Linking Cubes

Product Code: 080366, 066068

Teacher's Notes

An Introduction to Manipulatives

A manipulative is any object that aids children in visualising mathematical processes. Our range of manipulatives includes Tangrams, Geoboards, Fraction Pieces, Fraction Circles, Fraction Bars, Linking Cubes, Pentominoes and Pattern Blocks. However, a manipulative can be as simple as a piece of string or a tin can.

Manipulatives are invaluable in the classroom because, as modern research tells us, children retain information gained from hands-on experiences better than information they gain from memorisation. They learn in a physical way - with their hands as well as their minds. As a physical learning aid, manipulatives encourage this natural learning process by adding a concrete element to ordinarily abstract concepts.

Above all else, children enjoy working with concrete materials - in the hands of young children, manipulatives will excite their natural curiosity and motivate them to take responsibility for their own learning. Children will become flexible thinkers with a knowledge of mathematics that can be applied to a wide variety of situations - instead of being taught seemingly unrelated rules, they will learn to be problem solvers.

Introductory Activities

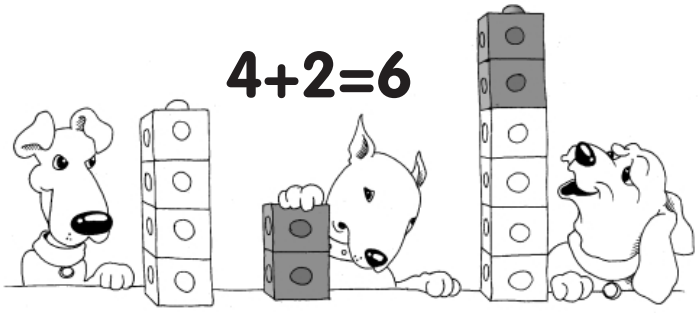
- First, allow the children to engage in free play with the linking cubes. Then gradually introduce various fun activities. Suggest that they make towers. Challenge them to build a tower as big as themselves. Can they make a person, a dog, or a camel? Help them form patterns with different colours. Familiarity with the blocks will help activities go smoother and hopefully reduce the fear of numbers that sometimes develops with traditional maths classes.

Introductory Activities cont...

- Ask the children to follow your instructions as you form a pattern with the blocks in front of the class. For example, "Take one red block and join it to a blue block". Take the exercise one step further by drawing the patterns on the board and asking the children to build them. This simple exercise helps children make the leap from the abstract (your instructions) to the physical (the blocks).
- Use the linking cubes for simple counting exercises. Ask each child to copy what you do as you hold one block up and count "one", hold another block up, join it with the first block and count them - "one, two". Continue this to 10. Try counting backwards.

Addition & Subtraction

- An extension to the introductory counting exercise mentioned above can be used to form a simple introduction to addition. In this case hold up one block, add two or three blocks and ask the children to count the blocks in order to find the total. The process can be reversed for subtraction.
- This exercise can be made much more exciting if the teacher comes up with little stories to represent the addition or subtraction and the children use the blocks to act out the stories. For example "There were 6 oranges on the tree and 2 fell off. How many oranges are left on the tree?"
- Part of a well-developed concept of, say, the number 6 is the fact that "2+4=6" and "3+3=6". These facts can be illustrated



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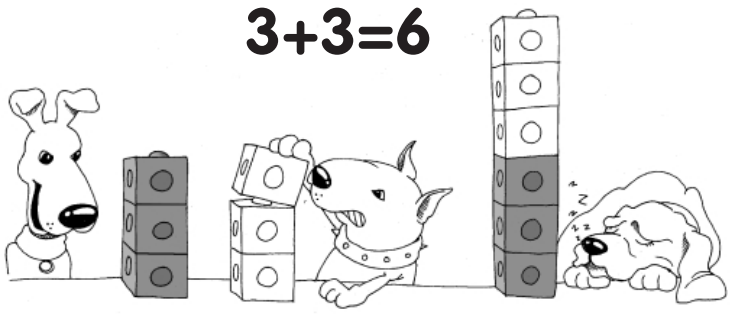


Addition & Subtraction

with the linking cubes by forming 6 different towers made up of 2 colours - for example 6 red (6+0=6), 5 red and 1 blue (5+1=6), 4 red and 2 blue (4+2=6) right through to 6 blue (0+6=6). Ask the children to make up blocks in this way. The patterns formed by the blocks will help children visualise the various attributes of the number 6. Encourage the children to use sentences to describe the towers in front of them. Perhaps the word "equals" could be substituted for "is the same number" in the early stages. Similarly, substituting "4 and 2" for "4+2" could be helpful. This exercise can be extended to point out the commutative nature of addition - "5+1=6" is the same as "1+5=6". It can also be used for fractions - "3 out of the 6 blocks are blue".

