Properties of Shapes: Reasoning About 3D Shapes

Aim	Success Criteria	Resources
Identify 3D shapes, including cubes and other cuboids, from 2D representations. To identify 3D shapes from 2D shapes.	I can identify 2D shape nets of common 3D shapes. I can reason about the faces of common 3D shapes. I can draw 2D shape nets of common 3D shapes.	Lesson Pack
	Key/New Words 3D shape, polyhedron, shape net, cube, prism, pyramid, edge, vertex, vertices, face, curved surface.	**Preparation** Differentiated Shape Nets Activity Sheets – one per child Diving into Mastery Activity Sheets – as required

Prior Learning	It will be helpful if children can revisit common 3D shapes and describe their properties.

Learning Sequence

	Remember It: Using the corresponding slide on the Lesson Presentation, the children are asked to name a selection of common 3D shapes. They are then challenged to work with a partner to describe the properties of the 3D shapes using faces, edges and vertices. The children try to identify the 3D shape their partner is describing, in fewer than five clues.	
	Polyhedrons: Using the corresponding slide on the Lesson Presentation, the children are reminded that a polyhedron is a 3D shape with flat faces, straight edges and vertices. Using the Venn Diagram shown, they are then asked to reason why cylinders, cones and spheres are not polyhedrons. Look for the understanding that they have curved surfaces and edges. Can children reason about the faces of common 3D shapes?	
	Shape Nets: Using the corresponding slides on the Lesson Presentation, the children are reminded that a shape net is a 2D drawing of an unfolded 3D shape, and that when they are drawing or reasoning about shape nets, they need to think carefully about where the edges of the faces meet. They then answer reasoning questions about the shape nets of common 3D shapes. Can children identify 2D shape nets of common 3D shapes? Can they reason about the faces of common 3D shapes? Can they draw 2D shape nets of common 3D shapes?	
	Shape Nets Activity: The children complete the differentiated Shape Nets Activity Sheets. Provide 3D shape modelling equipment as support. ★ Children working towards expected level match the 3D shape to the correct 2D shape net. ★★ Children working at expected level select the correct 2D shape net for the 3D shape from a choice of three options. ★★★ Children working at greater depth draw nets for given 3D shapes.	
	Diving into Mastery: Schools using a mastery approach may prefer to use the following as an alternative activity. These sheets might not necessarily be used in a linear way. Some children might begin at the 'Deeper' section and in fact, others may 'dive straight in' to the 'Deepest' section if they have already mastered the skill and are applying this to show their depth of understanding. Children complete fluency questions related to identifying 3D shapes from 2D shapes. Children answer reasoning questions related to identifying 3D shapes from 2D shapes, explaining their reasoning. Children work individually or collaboratively on problem-solving questions related to identifying 3D shapes from 2D shapes.	

Exploreit

Learnit: Children will find this superb Knowledge Organiser a useful tool to support their understanding in this lesson.

Buildit: Draw and construct 3D shapes from 2D shape nets for real life purposes through a Design Technology project.

Exploreit: Explore everyday food packaging and identify the nets. Use them to create a maths display.

DISCLAIMER

We hope you find the information on our website and resources useful.

Displaying the Presentation

To ensure this presentation displays correctly: If you are a Mac user, the presentation may open in 'slide master' mode - to see all the content, click 'close slide master' and the presentation should display correctly. If you are using Google Drive, the presentation won't display correctly if you open it in Google Slides. If you have opened it in Google Slides, you will need to download it again from the Twinkl website and this time open it from your computer.

Animations

This resource has been designed with animations to make it as fun and engaging as possible. To view the content in the correct formatting, please view the PowerPoint in 'slide show mode'. This takes you from desktop to presentation mode. If you view the slides out of 'slide show mode', you may find that some of the text and images overlap each other and/or are difficult to read.

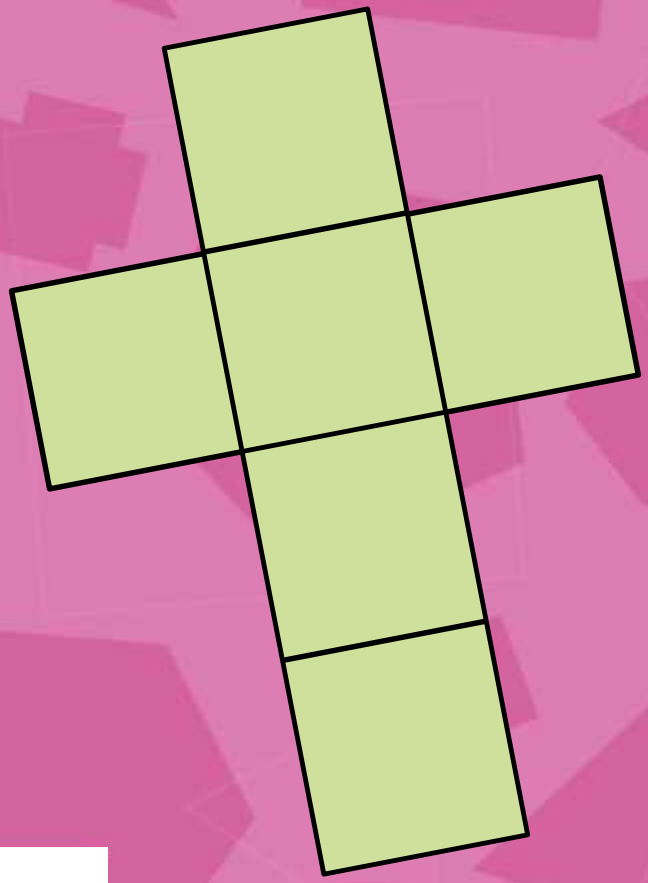
To enter slide show mode, go to the **slide show menu tab** and select either **from beginning or from current slide**.

