INVICTA EDUCATION

FRACTION CUBES & SPHERES

MATHEMATICS
SHAPE, SPACE AND MEASURES

PRODUCT GUIDE

IP 051759

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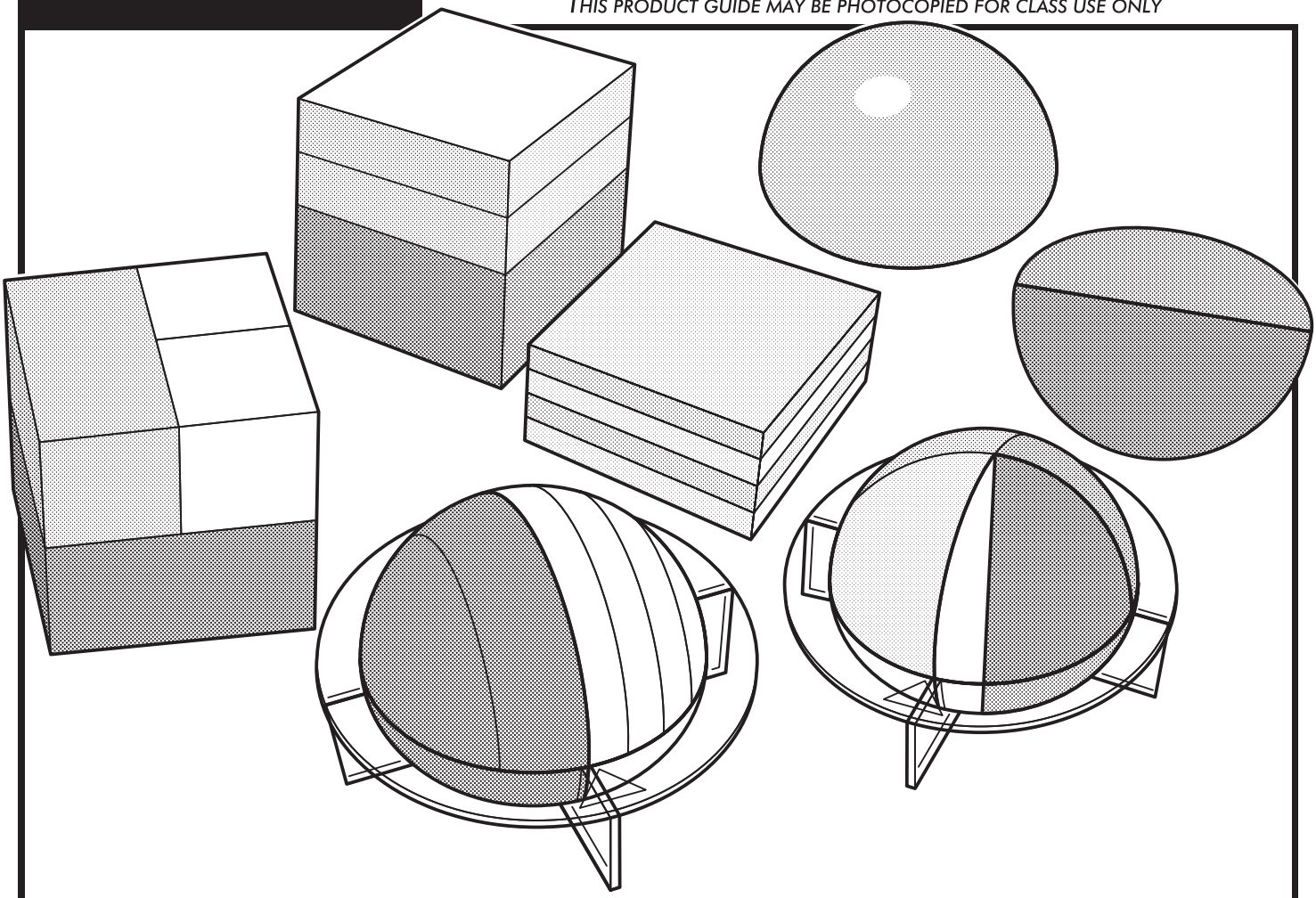

Fraction Cubes and Spheres allow children to explore the relationship between different fractions of solid shapes.

The set comprises three cubes and three spheres, each divided differently to show halves, quarters and eighths. To ensure that the fractions of the sphere can be held together to show different ways of making a 'whole' sphere, two transparent sphere-holders are included.

For extended work each fraction of each shape is marked with its decimal and percentage value.

To aid recognition of specific fraction values, each fraction piece of the same value is manufactured in the same colour plastic e.g. all halves are red.

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WARNING: NOT SUITABLE FOR CHILDREN UNDER 36 MONTHS BECAUSE SMALL PARTS MAY CAUSE A CHOKING HAZARD. TO BE USED ONLY UNDER ADULT SUPERVISION. Please retain the information from this pack for future reference. We reserve the right to alter designs and specifications (including colours and materials) when such changes are unavoidable. This product conforms to the safety requirements of EN71, ASTM, 16 CFR and The Canadian Hazardous Products (Toys) Regulations. MADE IN CHINA

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Product Guide IP 051759a (0310)

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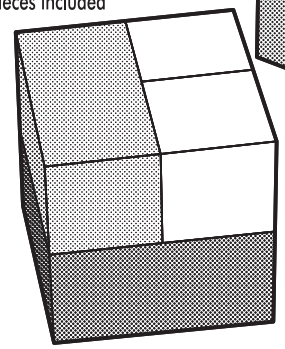
FRACTION CUBES

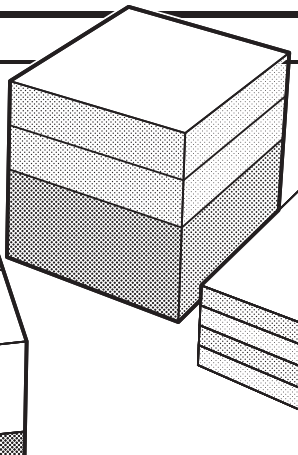
A cube can be halved along a plane in an infinite number of ways to produce two identical and equal parts - as long as the plane cuts between one face and the face directly opposite, passing through the centre line, or alternatively to a diagonally opposite corner, again passing through the centre line.

