Square Tiles

Product code 056812

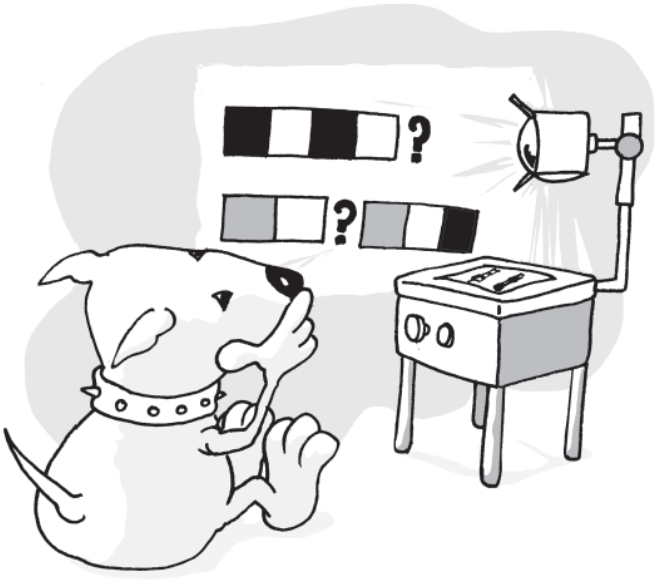
An Introduction to Manipulatives

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 Tiles, 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



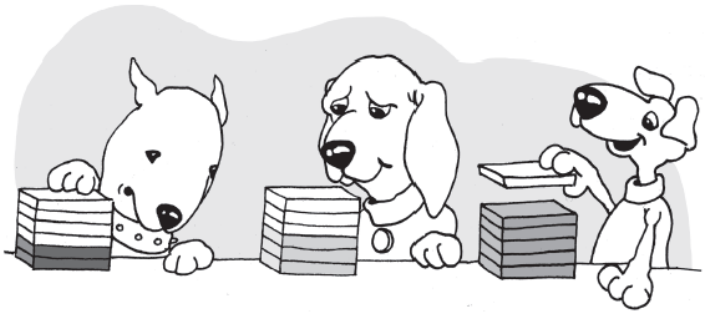
- First, allow the children to engage in free play with the tiles. Gradually introduce various fun activities. Familiarity with the tiles will help activities go smoother and reduce the fear of numbers that sometimes develops with traditional maths classes.
- Ask students to model a capital "A" with the tiles. Can they do the same in lower case? What about other letters or numbers?
- Start a colour-square pattern on the overhead projector and have a student guess what colour comes next. Have students use their own squares to copy and continue the pattern at their desks. After two or three patterns have been demonstrated, have students work individually.
- Distribute a set of square tiles to each student. Ask the students to find five different ways that a rectangle could be made using 12 squares. As the students use the square tiles and respond, draw a picture on the board to illustrate each rectangle.
- Play four in a row. Prepare a grid 5 x 6 beforehand. Children form pairs and then select 20 tiles each of one particular colour. Each child takes turns placing a tile on the grid with the aim of being the first to get four in a row either vertically, horizontally or diagonally. If the grid is filled without a row being completed, remove the tiles and continue.

Addition & Subtraction

- Hold up one tile, add two or three and ask the children to count the tiles 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 tiles to act out the stories. For example "3 children were swimming in the pool and 2 more jumped in, so how many children were in the pool?"

Addition & Subtraction

- 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 with the tiles 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 tiles in this way. The patterns formed by the tiles will help children learn the various attributes of the number 6.



4+2=6 **3+3=6** **5+1=6**

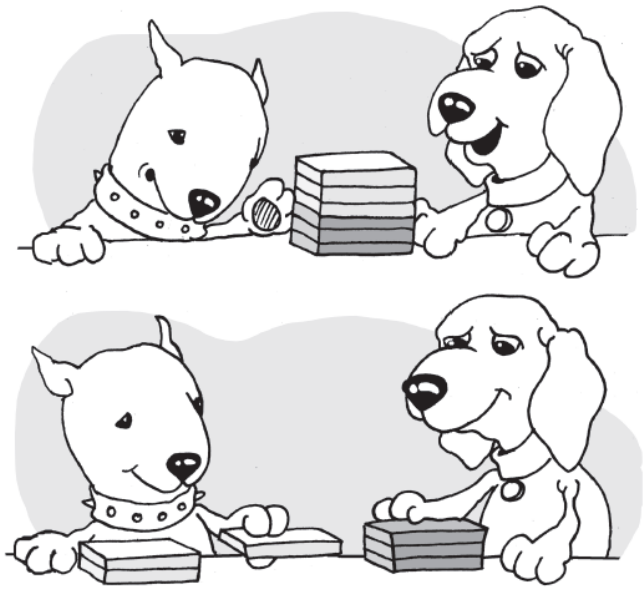
Encourage the children to use sentences to describe the towers in front of them. Perhaps the word "equals" could be substituted by "is the same as the number" in the early stages. Similarly, substituting "4 and 2 more" for "4+2" could be helpful. This exercise can be extended to point out the commutative 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 tiles are blue".

