Getting Started - Introduction

This section contains a collection of activities for 'getting started' in two senses. 'Getting started' at the beginning of your numeracy course, for example, at the beginning of the year or semester; and 'getting started' at the beginning of your individual numeracy sessions, in other words on a daily or weekly basis.

Getting started at the beginning of your course

Some activities in this section are particularly useful for as a means of beginning your numeracy course in an inviting and non-threatening manner. This is particularly important for students who may be nervous or anxious about returning to a mathematics classroom.

For many students this is their first contact with the classroom for many years. They may feel 'out of touch' with learning and think that they have forgotten any maths they once knew. It is important that classes at this stage are relaxed and friendly, and that mathematical concepts are introduced gradually, in a non-threatening way.

In this section there are activities that allow students to share their feeling about mathematics in a structured way, to discover what they have in common with each other and to learn to work together in a collaborative manner. These activities also enable student input into the numeracy course by encouraging them to express their opinions about the numeracy skills they need to learn. *Building positive attitudes to numeracy* discusses this important aspect of beginning your numeracy class more fully.

The section also contains activities that cater for a range of students in one class and enable you to get to know their individual numeracy strengths and weaknesses through observation, without formal assessment techniques, such as tests.

Structured group and pair activities

Many of the activities in this section are structured to encourage students to work together in pairs or small groups. Early use of structured groups activities is a very effective way to build trust and group cohesion in the class. We have found that students who are relaxed and comfortable with each other and with their teacher will have the confidence to contribute their ideas to class discussion, ask the questions necessary for successfully learning mathematics and provide mutual help to one another later in the course.

Included in this section is a collection of structured group problem solving activities called *Cooperative Logic.* These provide a positive introduction to small group activity as well as introducing students to problem solving techniques.

Getting started in a numeracy session

Many other activities in this section describe structures that are particularly useful as a means of starting off your numeracy sessions. They are usually quick and non-threatening activities, such as number games, problem solving tasks, puzzles or quick sets of questions.

When given immediately at the time the class is scheduled to start, these activities assist students to focus their attention on numeracy and ease them into the class environment before any new topics are commenced. They can be used simply to build students' confidence in familiar skills or they can act as a bridge between skills learned earlier in the course and those which will be taught in the current session.

The activities in this section can also be used effectively during a long session when a change in pace or atmosphere in the classroom is needed.

Building Positive Attitudes to Numeracy

Maths anxiety in adult numeracy students

Many students involved in adult basic education experienced failure in the school system and lost confidence in their ability to learn. This was particularly true of mathematics learning. Teachers of adults meet many students with very little self confidence, who are convinced that success with numbers is beyond them. Some, in fact, experience real fear when confronted with anything to do with mathematics. This syndrome is more widespread than most people realise and has been described as 'Maths Anxiety': a feeling of panic, helplessness and mental disorganisation that arises among some people when they need to do something that involves numbers.

What causes Negative Attitudes to Maths?

Many adults have negative stories about their experiences with maths. From listening to these stories it seems that most negative feelings about maths have their origins in school classrooms of the past, and sometimes even in the home. A lot of educators believe that it is the abstract nature of mathematics and the unimaginative methods used to teach it that have caused negative reactions in so many students.

Traditional mathematics classroom practices

In school mathematics most people were taught mathematical skills by completing pages of repetitive examples, often with no immediately obvious application.

It was usually taught in a competitive manner where collaboration was seen as cheating, rather than, as nowadays, a valuable opportunity for cooperative learning.

Emphasis on the right answer, rather than on the process of problem solving, and on memorisation, rather than understanding, made learning a difficult and alienating process for many. The 'sums' to which the teachers applied magical rules were impersonal and unrelated to people and human concerns, and had little to do with students' own lives and experiences.

Teachers generally relied on abstract and verbal reasoning to explain mathematical processes. This disadvantaged students who would have benefitted from visual and tactile experiences that could be provided by pictures, diagrams and 'hands on' materials.

In a traditional teacher-dominated classroom, students were expected to be silent and so were also denied valuable opportunities to learn through discussion and talking about their understanding and related experiences.

Timed tests, competitive arithmetic quizzes and the pressure to keep up with the rest of the class often created anxiety and blocked students' ability to think clearly.

For some these shortcomings in teaching methods have been made worse by teachers belittling them in front of the class for their mistakes, forcing them to the board to do problems which they obviously did not understand, even hitting them as punishment for wrong answers or untidy workbooks.

These humiliations, and the hours of sitting in classes, feeling stupid, understanding little of what was said, are not forgotten by our students. The anxiety provoked is brought into any new maths or numeracy class. So adult numeracy classes must be different from the traditional mathematics' classes in students' memories. These differences need to be clear from the very beginning.

Building a Positive Attitude in your Numeracy Class

We recommend that any new numeracy course starts with an opportunity for students to share their past feelings about mathematics and their current feelings about learning it again.

The following activity, *Sharing Attitudes to Maths,* is one way of achieving this sharing. It also suggests methods to find out about students' numeracy strengths and weaknesses as well as the skills they want to learn.

This should be quickly followed by activities which will allow students to experience immediate success and/or have some fun in their first numeracy class. Several activities, such as games, puzzles and group and pair activities are suggested for this purpose. They are included in the remainder of this *Getting Started* section.

Why does it matter? - A barrier to opportunities

Lack of numeracy confidence is an important issue because a lack of numeracy skills limits people's choices. Mathematics-based selection tests are widely (and often inappropriately) used by employers and institutions offering courses of study, even when the job or course does not necessarily require mathematical skills. Applicants who fail the tests, or who do not even take them because of their fear, are filtered out from the maths literate and lose the chance to participate in a wide range of occupations.

In the past, when mathematics was seen as a male 'unfeminine domain', women were particularly disadvantaged by mathematics being used as this 'critical filter'.

Their negative attitudes to the subject were seen as 'normal' and they were not encouraged to persevere, thus excluding themselves from a lot of courses and well-paid jobs. The absence of positive female role models further reinforced their traditional choices. A lot of work has been done in schools to change these attitudes over the last few decades. It remains to be seen whether this situation has changed as a result.

Sharing Attitudes to Maths

Overview

Many students are very anxious about returning to study of a maths related subject. It is important that they have an opportunity to share some of these feelings with you, the teacher, and with other students before the course starts. This way they will probably find they have a lot in common and can relax about learning with the group.

This activity should be conducted at the beginning of a new course.

For students it provides an opportunity to:

- Share their feelings and attitudes about maths with each other
- Compare their experiences about learning maths in the past
- Express their opinions of their numeracy strengths and weaknesses
- Establish numeracy learning goals

For teachers it provides an opportunity to:

- Explain that 'maths anxiety' is experienced by a lot of people
- Discuss prior maths' teaching methods as a possible cause of negative feelings about the subject
- Discuss alternative methods that will be used in this class
- Pinpoint areas of numeracy that students' see as learning priorities

Skills and Knowledge

- Feelings about mathematics and numeracy
- Common causes of negative feelings about maths
- Numeracy learning goals

Preparation and Materials

Read the Introductory Notes**:** *Building Positive Attitudes to Numeracy* which discuss some of the issues that are likely to be affecting adults returning to study mathematics or numeracy.

Photocopy Activity Sheet 1: *Maths and Me* (1 per student).

Suggested Procedure

The discussion revolves around the sentence starters in the Activity Sheet: *Maths and Me.* It can be done in several ways depending on students' levels of literacy and the size of the group.

Either:

- Students finish the sentences in writing on the page – rough notes are enough – then in small groups or whole class discussion, talk about what they have written. [It is then possible to collect and copy these after the discussion as a record of early feelings – a useful point of comparison if students improve during the course.]

- Students read the prompts themselves, think about their responses then discuss them.
- You use the sentence starters as verbal prompts and students talk about their responses question by question.

Introducing the the discussion

Explain:

- *Before we start this new numeracy class I want to talk a bit about numeracy and mathematics*
- *Often in adult classes people's feelings about maths affect how well they learn and how happy they are in the class*
- *So before we get started I want to explore some of this with you*
- *I also want you find out from you what you feel confident about, what you don't feel confident about, and what you most want to learn*

If the class is greater than 6 or 7, arrange students into random small groups.

If fewer than 8 students then it is preferable to all sit around a table together. You can then all participate in a single discussion. Use the suggestions below to assist you.

Remembering maths at school

Explain:

- *First I want you to think back to your school days*
- *I want you to spend a minute or two remembering how you felt in your school maths classes*
- *It might help if you close your eyes*

Using the Activity Sheet

If you are using the Activity Sheet: *Maths and Me*, distribute 1 per student.

