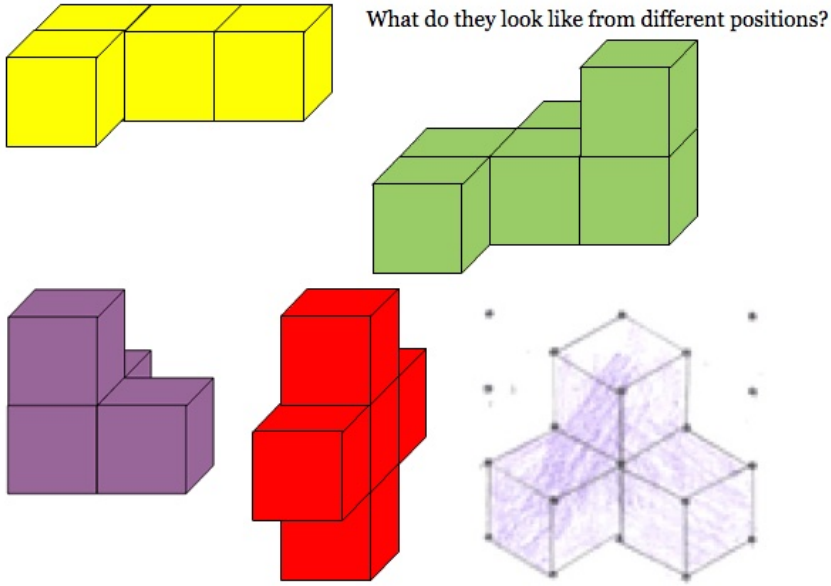
Viewing Cubes

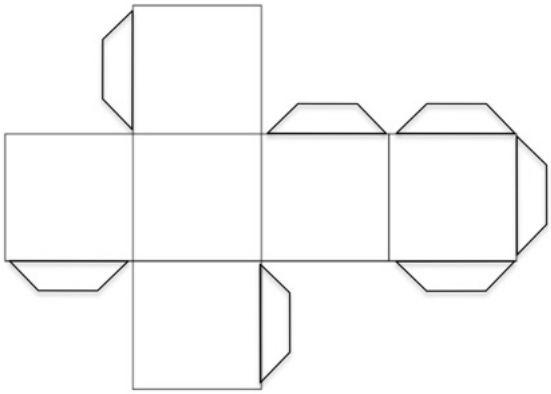
Here are some pictures of 3D shapes made from cubes and a drawing of one of the shapes on dotty paper. Can you make these shapes yourself?



Draw the shapes on dotty paper or take photographs of your models from different angles?

HELP

First make the models pictured above using cubes. If you don't have any cubes then learners could make some by copying this net onto scrap card, folding it along the fold lines and sticking down the tabs. Or by drawing the same net without tabs and sticking the edges together with sticky tape.



