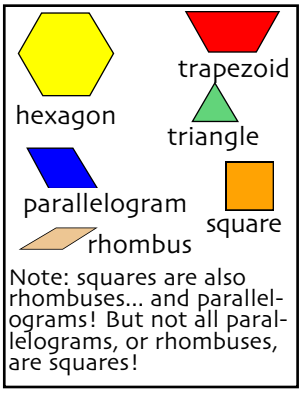
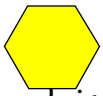
Why is my child playing with blocks to learn math?
A Parent's Guide to Hands-on Manipulatives

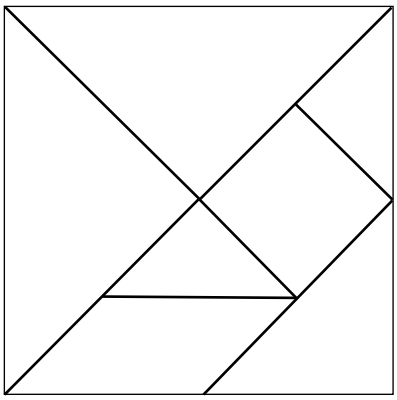
Since young children oftentimes have difficulty thinking about numbers abstractly, teachers may use hands-on manipulatives to teach children math concepts. Here is a breakdown of the kinds of hands-on materials your children may be using in school, and why:



Note: squares are also rhombuses... and parallelograms! But not all parallelograms, or rhombuses, are squares!

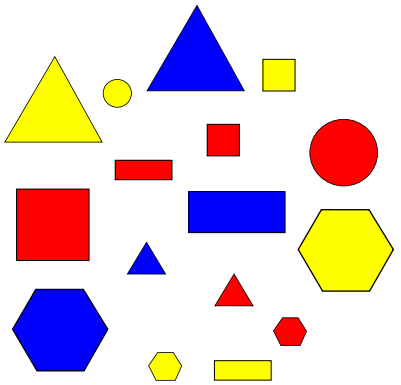
Pattern Blocks are flat blocks that consist of yellow hexagons, orange squares, green triangles, red trapezoids, blue parallelograms, and tan rhombuses. As the name suggests, children use these blocks in class to practice patterns, since recognizing patterns is a very important math skill. Pattern blocks are also used to teach geometric shapes and their relationships. Your children also use pattern blocks to practice fractions. For example:

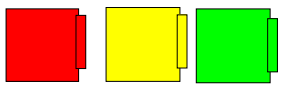
How many  are in  ? Answer:  (6). If **six** small triangles are in a hexagon, then how much is **one** triangle worth? Write the number as a a fraction. **Answer:** 1/6 (one sixth)



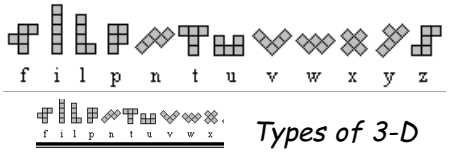
A Tangram is a geometric puzzle that consists of seven geometric shapes that fit into a square puzzle: two large triangles, one medium-sized triangle, two small triangles, a square, and a rhombus (see left). Sometimes the blocks are all one color, and other times the colors are mixed. Using tangrams helps children develop spatial sense. Teachers may challenge children to replicate a shape (other than a large square) using tangrams.

Attribute Blocks come in five shapes (rectangles, squares, circles, triangles, and hexagons), three colors (red, blue, and yellow), two thicknesses, and two sizes (60 blocks per set). Children use attribute blocks to practice sorting, e.g., finding all the "red circles." Young children can sort by one attribute, for example, all the "red" shapes. As they get older, they learn to sort by more than one characteristic, e.g., all the *small, blue triangles* (three attributes). Children also use attribute blocks to practice patterning, making comparisons, fractions, proportions, and other mathematical concepts.





Unifix Cubes are colorful, interlocking blocks that are used to teach counting, one-to-one correspondence (one number represents one object when counting), addition, subtraction, multiplication, etc.



Types of 3-D shapes that can be made with Pentominoes

Pentominoes are puzzles whose twelve different-shaped pieces (see left) can be combined together to make various three-dimensional shapes. Using Pentominoes can help children develop concepts about area, perimeter, spatial relationships, etc.