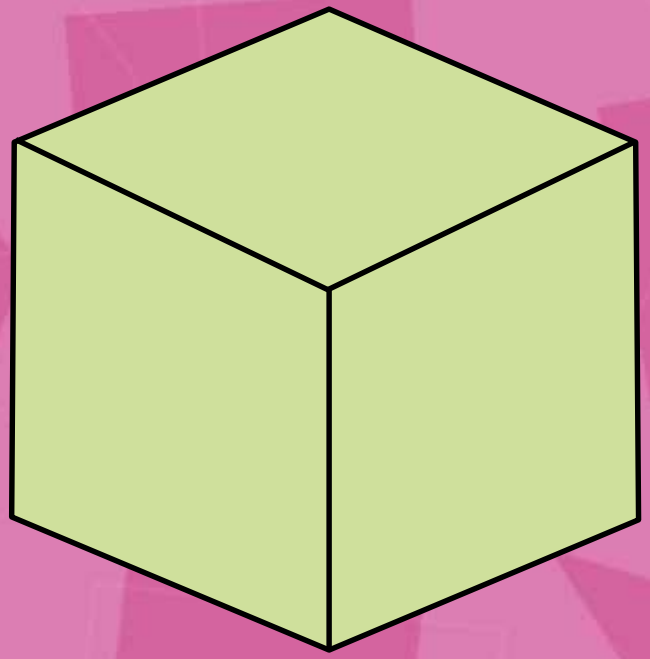
You may wish to delete this slide before beginning the presentation.

Maths

Properties of Shapes

Reasoning About 3D Shapes





Aim

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- I can identify 2D shape nets of common 3D shapes.
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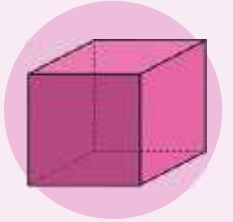
Remember It

Octahedron

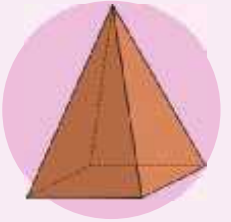
Triangular-based pyramid

Triangular Prism

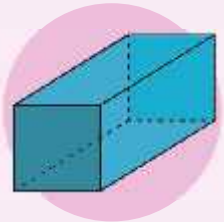
Cylinder



Cube



Square-based pyramid



Cuboid

Sphere

Cone

Challenge 1

Can you name these 3D shapes?