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 concept can be made more concrete using tiles as groups.

  Set out some simple multiplications and encourage children to count how many groups and how many tiles in each group before counting all of the tiles to arrive at the answer. Thus 2 groups of 3 tiles is the same as the number 6. And 4 groups of 2 tiles is the same as the number 8.
- Take the above exercise one step further by asking the children to set tiles out in front of them as you call out various simple multiplications. Perhaps at this stage more specific terminology such as "4 lots of 2" or "multiplied by" can be used. Eventually "equals" can be substituted for "is".
- To introduce the concept of division a sharing game can be used. A pair of children can be handed 6 tiles and asked to share them equally amongst themselves. Thus, 6 tiles shared out equally between 2 children means they get 3 each - 6 divided by 2 equals 3. Invent stories or everyday problems to create more interest.

6÷2=?



6÷2= 3 each

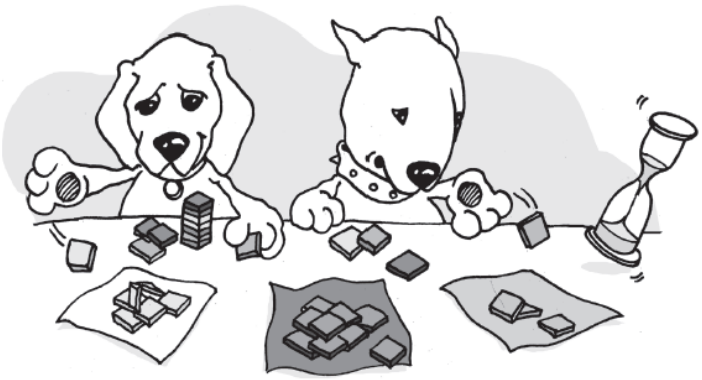
Repeat the exercise this time asking the children to form groups of 3. This will lead to the realisation that 6 tiles between 3 children means 2 tiles each - 6 divided by 3 equals 2. Teachers can then extend the exercise, using a number of tiles that is easily divisible before moving on to remainders.

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 onto a table.
2. Put one container on each piece of paper.
3. Give each participating child a random pile of tiles. Each student should have between 5 and 20 tiles.
4. On the count of "1,2,3 Go!" the teacher starts timing and the children try to put each of their tiles into the container representing the corresponding colour.
5. If someone places the wrong colour in a container they must get it out before they continue.
6. If one student finishes first, he or she should help one of the other students places the last of their tiles into the containers.
7. The timer is stopped when the last tile is placed in its container.
8. 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 key to achieving group goals.

Sorting Fun



Groups should try to improve their times by investigating different methods for completing the activity. Maybe the children should swap the piles around before the activity starts so that the person nearest to the red container, for example, has the most red tiles.

Graphing

As an introduction to graphing, tiles 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 tile if they eat cereal for breakfast and a blue tile if they don't. The first child to eat or not eat cereal should simply place their tile in a designated place. All the following children should join their tiles 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.

Area, Perimeter & Volume

- The difference between length, perimeter, area and volume can be simply demonstrated using tiles. A small sheet of paper can be used as an example. Ask the children to predict how many tiles can be laid end-to-end along one of the long sides of the sheet. Then ask them to try it, recording their results. The perimeter can be demonstrated in a similar way.
- Area can be determined by covering the sheet with tiles. In this way simple area calculations for squares and rectangles can be made using "number of tiles" as a unit of measurement. It can be pointed out that the number of tiles along the length of the sheet multiplied by the number along the width will equal the total number of tiles. The students should verify this fact themselves by counting the tiles as well as trying the same exercise with different squares and rectangles.
- As an extension, a similar exercise can be used to explain volume. Build a cube that measures 3 by 3 by 3 tiles. Point out that the volume in tiles can be determined by multiplying 3 x 3 x 3 = 27 tiles. Again the children can verify this by pulling the cube apart and counting the tiles. Ask them to build other cubes and rectangular prisms and work out their volumes.

Probability

1. Put 15 tiles into a cloth or plastic bag that cannot be seen through. Use 5 tiles of 1 colour and 10 of another. Mix them up thoroughly. Don't let the children see you put the tiles 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 tiles out one at a time show them to the class.
3. Tell the children that there are 12 tiles left and ask them to predict how many are one colour and how many are the other. Remind them that if they add their predictions together they must equal 12. Ask them to record their predictions.
4. Pull out another 3 tiles. Count how many of the 6 are one colour, and how many are the other. Tell them that there are now 9 tiles left and, again, ask them to record how many they think are left of each colour.
5. Continue this pattern until all the tiles have been taken out of the bag.
6. Point out that the laws of probability tell us that the tiles we pull out of the bag give an indication of what colours remain. As we pull out more tiles, our predictions should get better and better.
7. Try the exercise again to see if the children have gained an appreciation of probability. For advanced students, introduce fractions as a convenient notation for probability.
8. Repeat the exercise without telling the children the initial ratios.