Explain:

- *I want you to spend about 10 minutes on this*
- *Write whatever comes into your mind to finish the sentences*
- *Or if you don't want to write, just think about what you might say*

When they have had time to respond, ask:

- *Can you talk together about these in your small groups?*
- *You might want to compare - decide what's similar and what's different for each question*
- *Or you might just want to chat about each question*
- *Make sure everyone gets a chance to share their thoughts*

As students talk together, circulate amongst the groups and try to get a feel for some of the main issues for later discussion.

Allow the discussion to continue for as long as all the students seem engaged (usually about 20 mins).

Debriefing the discussion

Bring the groups together and ask each group to tell you some of the main things they talked about.

Some useful questions to assist the process:

- *Did you find that you had some things in common?*
- *What were they?*
- *Do others here feel similarly/differently?*
- *What did you feel about maths when you were at school?*
- *Do you think that affects how you feel about using maths today?*
- *Was what you learned about in maths classes useful to you?*

Draw on the content of the Introductory Notes: *Building Positive Attitudes to Numeracy,* to inform this discussion.

You should be able to reassure learners that your classes will be different from those at school because:

- *This is numeracy not just mathematics.*
- *Numeracy is about using maths that is relevant to the people in the class*
- *As your teacher I will use very different methods to teach than they did in school.*
- *I will try to make the classes interesting and fun*

This can be a good opportunity to introduce or discuss some of the methods you intend to use and explain that they are used with adults all over the country. For example, you might use hands on materials to make things clearer than they were at school, you will use games and puzzles as an enjoyable way to practise skills and learn new ideas...

Acknowledging students' strengths

An important part of this discussion and reflection process is to encourage students to find a positive starting point in their own mathematics skills as well as identifying those things they can't do.

Ask:

- *What are some of the things you feel you **can** do easily?*
- *Do you think there is a reason that you are better at this than other things?*
- *Do you use it often – what do you use it for?*

If students are particularly negative about their skills you may have to spend extra time encouraging this aspect of discussion. You could ask direct questions about money handling, such as giving change, or telling the time, or following recipes, until you find embedded skills that students take for granted - not realising they are using mathematical skills.

It is quite common for adults not to see mathematics in the things they can do themselves. They only recognise maths in the things that are too hard for them to do.

Exploring students learning goals

Finally, to assist you to understand your students' **learning priorities** ask about the skills they want to learn.

- *Are there some areas of maths that you really want to learn about in this class?*
- *Why is this important to you?*

Make a list of these as they are discussed and assure students you will use this to plan their program. You may have to negotiate around some of the less realistic learning goals, either at this point, or later in the course.

Extension and follow up activities

Use the list of skills that the students gave you and fill them in on Activity Sheet 2. You might also want to add in other core skills, such as using a calculator, shortcut multiplication by 10 or calculating simple percentages, that the students may not have mentioned.

Distribute the list to students at the next class and get them to rate their confidence with the skill by ticking the appropriate columns.

Collect, or take copies of, their individual sheets.

These will be a handy reference for you to:

- Discuss students' individual learning goals with them
- Understand how they see their strengths and weaknesses
- Plan a teaching program that prioritises students' needs
- Revisit at intervals in order to discuss progress with students.

Maths and Me

Activity Sheet 1

Write whatever comes into your head to finish these sentences.

Maths makes me feel ……..……

……..

Maths at school was ……

……..

I'm good at ……..……

……..……

I've never been able to ……...

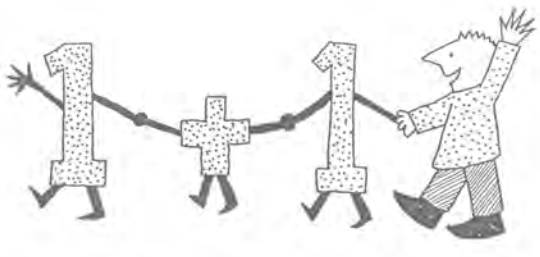
……..……..……..

I'd like to learn how to …….……

……..

Name .....

Maths Skill	Can do	Need more practice	Can't do yet



Multi Digit

Overview

This activity is a game which students at all numeracy levels enjoy.

It highlights the significance of place value in determining the size of whole numbers.

It encourages students to speak, listen to and write whole numbers in English.

It also provides opportunity for practising addition.

The activity can be used for a range of large numbers from thousands to millions, depending on the size of the grid, see Activity Sheets 1 & 2.

Skills and Knowledge

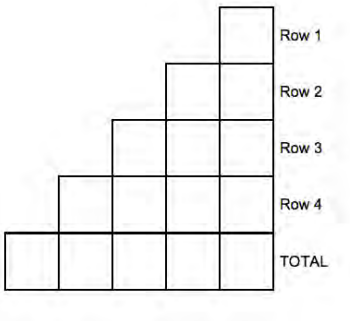
- Place value in whole numbers
- Addition
- Verbalisation of large numbers
- Writing large numbers
- Ordering large numbers

Preparation and Materials

- 1 10 sided dice
- At least one calculator
- Activity Sheet 1 (at least 1 per student)
- Activity Sheet 2 (several per student

Suggested Procedure

Distribute copies of the smaller grid from Activity Sheet 1.



Explain:

- *You will play individually.*
- *The aim of the game is to obtain the highest possible total at the end of each round.*
- *The numbers you use will depend upon the roll of the dice.*
- *Each time the dice is rolled you put the number into one square of the grid.*
- *We will do one together as an example:*

Example Game:

Roll the dice, e.g. 8 shows.

- *You must write 8 in the only box in row 1 of the grid.*

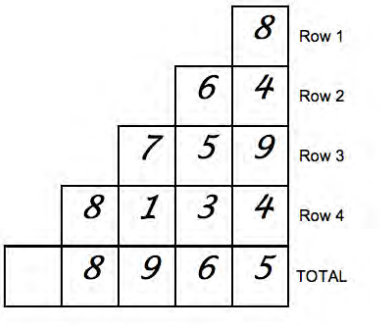
Roll the dice again (e.g. 6).

- *This time you choose which of the boxes in row 2 you put the number in*
- *In the first box it will be worth 60, in the second it will be worth 6.*
- *Remember you are looking for the highest number.*

Roll the dice the second time for row 2 (e.g. 4).

- *We have to put this number in the remaining box of row 2.*
- *We keep going like this until all boxes in the grid (except for the last line) are filled.*
- *You have to finish each row before moving down to the next.*

You now add together all the numbers as in normal addition of numbers:



Calculators should be on hand for students to whom this addition will be a problem (addition is not the main aim of the exercise). Alternatively, students can help each other with the additions.

The next step is to encourage the students to read their numbers out loud. They should read the numbers in such a way that 6,578 would be '*six thousand, five hundred and seventy-eight'.* This is best done by a series of question such as:

- *Who thinks they might have the biggest number? What is it?*
- *Does anyone have a higher number?*
- *Does anyone have a number between these?*
- *Who thinks they have the lowest?*

By listening to others reading their numbers, students should decide whether their own is bigger or smaller. However, if this seems too difficult you may wish to record the numbers on the board as they are read out.

Once you have practised with the small grid, move on and repeat the game on the bigger grid. Larger numbers in the millions will be encountered on Activity Sheet 2.

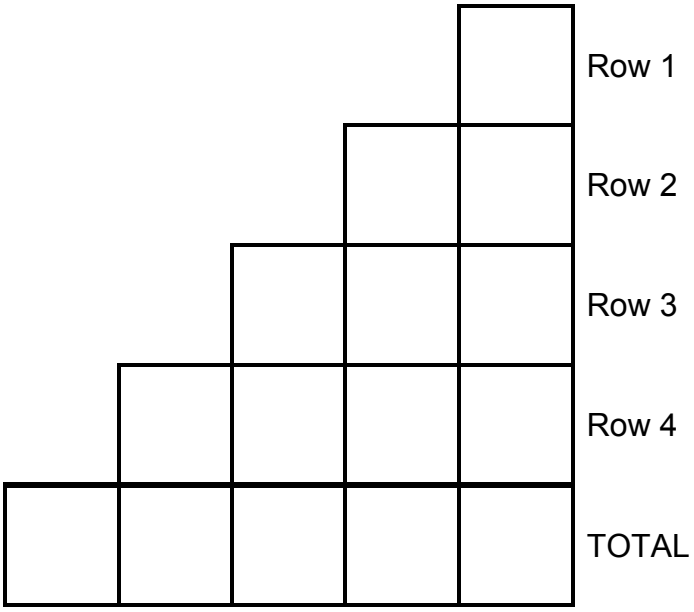
Note: for some students a gradual increase in grid sizes might be more appropriate than jumping immediately to the larger grid. In this way you can assist them to develop the language of large numbers over a period of time by making the game a regular activity.

