Year 5

3-D Shapes from 2-D Representations

Key NC Statement
Identify 3-D shapes, including cubes and other cuboids, from 2-D representations

Related NC Statements
• Compare and classify geometric shapes based on their properties and sizes (year 4) • Use properties of rectangles

Key Concepts
In this learning sequence, pupils begin to explore cuboids including cubes. They will learn that cubes are a subset of cuboids. They share defining features (faces, edges and vertices). Nets are introduced and pupils will be encouraged to visualise cuboids, rotating them and predicting what the net for the shape could be. They develop visualisation further by being challenged to include patterns on the nets. This learning sequence focuses on cubes and cuboids. Other 3-D shapes will be considered in Year 6.

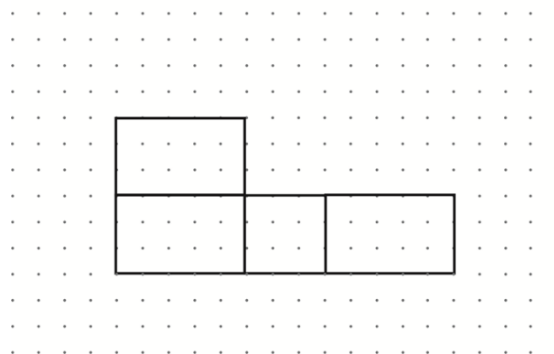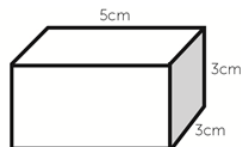| Steps within the Learning Sequence |
|---|
| Step 1: Define cuboids and cubes |
| Step 2: Understand nets |
| Step 3: Draw nets using given measurements |

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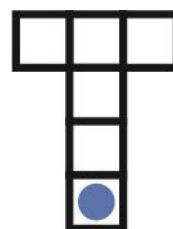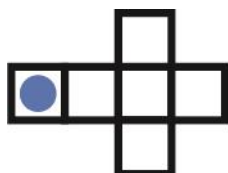
Destination Questions 🏁

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Look at the cuboid below. Draw two **more** faces to complete the net of the cuboid.

2 🏁

Here are the nets of three different cubes. On each net, draw one more circle so that the cubes will have circles on opposite faces.

3 🏁

Draw a possible net for this letter block.

All the letters must be in the correct orientation when the net is folded up.

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Step one

Define cube and cuboids

Present pupils with models of cubes and cuboids. Ask them to recreate these shapes using modelling clay or playdough. Whilst they are modelling, ask them to pay attention to how they are creating the faces, edges and vertices. This physical exploration will support the language of 3-D shape.

Ask pupils to use their models and the physical actions they used to build them to define key vocabulary:

- Face – flat surface on a 3-D shape
- Edge – where 2 faces touch
- Vertex – where 3 or more edges meet
- Vertices – plural of vertex

Ask pupils to compare their models of cubes and cuboids.

> **What is the same?**
> **What is different?**

Provide vocabulary as appropriate to support discussion.
This could include: face, vertices, vertex, edge, square, cube, cuboid, length, width, height, dimensions, 2-D, 3-D, angle, parallel and perpendicular.

> **They all have the same number of faces. (6)**

> **All the models are 3-D. This means they have 3 dimensions.**

> **Lengths and widths are the same in a cube.**

> **They all have the same number of vertices (8) and edges (12).**

> **All the vertices are 90˚.**

> **All the edges are parallel.**

> **All the faces on a cube are square.**

Ask pupils to reason using the statement below.

> Always / Sometimes / Never
> A cuboid is also a cube.

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Step two

Understand nets

Model unfolding a cardboard cuboid. Explain that this is a net. It is what a 3-D shape looks like, when it is opened out flat. Show pupils how to draw the net onto dotty paper. Handout_5LS24_step2_dotty_paper can be used for this.

Pupils explore unfolding different cuboid nets and recording their nets on to dotty paper.

Tell pupils that Eliza draws her nets in a different way. This is what she does.

- **Roll a shape**

Eliza places the shape onto a large piece of paper. She draws around the bottom face and then rolls the shape and draws around the bottom face again. She keeps rolling and drawing the bottom faces until all the faces have been drawn.

> We should count the faces.

> Will Eliza's method work?
> How can we check that we have drawn all of the faces?
> How can we check that the net works?

> We could cut out the net and fold it.

Provide pupils with the same cuboid shape and ask them to explore Eliza's method.
Compare the nets that pupils have drawn.

> They all have the same number of rectangles.

> What is the same about all of the nets?
> What is different?

> The rectangles are the same size but are in different places.

Provide pupils with six square pieces of paper. Ask them to create a net using the squares (taping the edges).
Again, compare the different nets.

> How many different nets do you think there are?

Using handout_5LS24_step2_netty_problem, pupils identify which nets will work, which won't and provide reasons for each decision.

Activities for exploring ideas at greater depth

Using only 5 squares, how many different nets make an open cube (box without a lid)?

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Step three

Draw nets using given measurements

Ask pupils to draw the net of a cuboid using 'Eliza's rolling' method, but this time they need to include dimensions on the net: the length and width of all of the different faces.

Provide pupils with a different cuboid (not a cube) and ask them to draw the net of the cuboid onto dotty paper, scaling it down (for example by halving the lengths) so that pupils can't use the rolling method. Pupils should include measurements on the 2-D representation.

1 🏁

- Draw nets of cuboids with images / patterns / writing on faces

Using a normal 1 to 6 dice, ask pupils to create the net of the dice using the rolling method. However, this time ask pupils to also include the digits on the net, so that when it is folded the digits are all in the correct orientation.

Discuss which nets have worked, which ones didn't and why.

> **Which nets worked?**
> **When they didn't work,**
> **why was that?**

Provide pupils with a range of different cube and cuboid net challenges, including:

- placing matching coloured dots on opposite faces, but not all faces
- different patterns on each face
- capital letters on each face (like an alphabet block).

Pupils create a net for packaging a product, with all the lettering written so that when folded up it is all in the correct orientation. Pupils are not allowed to fold the net up and then add the lettering.

2 🏁   3 🏁

Activities for exploring ideas at greater depth

Place another arrow on the net of this cube so that the cube will have arrows on opposite sides. Ensure that both point in the same direction once the cube is constructed.

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