Guesstimation!

1 Ask the class to put together linking cubes so that each child has 3 small towers - one of 3 blocks, one of 5 and one of 7.

2 Ask them to take a good look at each of the towers, paying particular attention to the length of each one.

3 Get the children to hold all three chains behind their back.

4 Call out which of the towers you want the children to produce. They must select a tower by feel and place it in front of them without looking at it.

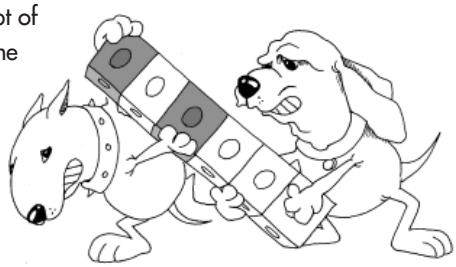
5 Repeat the exercise with towers of different lengths.

Multiplication & Division

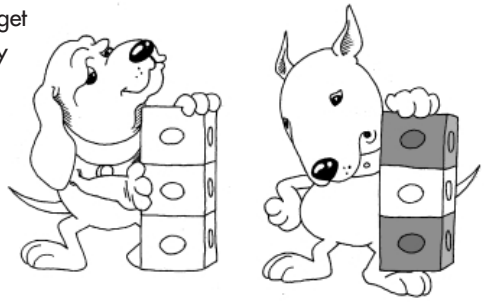
- When approaching multiplication for the first time, children are required to think of two numbers that represent two different things - the number of groups (or sets) and the number of members in each group. This difficult concept can be made more concrete using linking cubes as groups. Set out some simple multiplications and encourage children to count how many groups and how many blocks in each group before counting all of the blocks to arrive at the answer. Thus 2 groups of 3 blocks is the same as the number 6. And 4 groups of 2 blocks is the same as the number 8.
- Take the above exercise one step further by asking the children to set blocks out in front of them as you call out various simple multiplications. Perhaps at this stage more specific terminology such as "4 multiply by 2 blocks is?" can be used. Eventually "equals" can be substituted for "is". To make the exercise more interesting and challenging, use a story or everyday problem that can be represented by the blocks.

Multiplication & Division cont...

- To introduce the concept of division, a sharing game can be used. A pair of children can be handed 6 blocks and asked to share them equally amongst themselves. Thus 6 blocks shared out equally between 2 children means they get 3 each - 6 divided by 2 equals 3. Repeat the exercise this time asking the children to form groups of 3. This will lead to the realisation that 6 blocks between 3 children means 2 blocks each - 6 divided by 3 equals 2. Teachers can then extend the exercise, being sure to start with a number of blocks that is easily divisible such as 8 and 12 before moving on to remainders.



6÷2=3 each



Measuring & Graphing

- As an introduction to graphing, Linking Cubes can be used to make simple, two column, bar graphs. Ask the children to come to the front of the class and select a red block if they eat cereal for breakfast and a blue block if they don't. The first child to eat or not eat cereal should simply place their block in a designated place. The following children should join their blocks to form two towers representing those that do and don't eat cereal for breakfast.

More complex graphs can be introduced by collecting data each day of the week - perhaps graphing how many children are away each day or the temperature at a particular time.

- Divide the class into groups of 5 children. Ask each child in the group to put together ten linking cubes of the same colour.

1 Join everyone's towers so that each group has created a giant tower. Add lots of ten blocks so that the tower is tall enough to easily measure the height of each child.

Measuring & Graphing cont...

2 While the children are putting their towers together, assign each group a letter (Group A, B, etc) and write the letter on the board.

3 Move around the groups explaining that the blocks are to be used to measure everyone's height. One child should stand still while another determines the length of the tower that represents the first child's height. A third child can count the blocks. Make sure it is pointed out that counting the blocks in lots of ten makes it easier - part of the concept behind measurement is convenience and simplification.