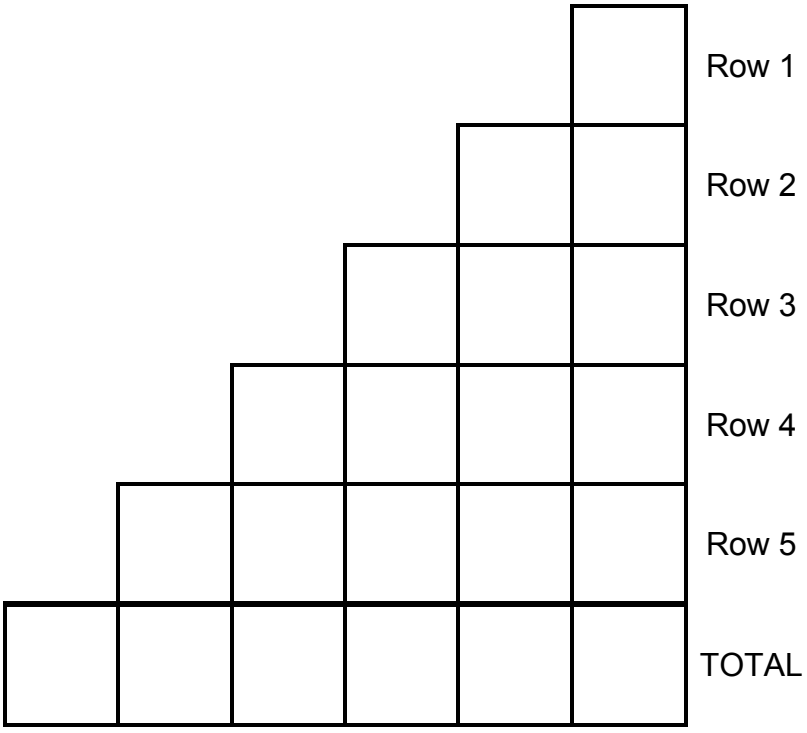
Extensions

- Ask students to arrange themselves in a line, according to their number, from the smallest to the largest. They should not look at other students' numbers but listen to each other read them aloud.
- Allow students to practice writing their numbers in words by asking them to write out a cheque for that amount of dollars.

Further practice at reading large numbers aloud can be gained by looking at numbers in newspapers, and for very large numbers, at *Tattslotto* or other lottery prizes in the paper.

Another activity that encourages this skill is *Capital Cities of Australia.*


Row 1
Row 2
Row 3
Row 4
TOTAL


Row 1
Row 2
Row 3
Row 4
Row 5
TOTAL

Row 1

Row 2

Row 3

Row 4

Row 5

Row 6

Row 7

TOTAL

Row 1

Row 2

Row 3

Row 4

Row 5

Row 6

Row 7

TOTAL

Introducing Co-operative Logic

Overview

This activity introduces students to a useful structure of problem solving activity. It encourages students to:

- Work co-operatively
- Apply problem solving strategies:
- Guess and check
- The use of diagrams and moveable pieces.

Skills and Knowledge

- Group interaction
- Logical reasoning
- Using hands-on materials
- Guessing solutions
- Checking
- Organising information

Preparation and Materials

Copies of the problems and their clues are attached to this session.

Photocopy each problem onto stiff paper or card (1 per group of 4). Place each problem into a labelled envelope.

For the **Build It** problems collect a selection of coloured blocks or cubes: 2 red, 2 yellow, 2 green, 2 blue, 2 orange for each small group. These can be centicubes, wooden blocks or small MAB cubes coloured with textas.

Photocopy Activity Sheet 8: *Self Assessment for Group Work* (1 per student) – optional.

Suggested Procedure

Introducing the activity

Explain:

- *In this class I want to show you a type of problem solving called Cooperative Logic, which will help develop your problem solving skills.*
- *Each problem is to be solved co-operatively, and you will need to work together to find an answer.*
- *Each person will have different clues so it is important to listen as each clue is read.*
- *If any of you find it hard to read, ask another student or the teacher for help.*

Work through one problem

Hold up the envelope containing *City Block* and show students the contents: one question card, a map, several moveable pieces and clue cards.

Place the question card, the map and the pieces in the centre of the table.

Explain:

- *Share the clue cards between you*
- *Some may receive more than one*
- *Read your cards aloud, in turn*
- *Listen carefully to each other's clues as they are read out*
- *No one can give their clue cards to another person or lay them down for others to read*
- *You can read you card aloud as many times as you need in order to solve the problem together*
- *As each clue is read you move the pieces around to help all of you solve the problem together*

Points to keep in mind

We have included moveable pieces in all of these problems in order to:

- Discourage students from using pencil and paper. When students start to work out solutions by writing, one person usually dominates and co-operative problem solving is replaced by individual problem solving.
- Encourage students to explain to each other words that are not understood, such as, opposite, west of. You should intervene only when no one in the group knows the meaning.

Although answers have been included it should not be necessary for students to ask you for correction. The group should be satisfied for themselves that they have met all the conditions. This is the beginning of the notion of self checking which should constantly be reinforced by you, e.g. checking subtraction by addition.

As the activity progresses you can observe which students understand all the terms used without help. This is a good opportunity for you to observe, without testing, any basic concepts missing in students' backgrounds.

Discuss strategies

Discuss the strategies used to solve problems. The two most important problem solving strategies underpinning these exercises are:

- Guess and check – take risks and try out solutions to see if they work.
- Using a visual aid, such as hands on materials. These give us a picture of what we are doing.

These two strategies form the basis of much problem solving in mathematics.

Discuss group dynamics (optional)

You *may* wish to draw attention to the behaviour of you students in the group and discuss how they actually operate in a co-operative situation. There are several ways to approach this:

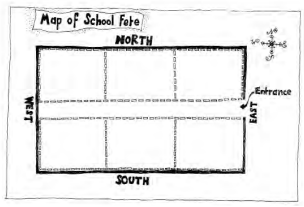
1. When students have completed one or two problems ask them to describe what happened in the group while they solved the problem.

   Ask questions like:
   - *Did anyone talk more than the others?*
   - *Was anyone very quiet?*
   - *Did you all have a say?*
   - *Did someone take a role, maybe as a leader?*

2. Have a more theoretical discussion about general roles that emerge in group situations e.g. leaders, followers, talkers. The discussion could draw on roles taken within their homes, classes, workplaces, etc.

3. Distribute a copy of *Self Assessment for Group Work* to each student. Ask them to reflect on working in the group and place ticks beside statements that were true. Then ask if they have anything to discuss with the rest of the class.

Finally ask students to reflect on their own way of operating in groups and to decide whether they would like to change it in any way.



Doing more of the problems

Select a second problem and distribute it to the groups.

Explain:
- *You should use the same process as before to solve this problem*
- *When you think you have the answer check through all your clues to double check*
- *Then let me know you are ready for another one.*

Proceed until all groups have completed at lest three problems (even if you have to assist some with hints).

Some groups will inevitably operate more quickly than others. You can give them more of the problems to solve. However, this will diminish your supply for a follow up session.

Another idea is to ask them to create a version of their own (see over).

Creating their own problems

In order to solve *Cooperative Logic* problems students need to *understand* the numeracy related language within them.

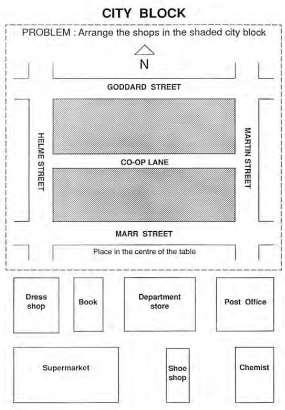
You can go one step further and encourage students to *use* the language themselves by creating a problem of their own.

Select one of the problems the groups have done already, a good example is *City Block*.

Distribute some scrap paper cut into clue sized pieces.