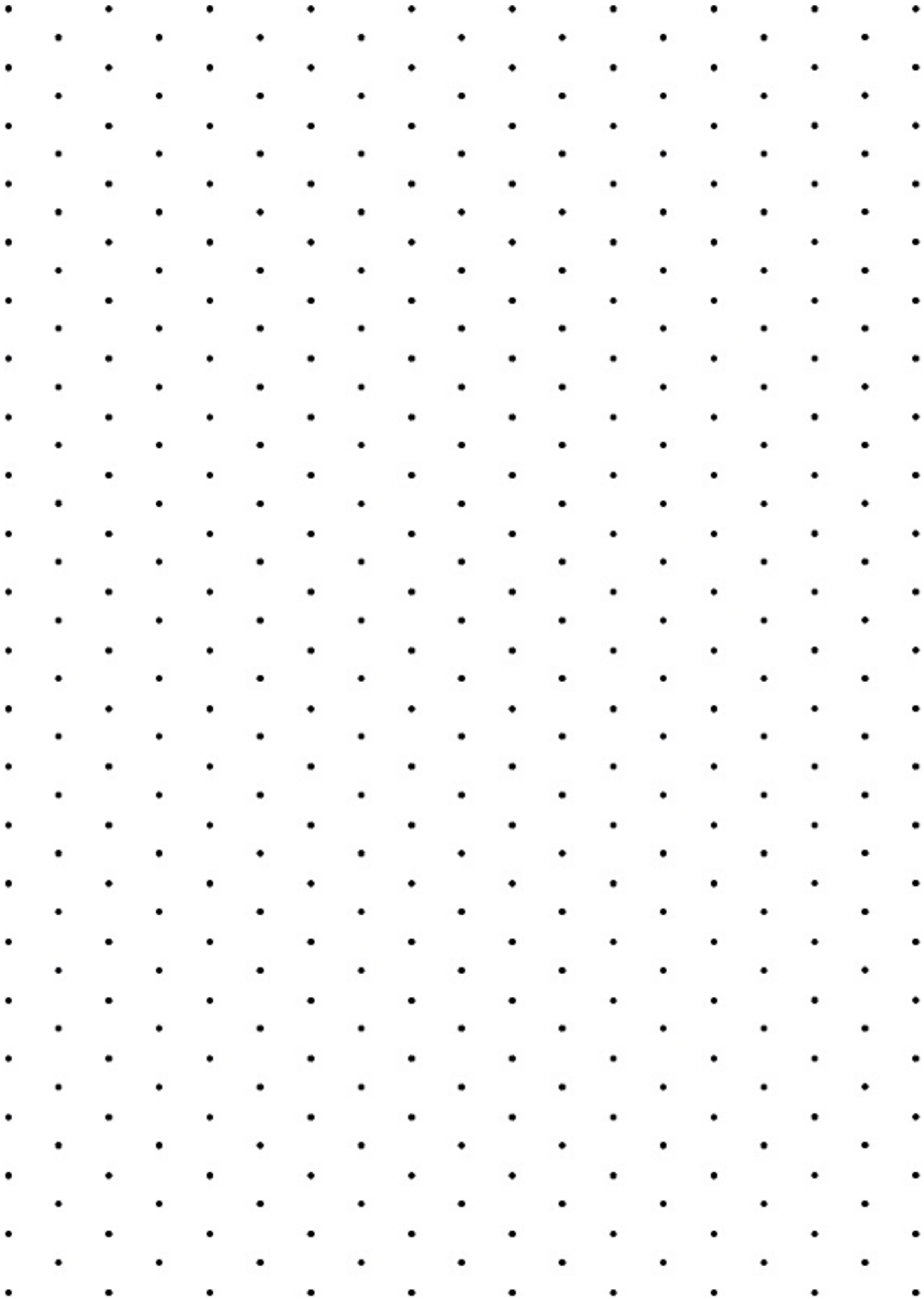
You can also make cubes from the cardboard cores inside toilet rolls.

A group could make 20 cubes and make the 4 solids pictured above, using contact adhesive to stick them together, then perhaps paint them.

Flatten the roll and cut off a piece so the remainder flattens into a square.	Make fold lines and shape the roll as nearly as possible into a cuboid shape.	Measure and cut flaps as show one quarter the length of the cuboid.	Fold down flaps to make a cube and secure with contact adhesive or sticky tape.

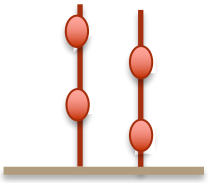
NEXT

Try the Viewing Cubes Again activity which also requires drawing on isometric paper. https://aiminghigh.aimssec.ac.za/years-4-7-viewing-cubes-again/ and plan and elevation drawings that are important in architecture and engineering.



HOME LEARNING AND INCLUSION GUIDE
THEME: Viewing Objects From Different Directions
Suggestions for Home Learning

Young children

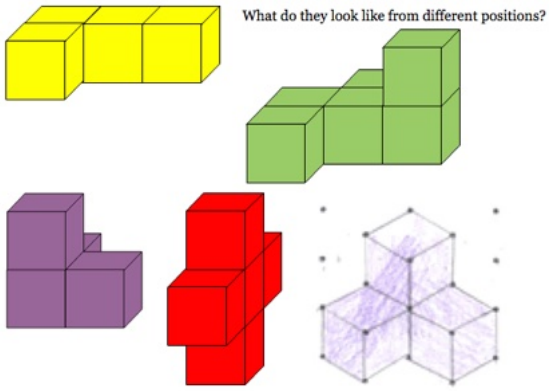


Bear climbing tree. Where is he?

Children can have lots of fun looking at objects from different directions and describing what they see. Perhaps use a phone to take some photos from odd angles of common objects. Then they can try to guess what they are. Or you can do this together and then challenge other adults to guess what they are.