To simplify the fraction cube set, all of the fraction pieces included have been produced by cutting along planes that are parallel to two opposite faces. The half cube is produced by cutting along the plane which goes through the centre line of the cube and is parallel to two opposite faces.



The cube can be quartered by cutting along a plane in any of the three dimensions, each way producing four identical parts. Cutting the cube in the same plane in which it was halved produces four 'slices'. Cutting along a plane perpendicular to the original will produce four long cuboids.

The cube quartered by 'slicing' can be reduced to eighths by further slicing along that plane or by cutting along a perpendicular plane to produce eight identical cuboid 'sticks'. These cuboid sticks can also be made by slicing the long cuboids.



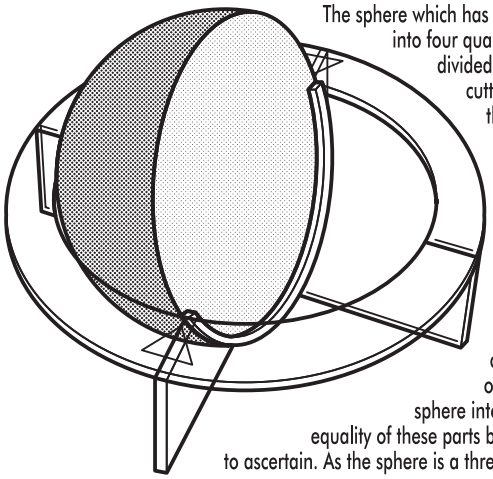
An alternative to slicing the cube is to cut it three times, once in each dimension, to end up with eight identical cubes - each will have dimensions exactly half of the original cube and a volume of one-eighth.

Encourage the children to construct complete cubes from the fractions that are available. What different combinations are possible? The children will discover that it is only possible if each half cube is constructed from the same 'family' of fractions - either slices or cuboids, not both.

FRACTION SPHERES

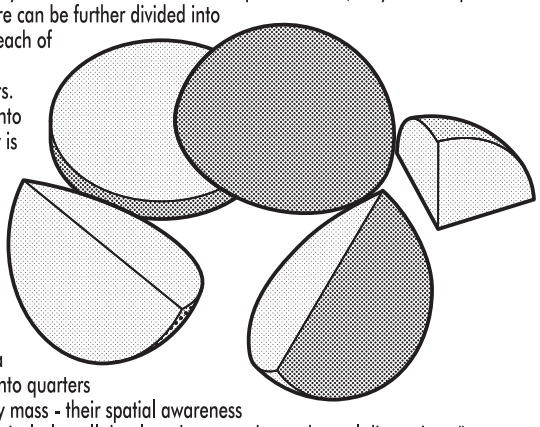
A sphere can be divided only into two equal parts along a plane in one way - they may look different to begin with but they can be rotated to look exactly the same. The plane will always go through the centre to give two identical hemispheres. Children may wish to try this for themselves by rolling balls of dough or plasticine and cutting them in half using a clay-modelling cutting tool - they can show that the two parts are equal by using a balance beam.
*See Note.

There are more possibilities when attempting to divide a hemisphere into two equal parts. The most easily identifiable quarter sphere would be to make a cut perpendicular to the first plane to have four parts rather like the segments of an orange. Two further cuts could be made along similar lines to produce eighths, which are segments of the sphere, each identical in shape and dimension to the others.



The sphere which has been segmented into four quarters can also be divided into eighths by cutting perpendicular to the first two planes, again leaving eight identical pieces.

An alternative way of dividing the sphere into quarters is to cut each hemisphere into two by making cuts parallel to the original, to slice the sphere into four parts. The equality of these parts becomes more difficult to ascertain. As the sphere is a three-dimensional shape the fractions are determined by volume and not dimensions. Although the quarter spheres produced by this method are different shapes and sizes, they are of equal volume. This sphere can be further divided into eighths by slicing each of the quarters with further parallel cuts. A sphere divided into eighths in this way is probably the most difficult to appreciate the equality of.



The children will probably have considerable difficulties slicing a plasticine sphere into quarters which are equal by mass - their spatial awareness will need to be particularly well developed to move beyond equal dimensions."

Again, as with the cube, encourage the children to reconstruct the sphere using different pieces.

There is a central rib built into the sphere holder which enables an individual hemisphere to be held in place. There are two arrows raised on the top outer rim which provide identification of this rib.

*Note
The fractions are calculated by volume, individual parts are not solid so direct practical comparison using an Archimedian approach is not possible. Also, due to the different amounts of plastic required to make each fractional piece, it is not possible to make comparisons by mass.

FURTHER ACTIVITIES

Encourage the children to record how many eighths, quarters and halves they require to complete each whole solid (the fractional sum should always equal 1.

1 = ( )1/2 + ( )1/4 + ( )1/8

Do the same for half cubes and hemispheres 1/2 = ( )1/4 + ( )1/8

Introduce decimals & percentage values using the engraved values on each fractional piece.

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