Explain:

- *I want you to create a new problem based on this one*
- *First change the pieces around*
- *Then write your own set of clues*
- *Later you will give it to another group to solve*
- *Make sure you use the numeracy words like 'north of', 'opposite' 'next to'*
- *Your problem is only a good one if it can be solved by other people*
- *So don't try to make it so hard they can't solve it*
- *Remember to keep a copy of your solution to check with.*



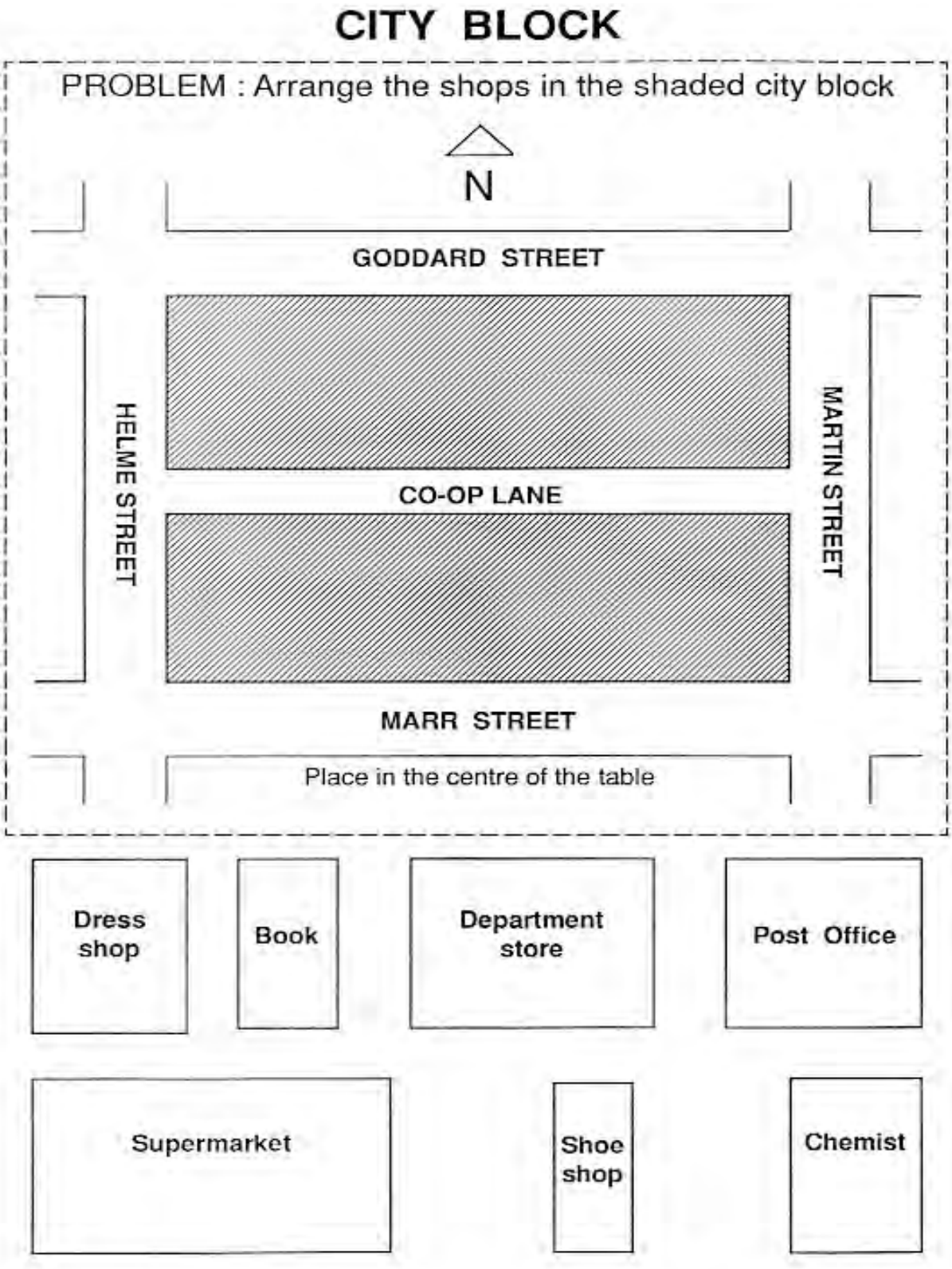
Note: if using *City Block* you may also have to give extra paper for students to change the size of the shops to fit. They could even draw their own map but don't let it get too complex.

City Block

Activity Sheet 1

✂ Copy and cut

Problem: Arrange the shops in the shaded city block



City Block clues

✂ Copy and cut

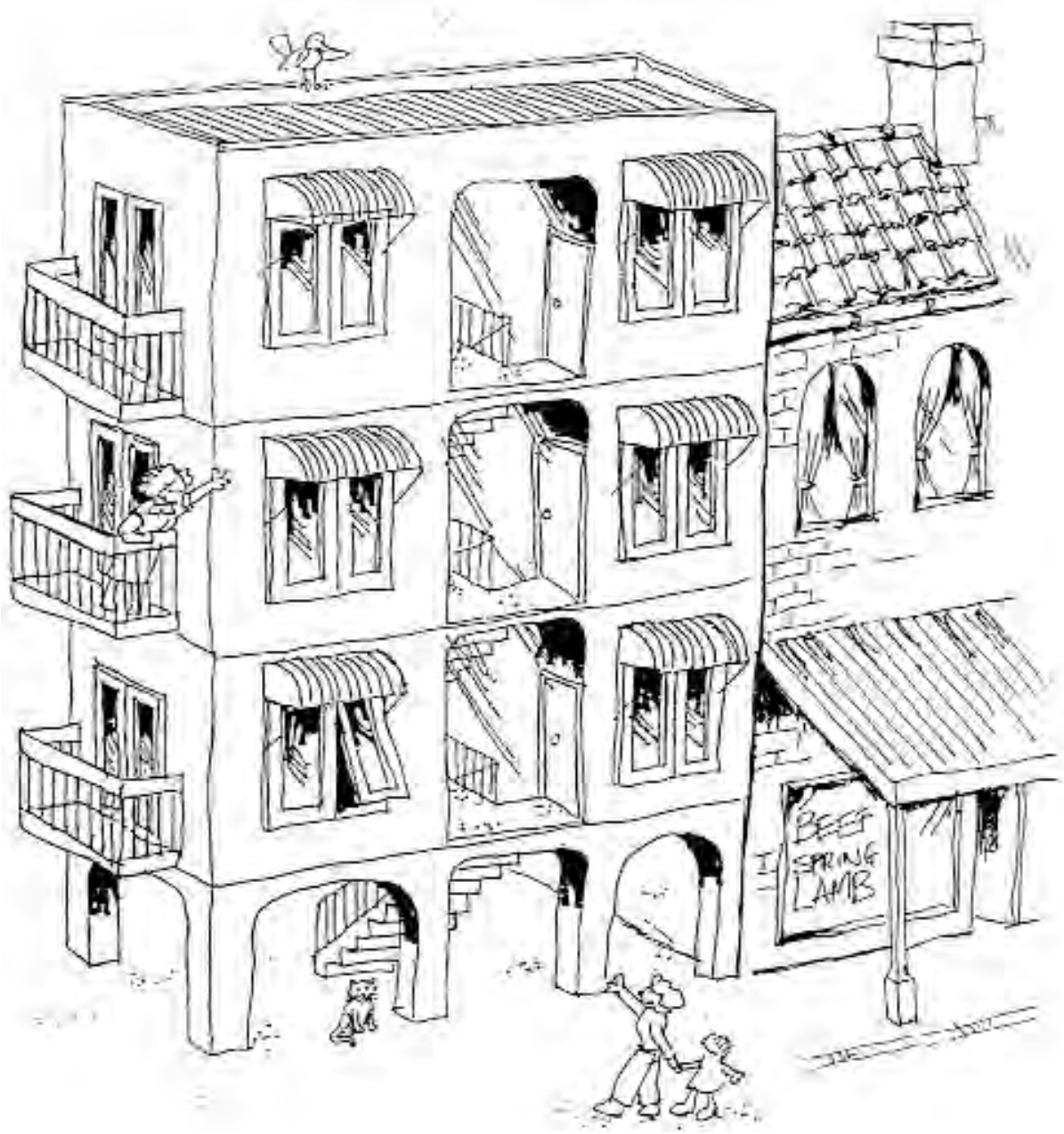
Walking from the supermarket to the chemist you pass the dress shop	The post office is south of the chemist, and next to the shoe shop.
The department store and the post office are on corners.	The post office is opposite the dress shop.
The chemist shop is east of the supermarket.	The supermarket is north of the bookshop.

The Flats

Activity Sheet 2

✂ Copy and cut

Problem: Who lives in which flat?



