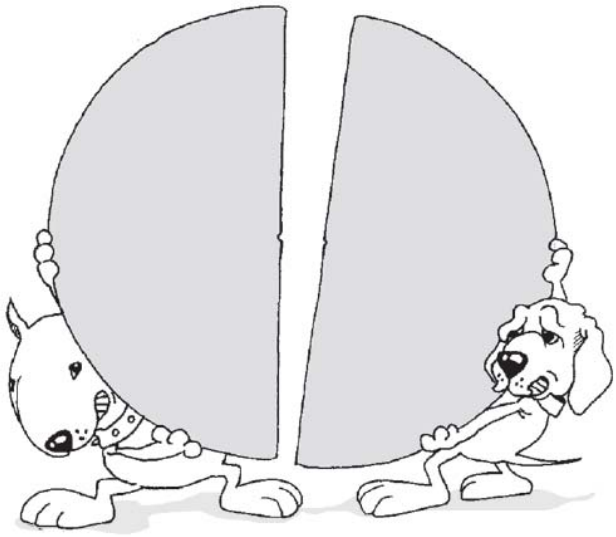
Fraction Circle Set

Product code 060673



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, Pattern Blocks and many others. 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.

Name the Fractions

Hold up two half fraction circles in front of the class and ask the children to describe what they see. Lead them towards thinking of a full circle as one whole. Now, take one half piece away and hold up the other one.

Ask if it is bigger or smaller than a whole. Ask what else the children notice about the half circle.

Explain that it is called "one half of a circle" and show how it can be written- $^1/2$ of a circle. Be sure to refer to the "whole" we are talking about - "half an apple" or "half a circle" is much clearer than just "a half". The denominator, 2, in $^1/2$ describes how many it would take to form one whole. Put the two halves back together again to demonstrate this. The numerator, 1, describes how many we are considering. Together $^1/2$ is known as a proper fraction. We will introduce improper fractions further on.

Repeat the process for $^1/3$, $^1/4$, $^1/6$ and $^1/8$.

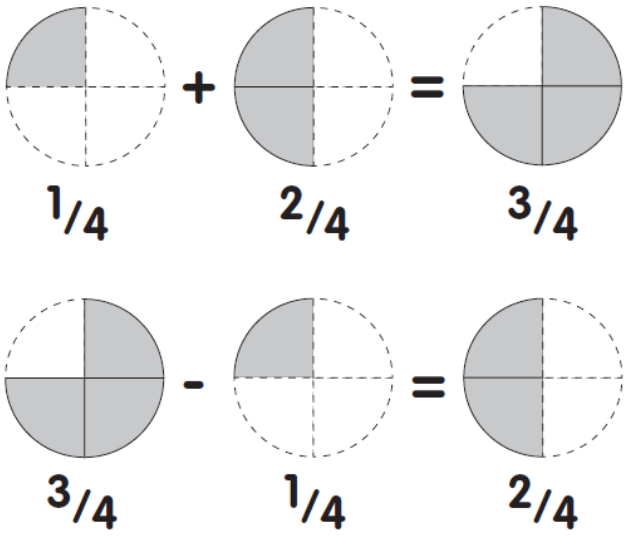
Which is bigger?

After introducing the notation for fractions, ask the children to arrange the fraction pieces in order of size and then write them down on a piece of paper. Ask the children what they notice about the order. Do they see any pattern? Point out that even though 6 is bigger than 4, $^1/6$ is smaller than $^1/4$.

Adding & Subtracting Fractions of the Same Denominator

Its only a small step from the above activities to adding fractions with the same denominator. If we take 1 quarter piece and add 2 quarter pieces we end up with 3 quarters. This can be expressed in writing as $^1/4+^2/4 =^3/4$. If we take one quarter away we are left with 2 quarters; $^3/4-^1/4 =^2/4$.

Set the class questions in the form of $^2/6+^3/6$ and $^5/8 -^3/8$.

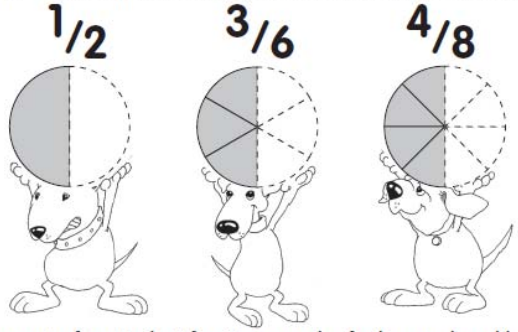


Adding & Subtracting Fractions of the Same Denominator

Ask the children to make as many whole circles out of the same colour as they can; 2 halves, 4 quarters etc. Point out that all of these are equal even though they are made from different fractions. Now see if they can find fracton pieces to make up one half circle, ie 2 quarters, 3 sixths and 4 eighths.