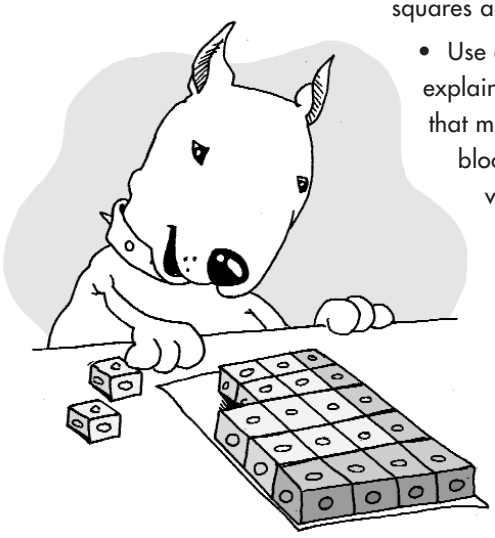
4 As each child is measured, he or she should move to the front of the class and write their name and their height in blocks on the board under the appropriate letter.

5 Use the data collected to make a bar graph for each group.

Encourage students to collect the data and produce the graphs themselves. Or use the blocks to measure and graph other objects. Concepts such as maximum, minimum, and average may also be introduced.

Perimeter, Area & Volume

- The difference between length, perimeter, area and volume can be simply demonstrated using linking cubes. Ask the children to predict how many blocks can be laid end-to-end along one of the long sides of a sheet of paper. Then ask them to try it, recording their results.
- Continue the blocks around the edge of the paper to demonstrate perimeter.
- Area can be determined by covering the sheet with blocks. In this way simple area calculations for squares and rectangles can be made using "number of blocks" as a unit of measurement. It can be pointed out that the number of blocks along the length of the sheet multiplied by the number along the width will equal the total number of blocks. The students should verify this fact by counting the blocks as well as trying the same exercise with different squares and rectangles.



- Use a similar exercise to explain volume. Build a cube that measures 3 by 3 by 3 blocks. Point out that the volume in blocks can be determined by multiplying 3 x 3 x 3 = 27 blocks.

Perimeter, Area & Volume cont...

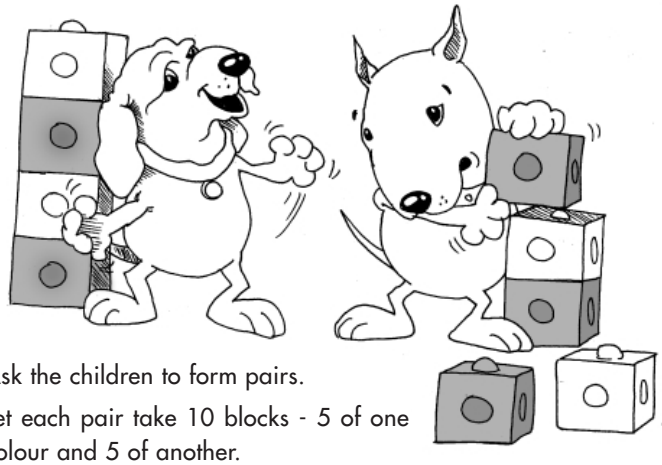
Again the children can verify this by pulling the cube apart and counting the blocks.

Ask them to build other cubes and rectangular prisms and work out their volumes.

- Displacement can be demonstrated by filling a see-through container half filled with water (a tall and relatively thin container is most effective).

Place a handful of blocks joined together as a cube in the water and mark the new height of the water. Disassemble the cubes and reassemble them into a tower. Place the tower in the water and point out that the water reaches the same height. To re-enforce the point, all the cubes can be pulled apart and individually placed in the water.

Patterns



1 Ask the children to form pairs.

2 Let each pair take 10 blocks - 5 of one colour and 5 of another.

3 Ask one child to make a pattern with four blocks.

4 Ask that child to memorise the pattern and hide the tower behind his or her back.

5 Now ask that child to give the other student instructions on how to build the pattern without looking at the blocks.

6 What happens if the original pattern is 5 blocks long?

7 As an extension, ask the child to write the instructions down.

Probability

1 Put 15 linking cubes into a bag that is not see-through. Use 5 blocks of 1 colour and 10 of another. Mix them up thoroughly.