The Flats clues

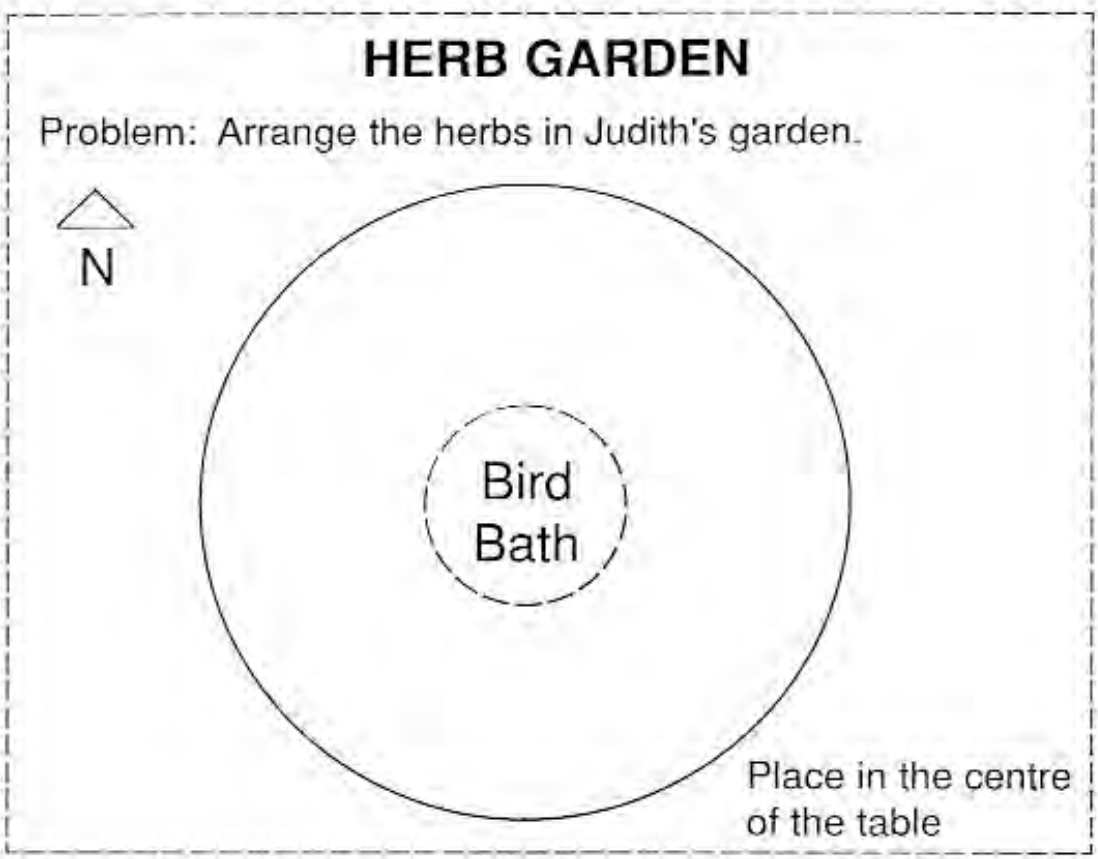
Activity Sheet 2 (cont.)

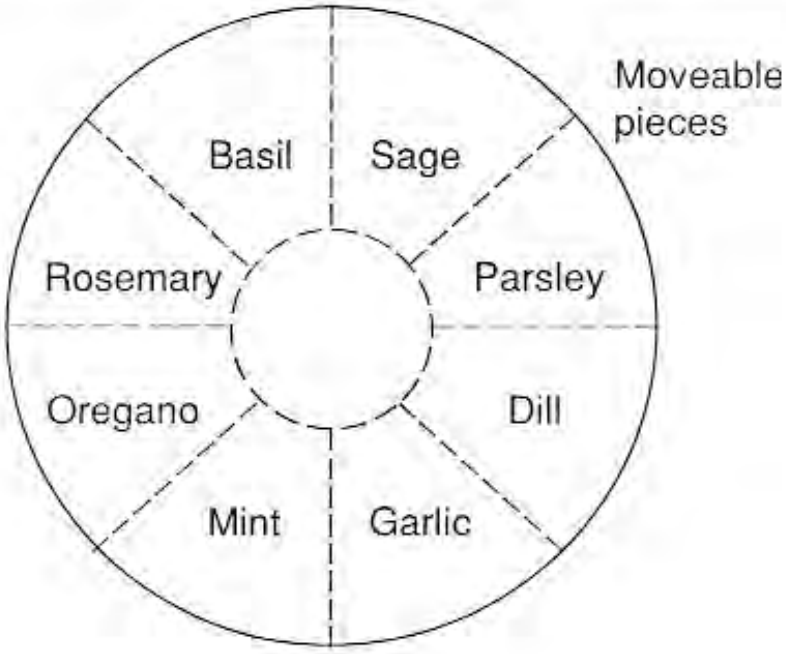
✂ Copy and cut

SARTORI	BATES
TRAN	FISHER
JOHANNSEN	WOODS

Jo Fisher walks downstairs to feed Maria Sartori's cat when she is away.	The Woods knock on the Tran's floor when their music is too loud.
The Johannsen family hear Mr Wood's feet overhead when he dances.	The Fishers do not live opposite the Johannsen family.
Maria Sartori goes up past the Bates' flat on the way up to visit the Tran family.	The Fishers grow tomatoes on their balcony in summer.

✂ Copy and cut


HERB GARDEN
Problem: Arrange the herbs in Judith's garden.
N
Bird Bath
Place in the centre of the table


Moveable pieces
Basil
Sage
Rosemary
Parsley
Oregano
Dill
Mint
Garlic

Herb Garden clues

✂ Copy and cut

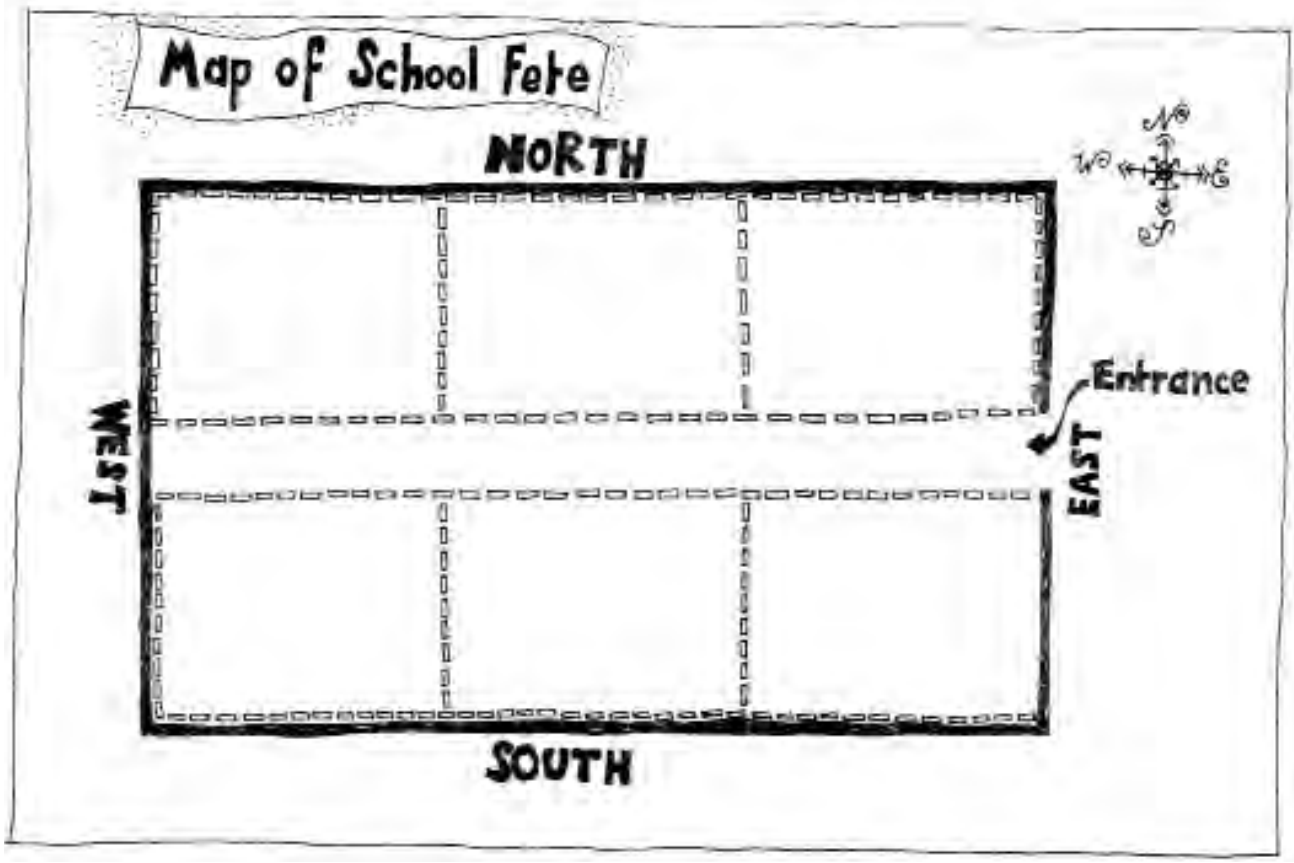
The oregano is opposite the garlic.	The sage is between the mint and the basil.
The rosemary is at the south end of the garden.	The bird bath is in the centre.
The parsley is opposite the mint.	The dill is next to the garlic.

