

Build It!

Concept Areas

Geometry and spatial reasoning in three dimensions, logic in a geometrical setting. Using vocabulary: cube, face, edge, side, touching, above, below, each, every.

Description

The group needs to build a small structure out of colored cubes. Each clue tells something about the structure, for example, "there is a red block below the green block," or "the two orange blocks share an edge." In some problems, students have to deduce what blocks they need from their clues. In one problem, each clue restricts its holder to touching only one color of block.

These problems are very popular starters. They're fun, and the first few are pretty easy without being trivial.

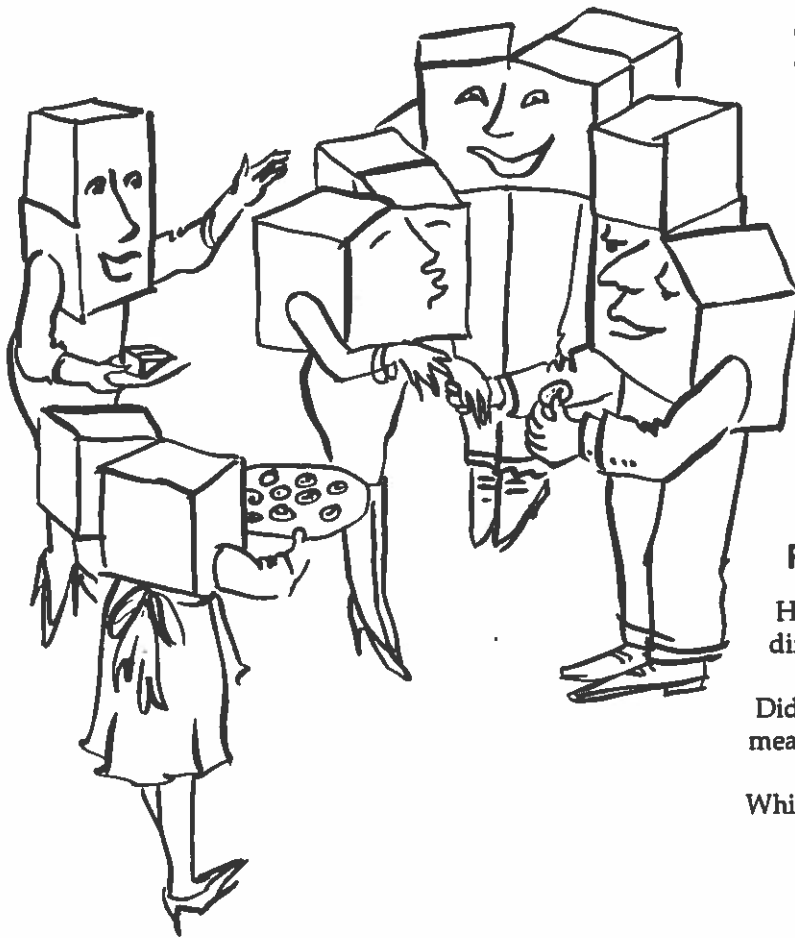
For Each Group:

- Colored cubes. You can solve every problem in this family by using a subset of eleven cubes: two each of red, blue, yellow, green, and orange, and one purple.

Purpose

We could go on for pages about the importance of geometry as part of mathematics learning at all levels. Let's just make three points here:

- First, the clues use mathematical language and force problem-solvers to use words like "face" and "edge" to get their clues across to others. Furthermore, students get into good discussions about whether "below" means "below and next to."
- Second, most geometry instruction is two-dimensional, yet we live in a 3D world. Learning to think in three dimensions is powerful and useful.
- Third, incorporating math language and 3D thinking will help those students who will need it the most—the students who don't often play with toys that enhance spatial visualization



Possible Debriefing Questions

How would you make these problems more difficult?

Did you use any words that had more than one meaning to the group?

Which was your favorite problem? Why?

Build It #1

There are six blocks in all.
One of the blocks is yellow.



Build It #1

The green block shares one face with each of the other five blocks.

Build It #1

The two red blocks do not touch each other.

Build It #1

The two blue blocks do not touch each other.

Build It #1

Each red block shares an edge with the yellow block.

Build It #1

Each blue block shares one edge with each of the red blocks.

Build It #2

There are six blocks in all, in a tower six blocks high.

There is a yellow block on top.



Build It #2

The red block is above the green block.

Build It #2

One of the yellows is above the green block; the other is below it.

Build It #2

Each of the blue blocks shares a face with the green block.

Build It #2

No two blocks of the same color touch each other.

Build It #2

There are two yellows, two blues, one green, and one red in the set of blocks.

Build It #3

There is a red block directly below a yellow block.

There is a green block on the bottom level.



Build It #3

There is a red block directly on top of a yellow block.

The highest block is on the third level.

Build It #3

There are six blocks in all.

An orange block shares a face with a green block and two others.

Build It #3

A blue block shares a face with a yellow block.

There is a red block on the bottom level.

Build It #3

A blue block touches red and green blocks only along edges.

There are three blocks on the bottom level.

Build It #3

A yellow block touches an orange block only along an edge.

Build It #4

Special Rule:
you may only touch the orange block.

Each yellow block is above a red block; every red block shares an edge with the blue block.



Build It #4

Special Rule:
you may only touch yellow blocks.

Your clue: the one red block shares a face with the orange block.

Build It #4

Help build it with blocks, but the blue block is the only one you are allowed to touch.

Your clue: the green block shares a face with one of the two yellow blocks.

Build It #4

Your job is to help the group build it, but the green block is the only one that you are allowed to touch.

The blue block shares a face with the orange block and two others.

Build It #4

You may only touch the red block.

The highest blocks (neither of which are blue) are on the third level.

Build It #4

Don't pass this one out — these are instructions to the teacher!

Note that each player can touch only one color of block; if you don't use the optional clue, no one can touch red. That's intentional!

Minimum blocks: One blue, green, orange, red; two yellows.