Use language like in front, behind, from the side, from the left, from the right, above/on top, below/underneath etc.

Upper Primary



Use this activity to build learners' familiarity with positional language like in front, behind, from the side, from the left, from the right, above/on top, below/underneath etc. If they have first learned these words in their home language they may understand the concepts, but they need to learn the words in the language of instruction.

If you have cubes, then make the objects pictured on page 1. Interlocking cubes are ideal so that the models will lock together. Ideally learners should be able to handle the models and look at them from different angles. If you have no cubes available then it would be helpful to make some as instructed on page 1. Alternatively find some objects such as cuboid boxes, cylindrical objects and other 3D shapes, and study and sketch them from different angles.

Use a phone to take some photos from odd angles of common objects. Then the learners should try to guess what they are and sketch them.

Years 7 to 10

If you are short of time, then ideally have the 4 solid models made up prior to the session so that you can show them to the group. If there is time, then the learners could make the models from the instructions on page 1 in the HELP box, perhaps with your help.

Learners are likely to find it easier to replicate a shape if they can see a 'real' version rather than just a picture.

Start with the diagnostic question and try to ensure that the learners understand why the drawing represents solid shape C.

In order to learn to sketch models made from cubes on isometric paper you need to have cubes available, because the point of the exercise is to gain experience of looking at such models from 3 perpendicular directions.

If you don't have cubes available then take photos of 3D shapes from different angles and ask the learners to say what they are and to sketch the objects from different directions.

If you do have cubes then start with one of the shapes, for example the yellow one, and ask learners to describe it. Encourage them to talk about the number of cubes used and their relative positions. Some learners might say it looks like an 'L' shape.

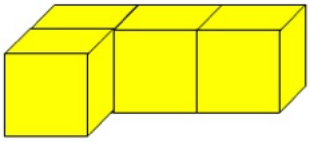
Ask the learners to make the yellow shape, individually or in pairs, and to compare their shapes to check they're the same. Depending on your learners' experiences, you could then challenge them to draw their shape on dotty (isometric) paper or sketch their shape on plain paper, or just put their shape on the table in front of them so that it looks different from the picture in the problem.

The other shapes could be tackled in similar ways and you could take some photographs of the results for display alongside a print-out of the activity itself.

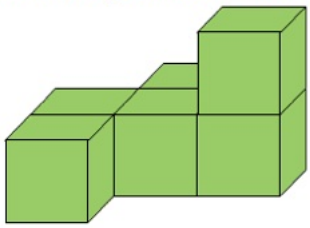
Key Questions

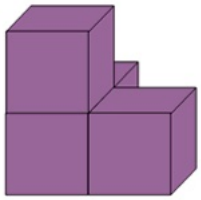
- How many cubes will you need for that shape?
- Can you describe how they are joined together?
- When you look at the objects from different directions how do the views change.
- If you took photos from above, from the front and from one side what would you see in the photos?

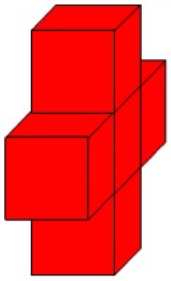
Years 11, 12 and 13

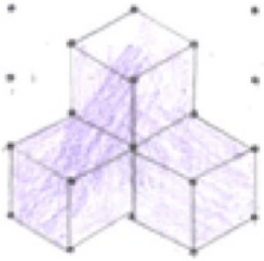


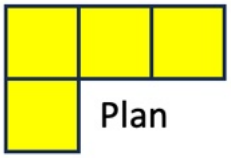
What do they look like from different positions?











Front elevation

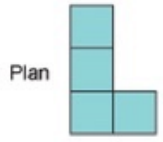
Side elevation

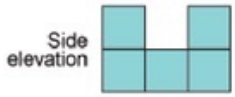
Draw plans and front and side elevations for the green, purple and red solids.

Here are 3 views of another solid.

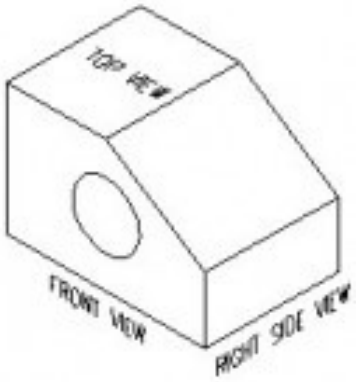
If you have some cubes then make the model for yourself.