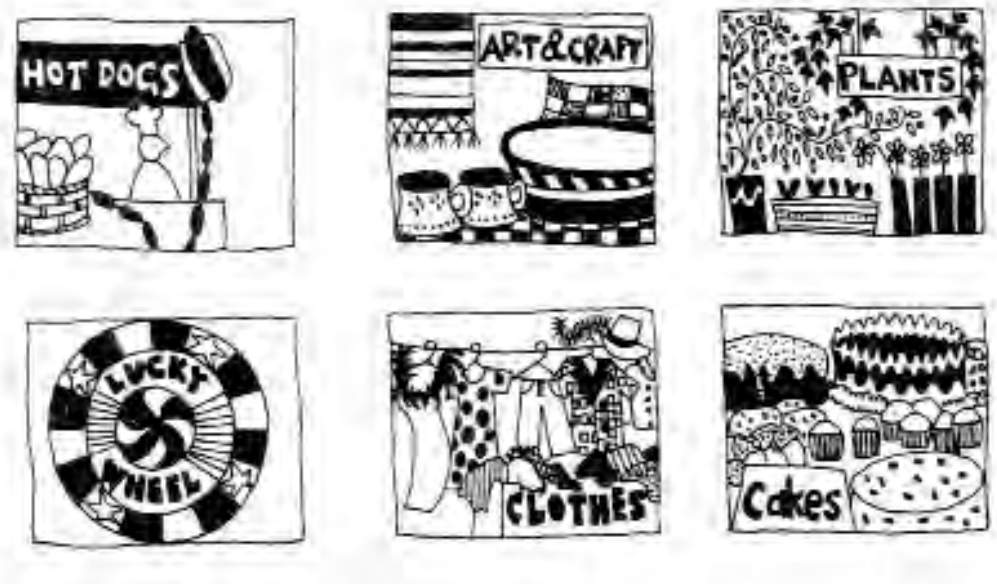
School Fete

Activity Sheet 4

✂ Copy and cut

Problem: Where is each stall at the School Fete?





School Fete clues

Activity Sheet 4 (cont.)

✂ Copy and cut

When Sylvia arrived at the hall she saw the clothes stall on her left.	The plant stall is opposite the hot dog stall.
The hot dog stall is next to the clothes stall.	The clothes are next to the cake stall.

The plant stall is west of the art and craft stall.	The lucky wheel is adjacent to the plant stall and north of the clothes stall.

Build It 1

Activity Sheet 5

✂ Copy and cut

There are six blocks in all.

One of the blocks is yellow.

The green block shares one flat side with each of the other five blocks.

The two red blocks do not touch each other.

The two blue blocks do not touch each other.

Each red block shares an edge with the yellow block.

Each blue block shares one edge with each of the red blocks.

✂ Copy and cut

There are six blocks in all in a tower six blocks high.

There is a yellow block on top.

The red block is above the green block.

One of the yellows is above the green block; the other is below it.

Each of the blue blocks shares a flat side with the green block.

No two blocks of the same colour touch each other.

There are two yellows, two blues, one green, and one red in the set of blocks.

✂ Copy and cut

There is a red block directly below a yellow block.

There is a green block on the bottom level.

There is a red block directly on top of a yellow block.

The highest block is on the third level.

There are six blocks in all.

An orange block shares a flat side with a green block and two others.

A blue block shares a flat side with a yellow block.

There is a red block on the bottom level.

A blue block touches red and green blocks only along edges.

There are three blocks on the bottom level.

A yellow block touches an orange block only along an edge.

Self Assessment for Group Work

Activity Sheet 8

✔ Tick the statements that were true for you.

I liked being in the group.

I listened to others.

I learned something.

I talked in the group.

I talked too much.

I helped other people.

I didn't talk much.

Moving Numbers

Overview

Moving numbers is comprised of a series of non-threatening number puzzles and tasks which:

- Provide practice in addition skills
- Encourage strategic thinking or problem solving strategies
- Can be used individually as warm up activities for sessions
- Can be used to change the pace or mood in a session
- Can be given as a challenge task for students waiting while others complete practice exercises.

As a collection of tasks they could also be used as 'Problem Solving Stations' (see below).

Skills and Knowledge

- Addition
- Guess and check problem solving strategy
- Using moveable pieces to solve problems

Preparation and Materials

Copies of Activity Sheets 1 – 4 (1 per student)

1 copy Activity Sheets 1 – 4 on coloured card (if used for problem solving stations)

Copy Activity Sheet 5 on to coloured card or stiff paper. Cut the sets of moveable numbers and store in envelopes (1 set per individual or pair of students)

Suggested Procedure

The instructions for each of these puzzles or tasks are given on the Activity Sheet and should be self explanatory.

As indicated above, you can use these as single activities in the classroom or as Problem Solving Stations. Both methods are described briefly below.

Individual tasks within a session

For each task distribute a copy of the Activity Sheet to each student or pair of students.

Also distribute one set of moveable numbers to each student or pair.

Explain:

- *In the envelope is a set of numbers*
- *These moving pieces are a good strategy to use for puzzles and problem solving*
- *They allow you to try out different combinations without having to keep rubbing out when they don't work*
- *Each of the questions asks you to use different numbers*

- *Take the numbers you need out of the envelope*
- *Move them around on the paper until you find the correct arrangement*
- *Now write the correct numbers on your paper*
- *Finally, put the numbers back in the envelope*

When students have completed the tasks on the Activity Sheet, encourage them to use the numbers and try and create a puzzle of their own for other students to solve.

Problem Solving Stations

This term refers to a series of tasks set up on tables around the room. Students, in pairs, move around the room attempting the various tasks.

For variety it is useful to combine number tasks, such as these, with a collection of spatial puzzles and tasks.

The task or problem is usually displayed prominently on the wall or on the table. The items that students need to perform the task are arranged on the table. These items could include:

- Sets of numbers to manipulate during the task
- Coloured pencils or textas
- Copies of the task on which students can record their solutions.

Using a recording sheet

A list of tasks with spaces for students to record their answers can also be incorporated into the activity to give it an extra element of seriousness.

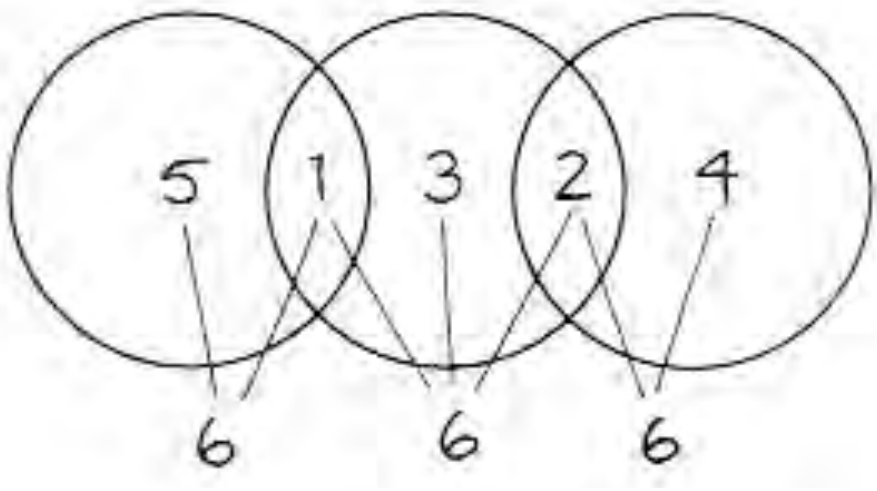
The students then take the list around from table to table and make a record of the tasks they completed successfully.

The record sheet can incorporate columns for comments and perhaps columns which students can tick to indicate the degree of difficulty (eg easy, challenging, too hard)

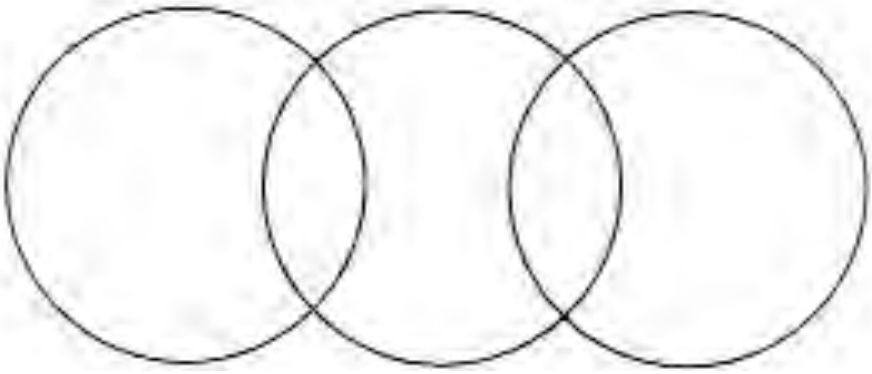
Numbers in Circles

Activity Sheet 1

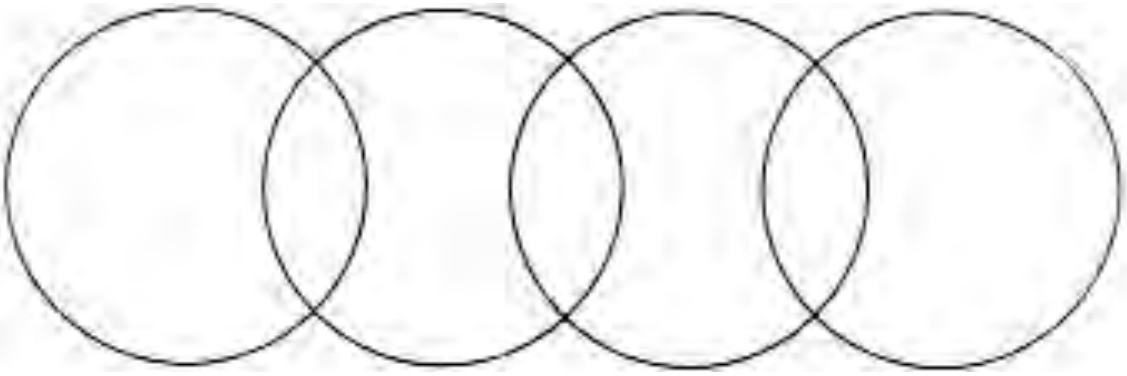
All the numbers inside each of these circles add up to 6



