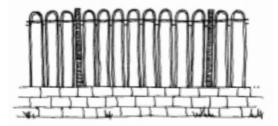
Around the school

Set up a short mathematics trail within the school building.

— Choose a convenient route around the school

— Make the clues fun and relevant to the ability of the pupils

— Contextualise the questions so that the trail is more than a mathematical exercise that could just as easily have taken place in the classroom

— Plan different starting points so that groups of pupils can start at the same time

— Include as many different mathematical concepts as possible.

Language

scale

distance

direction

north

south

east

west

In the park or school grounds

Ask the children to devise outdoor maths trails for each other to follow, working in small groups. Supply pupils with copies of a map of the local area in which the school is located. Give them time to investigate it and look for certain landmarks. Ask them to estimate and then measure certain distances on the map from the school: home, shops, the park and so on. Then convert the measurements into actual distances, using the scale of the map.

Educational broadcasts

Size of class
up to 30 pupils

Timing
30–60 minutes

Resources
large-screen television, video recorder
educational videos with teachers' notes
as selected

Introduction and organisation

Educational broadcasts can be an interesting source of mathematical ideas.
Many of the programmes are available on video with accompanying teachers' books
and materials to support lessons in the classroom.

BBC

MegaMaths Fractions

These programmes cover difficult mathematical topics such as fractions of wholes
and sharing of amounts. They also demonstrate 'sharing' with shapes, objects and
numbers, and make links to multiplication and division facts.

MegaMaths Times Tables

This series offers valuable help with learning well-known 'chants'. Real life situations
will also help the pupils to understand processes and patterns behind the tables.

Contact

BBC Educational Publishing

tel: 01937 541 001

website: www.bbc.co.uk/schools

Objective
- will depend on the topics covered by the programmes selected

Channel 4

TVM Number (part 2)

These programmes explore various aspects of the number curriculum.
They explore numbers in different cultures and in everyday use.

In Place	Number systems and place value
Take a Quarter	Fractions
7 Rules	Operations
Sequences	Patterns
Time Scale	Numerical problems

Puzzle Maths (part 2)

These programmes offer mathematical problems, puzzles and games,
illustrated through creative graphics, animation and live action. They are designed
to motivate the pupils to participate in solving mental mathematical problems.

Number

Addition and Subtraction

Multiplication and Division

Reasoning about Numbers

Shape and Space

These programmes can be purchased on video, together with a teachers' guide
and activity book.

Contact

Channel 4

tel: 01926 436 444

fax: 01926 436 446

email: info@schools.channel4.co.uk

website: www.channel4.co.uk

Visits and outings

Size of group

up to 30

Timing

half a day per week

Resources

bus hire information or local transport timetables and prices

information on maths trails and exhibitions at local museums and parks

information on school visits to local supermarkets

Objective

● will depend on the topics covered on the visits

Introduction and organisation

You will need to gather information before the summer school takes place, including details of public transport or minibus hire costs. Some venues may produce materials for pre-visit preparation or post-visit follow up work.

Supermarkets

Sainsbury's and Tesco are two supermarkets that have a programme for pupils to be shown behind the scenes, investigate prices and operate a till. Contact your local branch and investigate what they can offer that would be of mathematical value.

Museums

Local museums may have exhibitions as part of Maths Year 2000. In London, for example, the British Museum (020 8312 6565) and the Greenwich National Maritime Museum (020 8312 6608 or www.nmm.ac.uk) are showing mathematical exhibitions, and Livesey Museum in Southwark (020 7639 5604) has a 'Number Crunching' exhibition. York Castle Museum (01942 705 395) has a Numeracy Trail.

Parks or gardens

Some local parks or gardens may have maths trails. Examples are Kew Gardens (020 8332 5000), Warwick Castle Maths Trail (01926 406 603), Walsall Numeracy Trail (01922 424 200) and Sefton Botanical Gardens (0151 934 3404).

Planning a day out

This can be an activity in itself. Ask groups of pupils to research journeys by different forms of transport, costs, timings and so on. Alternatively you could ask pupils to plan a school outing such as a picnic or barbecue and calculate the quantities of food and drink needed.

Plans and models

Size of class
up to 30

Timing
30–60 minutes, depending on the activity

Resources
tape measures, rulers, pencils, paper
thin card, glue

Language
millimetres, centimetres, metres
kilometres, inches, feet, miles, area
perimeter, scale, net, estimate, convert

**Groups
of 2**

Objectives
- use, read and write standard metric units for length
- convert smaller to larger units
- know imperial units of measurement
- suggest suitable units and measuring equipment to estimate length
- calculate the perimeter and area of simple compound shapes

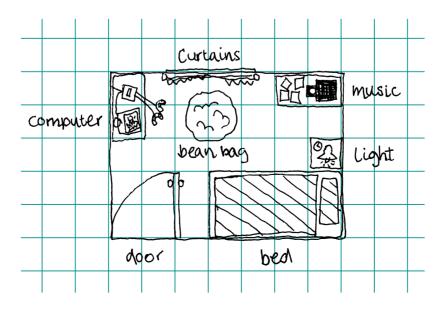
Introduction and organisation

Discuss with the pupils the idea of scale drawings and how they can be used to design rooms.

Ask the pupils to draw a plan of the classroom in which they are working.

Let the pupils work in pairs to design their ideal bedroom. Then they draw a scale plan of it, indicating the positions of the furniture and other objects they would like in it. (This could be connected to Unit 4.4: Data handling, which includes equipping their own bedroom within a certain budget.)

Other ideas

Discuss with the pupils the idea of nets of solid shapes. Ask them to design a box to hold a certain number of sweets or biscuits (these could be the ones they made in Unit 4.3: Cooking).