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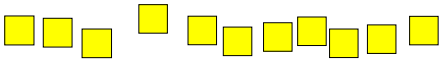
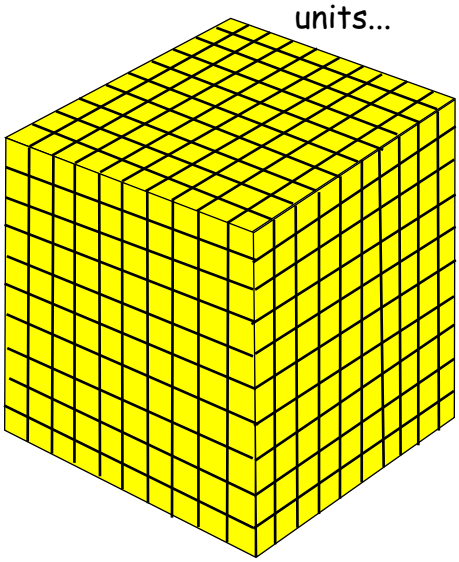
Base 10 Blocks are used for learning addition, subtraction, and place value, for example: the number "256" consists of two groups of one hundred, five groups of ten, and six units, or *singles*. Elementary children use base ten blocks and place value mats (see below) to represent numbers in different ways: the number "15" can be shown as 15 units/ones OR one group of 10 and five units. Children can learn to trade 10 singles for one group of ten, and 10 groups of ten for a group of one hundred, etc. with base ten blocks. These are important concepts that will assist them when adding and subtracting large numbers.

Base 10 blocks come in single units (ones cubes)...

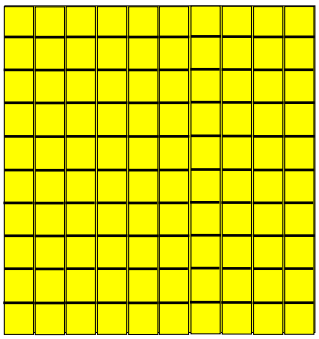


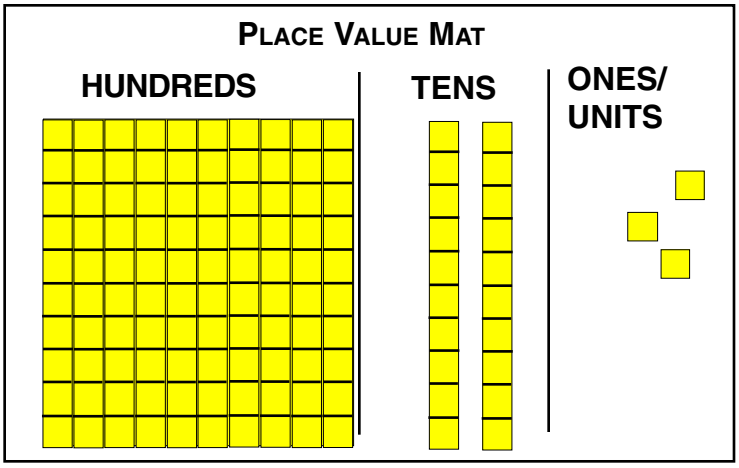
sticks that each represent ten units...

and cubes that each represent 1,000 units...

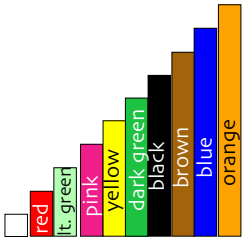


plates that each represent 100 units...

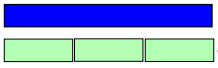




A place value mat is a piece of laminated cardstock that is divided into sections -- hundreds, tens, & ones/units. Children use the mats with Base 10 Blocks to demonstrate numbers. The mats help children recognize and understand place value, e.g., the number "123" (shown above) consists of one group of hundred, two groups of ten, and three units. When children are learning subtraction that involves multi-digit numbers and trading (or "borrowing" as many of us learned in school), Base 10 Blocks and place value mats help them visualize this process.



Cuisenaire Rods are a set of colored sticks that are usually one centimeter wide, and one centimeter thick (2 cm X 2 cm for the Jumbo rods), but vary in length. Each color-coded rod represents a specific unit value from one to ten units. For example, the white rod (left) represents one unit, the red rod is two units, light green is three units...and finally, the orange rod is worth ten units. In a set, all same-colored rods are worth the same value, e.g., all blue rods are worth nine units. Cuisenaire Rods are used to teach addition, subtraction, spatial problem solving, multiplication, division, geometrical concepts such as perimeter, and fractions.



For example, a child can figure out what nine divided by three is (9/3) by using the rods: 9/3 = 3 (3 rods, each worth 3 units can fit into a rod worth 9 units.)

Sources: Information regarding Cuisenaire Rods from www.etacuisenaire.com and http://www.arcytech.org/java/integers/integers.html. Other sources include, "No Matter What Shape Your Fractions are In" at http://math.rice.edu~lanius/Patterns; "Quality Educational Materials for Unique Learners!" at http://wisdomseekerinc.com/whatisdibet.html; "Tangrams: Make It" at http://tangrams.ca/inner/makeset.htm; "The Pentominoes Page" at www.puzzlecraft.com/solutions/pent/pentom/pentomin.html; "Unifix Cubes" by Teaching Planet at www.teachingplanet.com.

--Title I Dissemination Project, 2004--