Put the numbers 2, 3, 5, 7, 8 into the circles so that inside each circle the numbers add up to 10



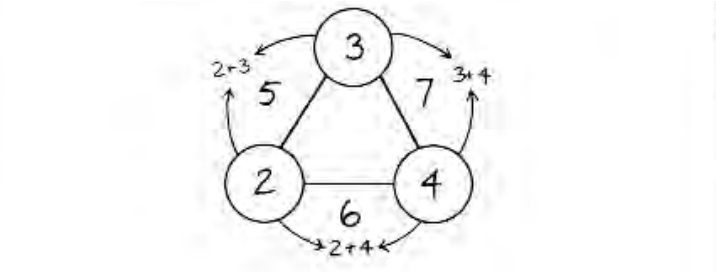
Use 3, 4, 5, 6, 7, 8, 9 in these to total 15 in each circle

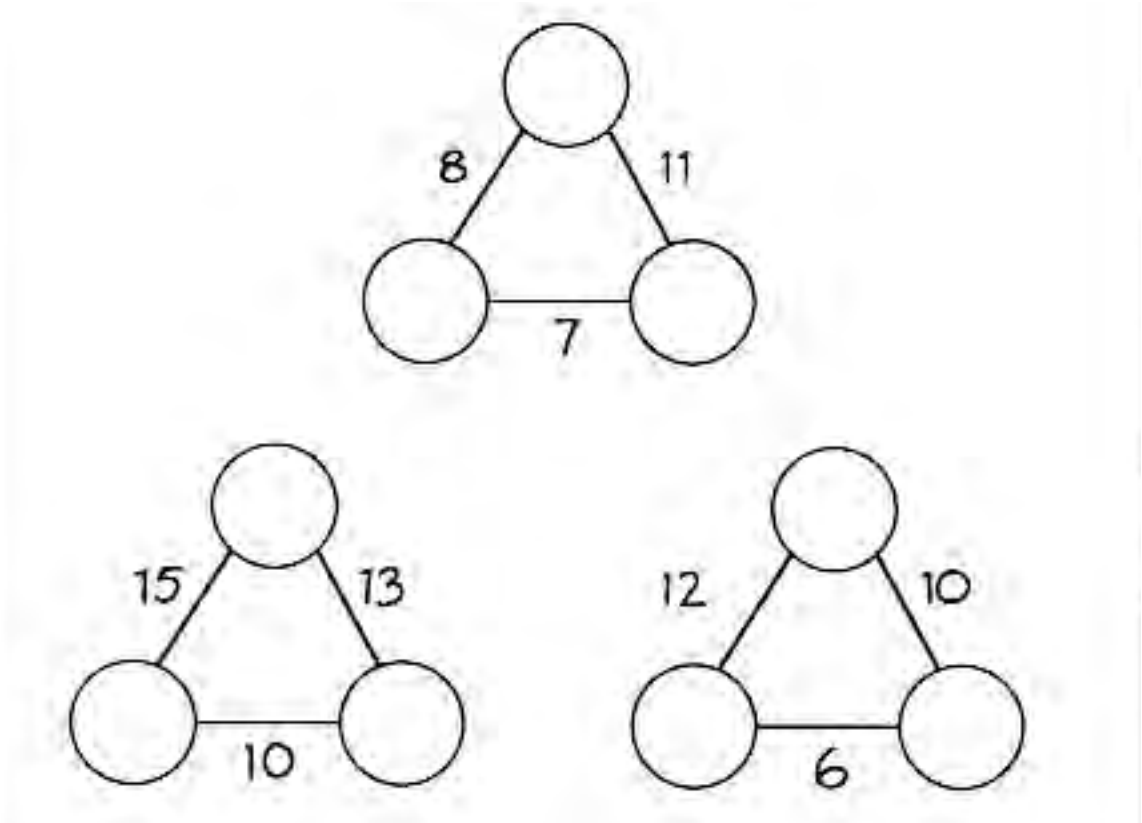


Numbers in Triangles

Activity Sheet 2

Put numbers in the circles so that each pair adds up to the number between them. For example:





Now make up one of these puzzles for a friend to solve.

1. Arranging the Digits

Find all the numbers you can make with these three digits

1 2 3

Extension: How many numbers can you make with the 4 digits:

1 2 3 4

2. The Coded Alphabet

If A = 1, B = 2, C = 3, D + 4, etc.

How many points is your name worth?

Is your name worth more points than the person sitting next to you?

Extension:

Can you find a word worth 50 Points?

Can you find a word worth 100 points?

Magic Squares

Activity Sheet 4

In these squares all the **rows**, **columns** and **diagonals** add up to the **same** total.

8		
	5	*7*
		2

Use all the digits from 1 to 9.

In other words,
1, 2, 3, 4, 5, 6, 7, 8, 9.

2	*4*	*6*
		1

Use all the digits from 0 to 8.

These are:
0, 1, 2, 3, 4, 5, 6, 7, 8.

	2	
	6	*8*
	10	

Use all the digits from 2 to 10.

		11
8	*13*	*6*

Use all the digits from 5 to 13.

Digit Sheet

Activity Sheet 5

✂ Copy onto card or stiff paper and cut into sets of digits.

1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5
6	6	6	6	6	6	6	6
7	7	7	7	7	7	7	7
8	8	8	8	8	8	8	8
9	9	9	9	9	9	9	9
0	0	0	0	0	0	0	0

Quick Questions

Overview

Quick Questions' describes a simple activity type that can be used for students to practise and revise a wide range of 'in the head' skills. 'Quick Questions' are short sets of questions, displayed in large print on pieces of paper or card. They are shown one by one to students to encourage them to use short 'in the head' calculations rather than formal pen and paper methods.

They are particularly effective for:

- Recall of number facts & tables
- Practising shortcut or 'in the head' skills
- Revising 'in the head' skills from prior sessions
- Creating a focused start to a session
- Changing energy mid session

Skills and Knowledge

Recall of multiplication tables

Recall of essential addition facts

Converting measurements

In the head calculations, including:

- Quick addition & subtraction
- Multiplying by 10, 100, 1000
- Dividing by 10, 100, 1000
- Halving & doubling
- Multiplying & dividing by 4
- Finding ½, ¼ or 1/10 of a number
- Percentages using these methods

Preparation and Materials

Create a set of 5 questions (of gradually increasing difficulty) applicable to your class and the current topic.

Cut sheets of A4 paper in 2 or 3 pieces (1 sided scrap paper is ideal).

Number the pieces 1 – 5 in small print.

Use a texta to write one question in large print on each card.

Suggested Procedure

It is good to introduce this method early in the course as one of the techniques you will use regularly. It can then be used to practise skills as they are taught and keep them alive through revision at intervals throughout.

Explain:

- *For these questions you only need a pen and paper*
- *Put away your calculators or phones for a while*
- *I will show you one question at a time*
- *I want you to try and work it out in your head*
- *Just write down the answer – not a lot of working out*
- *The only real rule is that you can't use formal school methods to do it*
- *I won't go too fast but I'd like you to do these as quickly as you can.*

When you have displayed one set of questions, work through the answers on the board.

Emphasise the in the head methods that students used to do them.

Focus on improvement and points of continuing difficulty with questions such as:

- *Do you think you are getting better at these?*
- *Do you want more practice?*
- *Which of them did you find difficult?*
- *Why was that harder than the others?*

Acknowledge improvement in individuals and encourage students to compete against themselves to try and improve their own scores.

If any students are not improving, try to find out their sticking points or difficulties, and provide some extra activities or exercises that may help them practise the necessary skills.

Activity Sheet 1 contains a sample set of Quick Questions to indicate what the sets would look like in practice.

Activity Sheet 2 contains sets of sample questions, These are only an indication of how this method can be used for a variety of skills. It is recommended that you develop your own sets of questions to suit the needs of your class.

It takes only a few minutes to prepare a set before going into class.