Once again, point out that each of these fractions is equal to the others. Show this on the board using traditional fractions notation; $^1/_2 = {}^2/_4 = {}^3/_6 = {}^4/_8$.

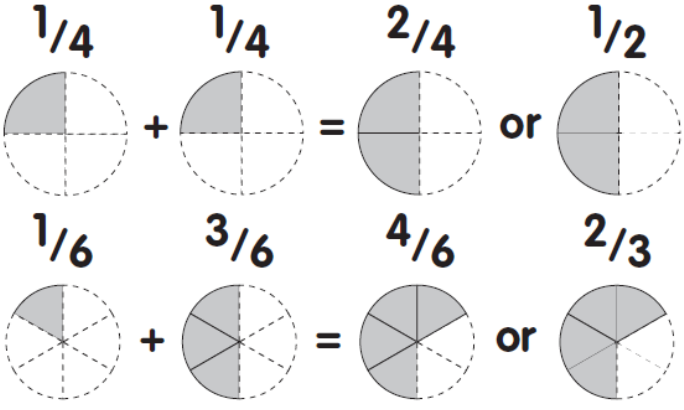
Extend the activity by asking the class to find equivalent frations for fractions such as $^2/_8$, $^4/_6$, $^2/_6$ and $^8/_8$. Then ask them to find all the possible equivalent fractions with their fraction circles.



The concept of equivalent fractions can be further explored by asking children to "express fractions in their lowest terms" (also known as "simplifying" fractions). This will also improve students' abilities in adding and subtracting fractions since the answer can be expressed in the simplest terms. This is done by forming equivalent fractions with as few fraction pieces of the same colour as possible.

Put four, $^1/_8$ fraction pieces together and challenge students to find all the possible equivalent fractions. They will find an equivalent fraction with 2, $^1/_4$ fraction pieces or 3, $^1/_3$ pieces but point out that 1, $^1/_2$ piece is the equivalent fraction expressed in the lowest possible terms. Ask the class to find the equivalent fractions in the lowest possible terms for $^2/_8$ and $^4/_6$.

Extend the activity by asking the children to perform additions or subtractions with fractions of the same denominator and then simplify their answers so that they are expressed in the lowest possible terms. For example, $^1/_4 + {}^1/_4$, $^1/_6 + {}^3/_6$, $^3/_8 + {}^3/_8$, $^2/_8 + {}^4/_8$.



Adding & Subtracting Fractions of a Different Denominator

Once the children are comfortable with equivalent fractions, we can introduce addition and subtraction of fractions with different denominators. This involves finding equivalent fractions for one or both of the fractions in question so that both fractions have the same denominator before actually attempting the sum.

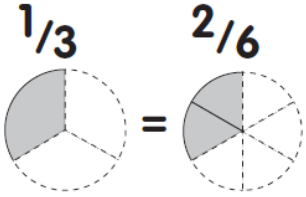
Perhaps it would be helpful, at first, to hold up the half circle and show that 2 quarters, 3 sixths and 4 eighths each make up one half. So $^1/_4 + {}^1/_4 = {}^1/_2$, $^1/_6 + {}^1/_6 + {}^1/_6 = {}^1/_2$, $^1/_8 + {}^1/_8 + {}^1/_8 + {}^1/_8 = {}^1/_2$.

Now hold up $^1/_4 + {}^1/_8 + {}^1/_8$ and show that this equals $^1/_2$. We can show that $^1/_4$ is equivalent to $^2/_8$ so $^1/_4 + {}^1/_8 + {}^1/_8$ is the same as $^2/_8 + {}^1/_8 + {}^1/_8$. This equals $^4/_8$ and, when this is expressed in the lowest possible term it equals $^1/_2$.

