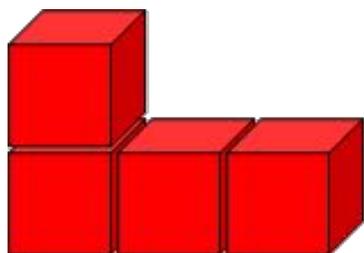


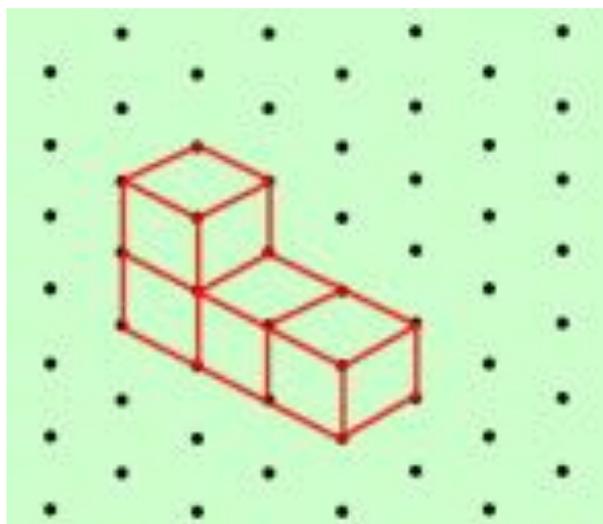
Viewing Cubes Again



Here are 4 cubes joined together. If you have some cubes, make this object.

These cubes can be drawn on dotted paper.

Copy this drawing and, with a bit of practice, you will be able to draw cubes on dotted paper.

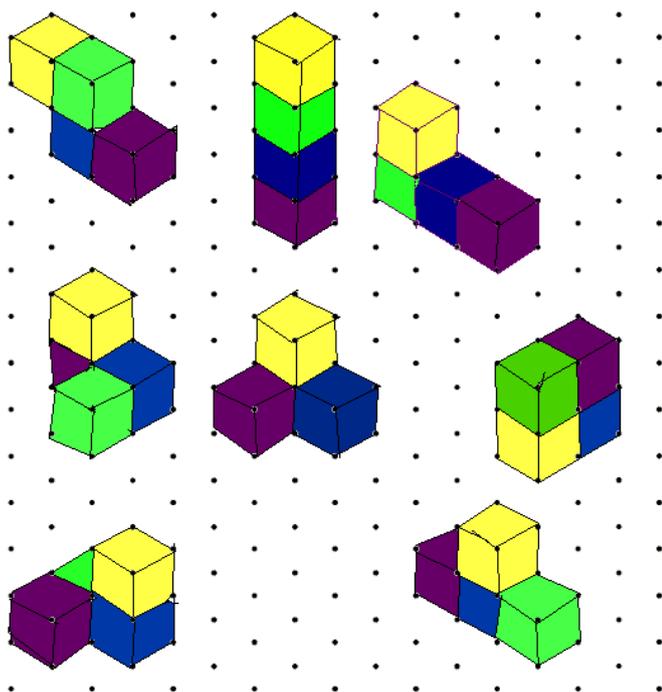


Make some different arrangements of 4 cubes.

How many different arrangements can you find?

Draw your arrangements on dotted paper.

Solution



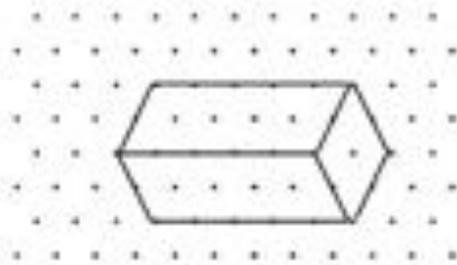
Here are the 8 arrangements of 4 cubes.

Diagnostic Assessment

This should take about 5–10 minutes.

1. Write the question on the board, say to the class:
“Put up 1 finger if you think the answer is A, 2 fingers for B, 3 fingers for C and 4 fingers for D”.
2. Notice how the learners responded. Ask a learner who gave answer A to explain why he or she gave that answer and DO NOT say whether it is right or wrong but simply thank the learner for giving the answer.
3. Then do the same for answers B, C and D. Try to make sure that learners listen to these reasons and try to decide if their own answer was right or wrong.
4. Ask the class again to vote for the right answer by putting up 1, 2, 3 or 4 fingers. Notice if there is a change and who gave right and wrong answers. It is important for learners to explain the reason for their answer otherwise many learners will just make a guess.
5. If the concept is needed for the lesson to follow, explain the right answer or give a remedial task.

What are the dimensions of the cuboid?



D. is the correct answer.

Common Misconceptions

A. ‘Because if u count the dots u can see it goes 3 by 5 by 3’ Counting the dots rather than the space between is a common mistake.

B. Probably can see the edges of the square are 2 units but counted the 6 dots to get the length.

C. Counting dots mistake again: ‘It goes across three dots then 5 dots then three dot’.

<https://diagnosticquestions.com>

Notes for teachers

Why do this activity?

This activity helps learners to relate 3D solids to drawings of them. To find all possible arrangements requires a systematic approach.

Possible approach

You might like to begin by making a shape with three cubes joined together and drawing it on the board. Give the learners some dotty paper (see page 3) and ask them to copy the drawing in pencil. Make sure they have erasers so that they can correct errors.

Then ask learners to make (or imagine) a different shape made from 3 cubes joined together and to draw it on the dotty paper. Discuss the fact that there are only two arrangements.

Introduce the 4-cube activity by making the arrangement of four cubes shown in the picture. Leave pairs of learners to try to make other arrangements for a while without saying much more at this stage, then bring the whole group together to discuss some issues. How are they checking that each shape they make is different from the shape/s they have already made? Has anyone got a good system for making the shapes so that they are sure they'll be able to find them all?

Draw attention to those who have developed a clear approach, for example by having three cubes the same and looking for all the positions that the fourth cube could go etc. Having talked together in this way, the learners should feel confident enough to find all the different arrangements.

Their models and drawings would make an interesting display, particularly if some pairs were encouraged to describe in words how they went about finding all the possibilities.

Key questions

Is this arrangement different from this one? How do you know?

How will you know when you have found all the different arrangements?

Possible extension

- (1) Take photos of the arrangements from different angles and ask the learners to identify which photos go with which arrangements.
- (2) Learners could go on to make all the arrangements of five cubes - this is much more challenging and requires a very organised approach. Encourage them to use the 4-cube arrangements as a basis for this extension.

Possible support

If some learners are struggling with drawing the models, provide enough cubes for them to be able to keep each one as they make it.

Learners might start with <https://aiminghigh.aimssec.ac.za/grades-4-to-6-viewing-cubes/>

This problem is adapted from the NRICH task [The Third Dimension](#) with permission of the University of Cambridge. All rights reserved.