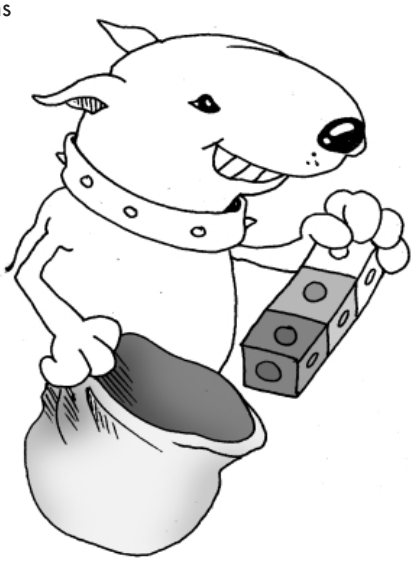
Don't let the children see you put the blocks into the bag, but tell them that you put 5 of 1 colour and 10 of another. Don't tell them which colour is more common.

2 Pull 3 blocks out one at a time, join them and show the class.

3 Tell the children that there are 12 blocks left and ask them to predict how many of each colour are left. Remind them that if

Probability cont...

they add their predictions together they must equal 12. Ask them to record their predictions.



4 Pull out another 3 blocks and join them to the original 3. Count how many of the 6 are one colour, and how many are the other. Tell them that there are now 9 blocks left and, again, ask them to record how many they think are left of each colour.

5 Continue until all the blocks have been taken out of the bag.

- Point out that the laws of probability tell us that the blocks we pull out of the bag give an indication of what colours remain in. As we pull out more blocks, our predictions should get more accurate.

  Repeat the exercise without telling the children the initial ratios.

  For more advanced students, fractions can be introduced as a convenient notation for probability.

Sorting Fun

This activity aims to teach children about cooperation and achieving group goals as well as sorting skills.

1 Place 4 pieces of coloured paper matching the colours of the linking cubes onto a table. Put one container on each piece of paper.

2 Give each participating child a random set of blocks all joined together. Each student should have between 5 and 20 blocks.

3 On the count of "1,2,3 Go!" the teacher starts timing and the children try to put each of the blocks into the container representing the corresponding colour as quickly as possible.

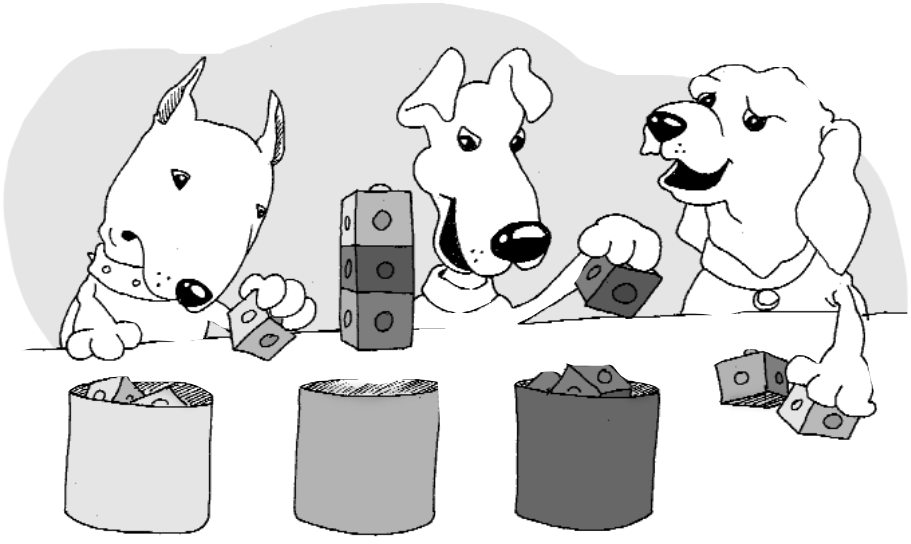
4 If someone places the wrong colour in a container they must get it out before they continue.

5 The timer is stopped when the last block is placed in its container.

6 If one student finishes first, he or she should help one of the other students place the last of their blocks into the containers.

7 Be sure to explain to the children that there is no winner in this game - the goal is for the whole group to complete the activity in the shortest time. Cooperation and communication are the keys to achieving group goals.

8 Groups should try to improve their times by investigating different methods for completing the activity. Is it better to pull the blocks apart first and then do the sorting or do you save time by dealing with one block at a time? Maybe the children should swap towers before the activity starts so that the person nearest to the red container, for example, has the most red blocks.



EDUCATIONAL EXPERIENCE

Educational Experience
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