For teaching purposes you may wish to use more than one set of questions. (E.g. division by 10 and halving, prior to teaching 5% shortcuts.) However, to maintain students' focus and attention, it is better if these are done in batches of 5, rather than reviewing the answers to 10 questions at one time.

A Single Number Set Variation

Some teachers have a single set of pre-prepared 'Quick Question' numbers in their box of teaching tricks. These numbers, on cards, rather than scrap paper, can be used many times over, using different operations each time. For example:

A set of numbers between 0 and 99, such as: *7; 15; 26; 42; 73*
Used to practise: *+10; +9; -10; double; halve; x10 or find 'how much more makes 100?'*

For example, explain:

- *I want you to add 10 to all of these numbers*

A larger set of numbers like: *72; 108; 124; 240; 820*
Used to practise: *doubling; halving; halving then halving again (÷4); x10; ÷10; 10%*

Some teachers also find it effective to hold up these number cards and go progressively around the room asking individual students to answer. This further encourages quick 'in the head' responses rather than reliance on pencil and paper.

Activity Sheets 3 & 4 contain the two sets of numbers described above to get you started. However, it is recommended that you develop your own numbers sets to suit the needs of your class.

Sample Quick Questions

Activity Sheet 1

Note this is a sample set only. It is designed for students learning to find 1/10 or 10% using short cut techniques.

✂ Copy onto A4 paper and cut.

1 **10% of $70**
2 **10% of $250**

3

10% of $400

4

10% of $3,000

5

10% of $5,060

Sample Quick Questions

Activity Sheet 2

These sets of possible Quick Questions are examples of how quick questions may be used at a number of levels and for a number of skills. They are provided as models only. It is best to create your own according to the needs of your students.

Skill practised or revised	Example Quick Question Set	Skill practised or revised	Example Quick Question Set
Multiplication tables	1. 5 x 9 2. 6 x 8 3. 7 x 0 4. 4 x 9 5. 8 x 7	Halving = 50%	1. ½ of 16 2. ½ of 24 3. ½ of 68 4. 50% of 36 5. 50% of 56
Adding 9	1. 11 + 9 2. 34 + 9 3. 58 + 9 4. 72 + 9 5. 105 + 9	Halving twice = ÷4 = ¼ of .. = 25%	1. 84 ÷ 4 2. ¼ of 100 3. ¼ of 28 4. 25% of 124 5. 25% of 840
Subtracting 9	1. 45 – 9 2. 23 – 9 3. 72 – 9 4. 104 – 9 5. 235 – 9	Dividing by 10 = 1/10 = 10%	1. $50 ÷ 10 2. 10% of $600 3. $7,000 ÷ 10 4. 10% of $640 5. $9,050 ÷ 10
In the head money calculations	1. 4 x 99 cents 2. 2 x $1.99 3. 3 x $2.99 4. 2 x $3.95 5. 5 x $3.98	Shortcut percentages	1. 10% of $900 2. 20% of $900 3. 20% of $600 4. 30% of $800 5. 40% of $500
Multiplying by 10 & 100	1. 3 x 10 2. 5 x 100 3. 11 x 100 4. 200 x 10 5. 305 x 10	Shortcut percentages	1. 10% of $300 2. 20% of $300 3. 10% of $800 4. 5% of $800 5. 15% of $800

Single Number Set Variation

Activity Sheet 3

Note: This is a sample set only. It is designed for students practising a variety of number skills such as: +10; +9; -10; double; halve; x10 or 'find how much more makes 100?'

✂ To use this set, photocopy on to card and cut.

1.   7
2.   15
3.   26

4. 42
5. 73

Single Number Set Variation 2

Activity Sheet 4

Note: This is a sample set only. It is designed for students practising a variety of number skills such as doubling; halving; halving then halving again (÷4); x10; ÷10; 10%.

✂ To use this set, photocopy on to card and cut.

1. 72
2. 108
3. 124

4.

240

5.

820

10 Questions

Overview

10 Questions' describes a simple activity type that can be used for students to practise a range of essential skills and 'in the head' calculation techniques.

The sets of 10 questions can be presented:

- On the board
- On slips of paper
- As homework exercises
- To the whole class at once
- Tailored to individual students.

The sets can focus on one particular skill, especially when it is initially taught. Sets composed of a mixture of skills can be used as revision and consolidation exercises.

Additional sets for further practice can be made easily by merely varying the numbers used.

Skills and Knowledge

A wide range of essential skills, including:

- Calculating change
- Subtraction techniques
- Shortcut addition techniques
- Doubling
- Halving
- Multiplication by 10, 100
- Division by 10, 100

Preparation and Materials

Type a set of 10 questions to fill 1/2 or 1/3 sheet of A4 paper.

- Duplicate on paper 2 or 3 times.
- Photocopy and cut into slips to distribute to students.

Alternatively:
Handwrite different sets for individual students.

Suggested Procedure

Introducing the activity

It is good to build this method into the routine of the class early in the course. It should be combined with a number of other strategies to keep classes varied in pace and style.

They can be used as:

- An activity to start the class
- An activity to finish the class
- Homework exercises

You might use the same sets of questions for all the students in the class.

Or, if you are catering to a number of widely differing needs in the one class, you may give individual students different sets of questions.

After correction in class, the same set of questions can be re-issued as homework, then again in the following class. This tends to motivate students to do the homework and will help them memorise the associated number facts.

Explain to students that you will use *10 Questions* frequently to practice skills as they are taught and as a way of doing revision to make sure they don't forget the new skills.

Explain:

- *I don't want you to write much when you do these*
- *They are mainly to do in your head*
- *All you need to write on the paper is the answer*
- *And maybe a few jottings to keep track of your thinking*
- *I don't want you to use a calculator for these*
- *And I don't want you to use the long formal school methods*

You may have to keep reminding some students not to use the formal calculations from school. Not because the formal methods are wrong, but because you also want them to learn these quicker and more adult ways of doing things in their heads.

Sample sets of 10 questions are provided *in Activity Sheet 1* as models. These are sets designed for students to practise using number pairs in order to calculate change. Further similar sets of 10 Questions are provided in Practice Sheets 1 & 2, *Calculating Change* and *The Power of Halving*.

To use this type of activity create sets of numbers to suit the skills you are teaching and the individual or group needs of your students.

Activity Sheet 2 contains sets of sample questions, These are only an indication of how this method can be used for a variety of skills. It is recommended that you develop your own sets of questions to suit the needs of your class.

Activities for introducing several of these skills are included in the *Exploring Numbers* and *In the Head Calculations* sections of this resource.

10 Questions Sample Sets

Activity Sheet 1

Note: These are a sample sets only. They are designed for students learning pairs of numbers which add to 10 to assist with subtraction.

✂ Copy onto A4 paper and cut.

Set 1

For each of these, how much more do you need to make $1?

1. 30c
2. 50c
3. 90c
4. 20c
5. 70c
6. 10c
7. 40c
8. 80c
9. 60c
10. 100c

Set 2

What is the change from $1 if you spend:

1. 95c
2. 55c
3. 15c
4. 75c
5. 35c
6. 65c
7. 45c
8. 5c
9. 85c
10. 25c

Sample 10 Questions

Activity Sheet 2

These sets of possible 10 Questions are examples of how 10 Questions may be used for a variety of skills. They are provided as models only. It is best to create your own according to the needs of your students.

Skill practised or revised	**Example 10 Question Set**
In the head addition and subtraction with useful number pairs	1. 56 + 4 = 2. 3 + 77 = 3. 12 + 8 = 4. 34 + 6 = 5. 8 + 22 = 6. 90 – 5 = 7. 50 – 6 = 8. 30 – 8 = 9. 60 – 5 = 10. 40 – 9 =
In the head addition and subtraction of money using number pairs	1. $2.20 + $1.80 = 2. $3.50 + $2.50 = 3. $6.90 + $3.10 = 4. $12.10 + 90c = 5. $14.30 + $5.70 = 6. $20 - $1.50 = 7. $30 - $3.60 = 8. $50 - $2.75 = 9. $10 - $4.80 = 10. $15 - $10.90 =
Doubling and halving	1. One for $5, two will cost .. 2. One for 50c, two will cost .. 3. One for $2.50, two will cost .. 4. One for 75c, two will cost .. 5. One for $35, two will cost .. 6. One for $1.25, four will cost .. 7. One for $3.60, four will cost .. 8. One for $10.50, four will cost 9. One for $90, four will cost .. 10. One for $5.90, four will cost ..
Time calculations using number pairs to 60	How many minutes until the *next hour* if the time is … 1. 1:25 pm …minutes until … 2. 3:40 pm 3. 9:45 am 4. 1:50 pm 5. 12:10 am 6. 8:05 pm 7. 5:50 am 8. 10:20 am 9. 2:45 pm 10. 7:15 pm