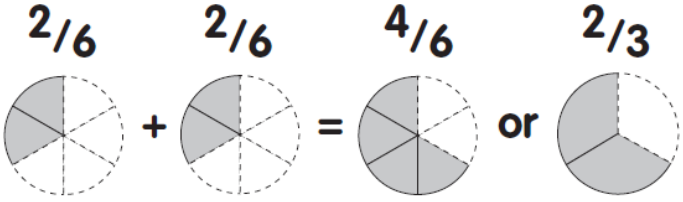
Now try $^2/_6 + {}^1/_3$. In this case we have to find an equivalent fraction for $^1/_3$ so that the whole sum is expressed in sixths. $^1/_3 = {}^2/_6$ so $^2/_6 + {}^2/_6 = {}^4/_6$ and $^4/_6 = {}^2/_3$. The fraction circles neatly illustrate each of these steps. Try $^3/_8 + {}^1/_4$ or $^1/_2 + {}^1/_6$.

$$^2/_6 + {}^1/_3 = \boxed{?}$$

we know that $^1/_3$ is equivalent to $^2/_6$



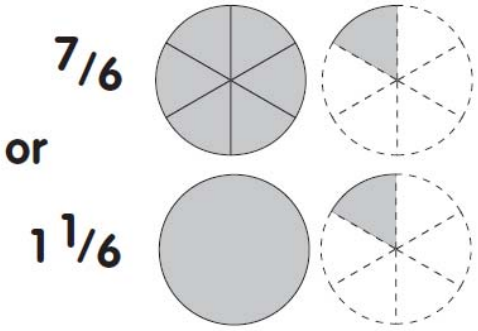
so we can then add 'like' fractions together.



If the children are comfortable with addition try $^3/_4 - {}^1/_2$ or $^1/_2 - {}^1/_6$. The same principles apply - express both fractions in the same denominator, do the sum and simplify the answer to express it in the lowest terms.

Improper Fractions

The children already know that one whole is represented by a full circle. They also know that this can be expressed as $^2/_2$, $^3/_3$, $^4/_4$, $^6/_6$, or $^8/_8$. Improper fractions make up more than one whole circle so if we use 2 halves to represent the whole and add, $^1/_6$ we can use fraction circles to represent $^7/_6$. This can also be written as $1\,^1/_6$ - this is known as a mixed number. Try $^4/_3$, $^{11}/_6$, and $^9/_8$, asking the children to construct the improper fractions with the fraction circles and then each of them as a mixed number.



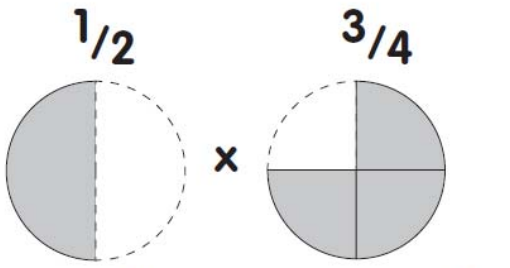
Multiplying Fractions

First, multiply some proper fractions by whole numbers. Show that 3 x $^1/_8$ is the same as $^1/_8$ + $^1/_8$ + $^1/_8$.

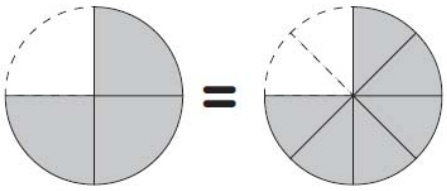
$$3 \times {}^1/_8 = {}^1/_8 + {}^1/_8 + {}^1/_8$$

Remember that the answers should be simplified. To illustrate this show that 3 x $^2/_8$ = $^3/_4$. Now ask the children to find $^1/_2$ of $^2/_3$. This means that we want to divide $^2/_3$ into two equal parts and we want to keep one of them. So $^1/_2$ of $^2/_3$ = $^1/_3$. Introducing correct notation, $^2/_3$ x $^3/_6$ can be found by taking three $^1/_6$ fraction pieces, splitting them into 3 equal groups and keeping two of them $^2/_6$ or $^1/_3$.

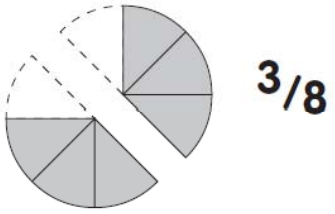
Again, equivalent fractions might have to be found - if we want to find $^1/_2$ x $^3/_4$, we can show that if we put together three $^1/_4$ pieces we will find it hard to divide into 2 equal groups. However, if we show that $^3/_4$ is the same as $^6/_8$, we can make two equal groups and find that the answer is $^3/_8$.



we know that $^3/_4$ is equivalent to $^6/_8$



so we can find two equal groups ($^1/_2$), giving us an answer of $^3/_8$.



We can simplify the division of fractions if we take care how we express the questions. Instead of $^3/_4$ ÷ $^1/_4$, we say, "How many $^1/_4$ go into $^3/_4$?" or , "How many $^1/_4$ pieces go together to make $^3/_4$?" If children construct $^3/_4$ with three $^1/_4$ pieces, they can see that the answer is 3. Now try $^2/_3$ ÷ $^1/_6$.

Division

$$^3/_4 \div {}^1/_4 = 3$$