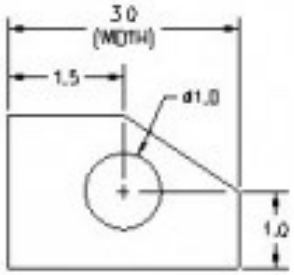
Can you draw this model?



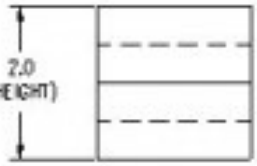


TOP VIEW





FRONT VIEW



RIGHT SIDE VIEW

Talk to other students about this example of an engineering drawing. Explain how these diagrams give all the information needed to manufacture this object. Give a written account of what you notice in these drawings.

Make a drawing of the side elevation for the garage pictured here.

Base your drawing on the information given in these plans of the top view and cross section.

Why do this activity?

Learners find it difficult to visualise the 3D object when given a 2D representation. This activity provides practice in working from the 2D picture to the 3D model and then drawing and photographing different views of the object.

The activity also provides a good opportunity to develop learner's familiarity with positional language, for example behind, in front, to the left, to the right, above/on top, below/underneath etc.

Learning objectives

In doing this activity students will have an opportunity to:

- develop skills of visualising 3D shapes from 3 directions (above, front and side)
- develop skills of drawing representations of 3D shapes made from cubes

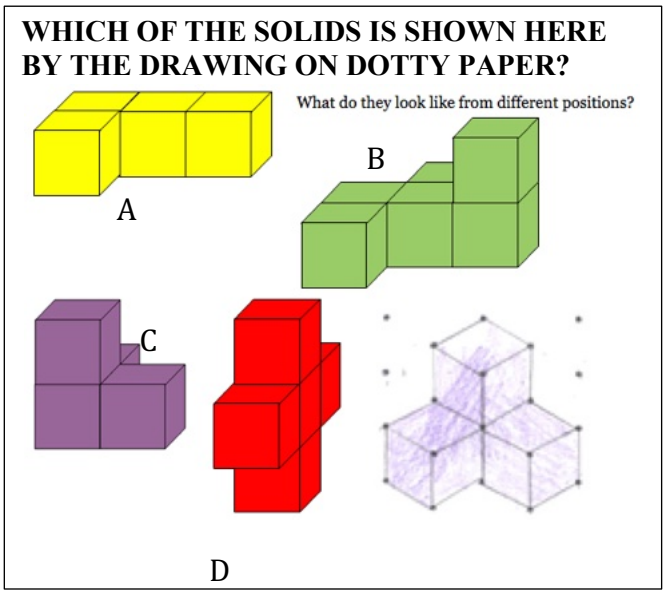
Generic competences

In doing this activity students will have an opportunity to develop the spatial awareness that is needed to interpret and draw plan and elevation diagrams that represent building designs and architects' plans.

DIAGNOSTIC ASSESSMENT

This should take about 5–10 minutes. It can be used before or after the lesson.

Show the question to the learners and say:
"**Put up 1 finger if you think the answer is A, 2 fingers for B, 3 fingers for C and 4 fingers for D".**



1.Notice how the learners respond. Ask a learner who gave answer A to explain why he or she gave that answer. DO NOT say whether it is right or wrong but simply thank the learner for giving the answer.

2.It is important for learners to explain the reason for their answer because it helps them to clarify their own thinking and to develop communication skills.

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.

5.Notice if there is a change and who gave right and wrong answers.

The correct answer is: C

Common Misconceptions

Answers A, B and D show that learners find it difficult to visualise the solids and to relate any of them to the drawing.

The teacher can help the learners by making shape C from cubes, letting the learners handle it and look at it from different positions and then talking about the drawing.

As an extra diagnostic question ask: 'Which shape is made from 6 cubes?'

https://diagnosticquestions.com

Follow up

Viewing cubes again https://aiminghigh.aimssec.ac.za/viewing-cubes-again/
Three views https://aiminghigh.aimssec.ac.za/three-views/

Subscribe to MATHS TOYS if you have not already done so. https://www.youtube.com/mathstoys Or go to YouTube, search for Maths Toys.

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