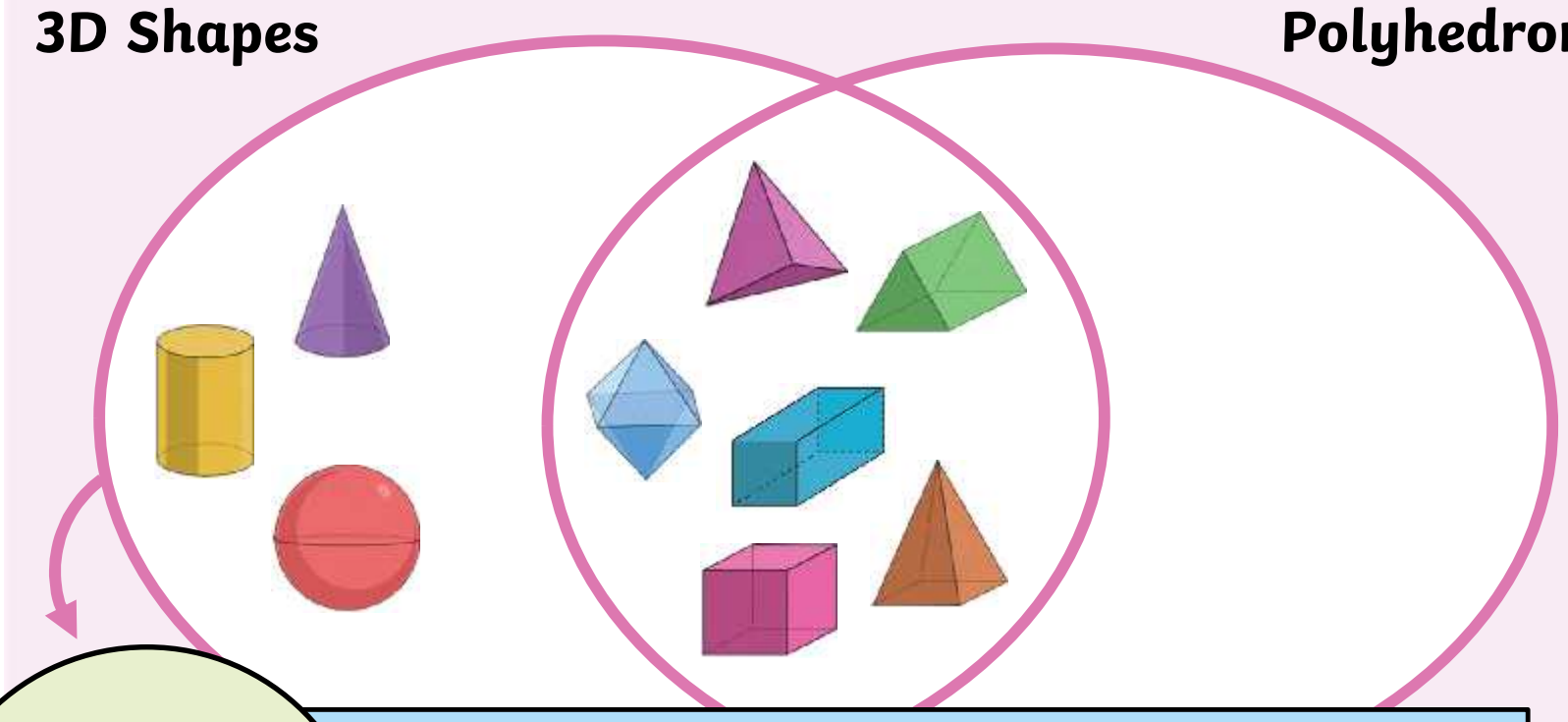
Challenge 2

Work with a partner.

- One of you secretly chooses one of the shapes.
- Describe the shape using the properties of faces, edges and vertices.
- Can the other person identify the shape in fewer than 5 clues?

Polyhedrons

Polyhedrons are 3D shapes that have **flat faces**, **straight edges** and **vertices**.



Why aren't cylinders, cones and spheres polyhedrons?

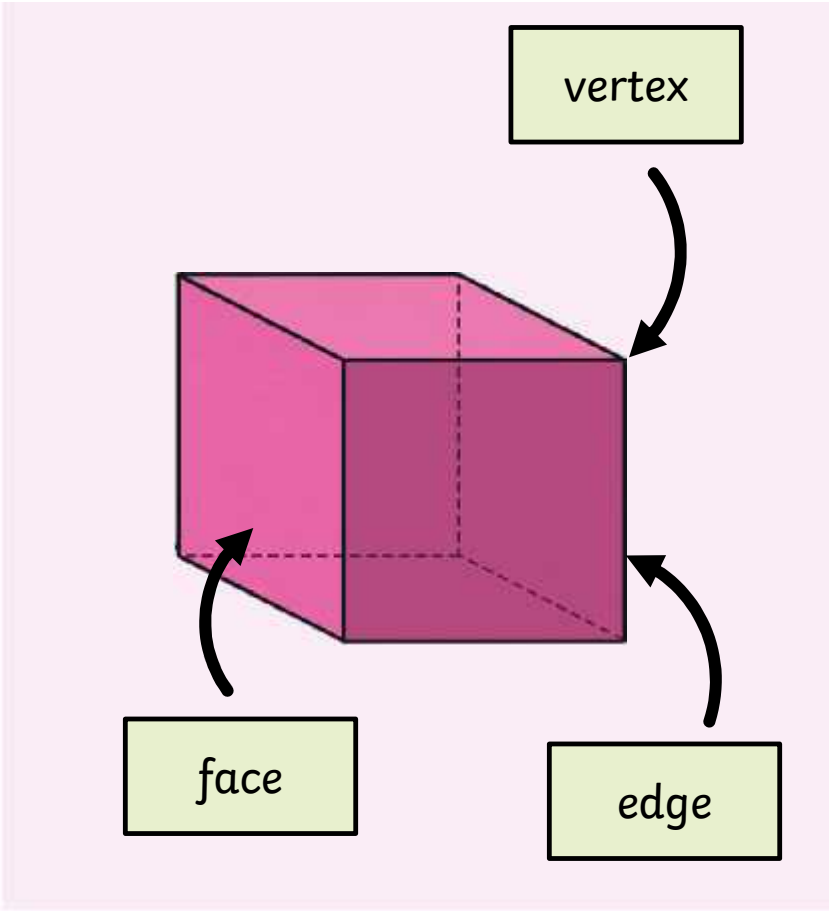
A cylinder has one curved surface and two curved edges.

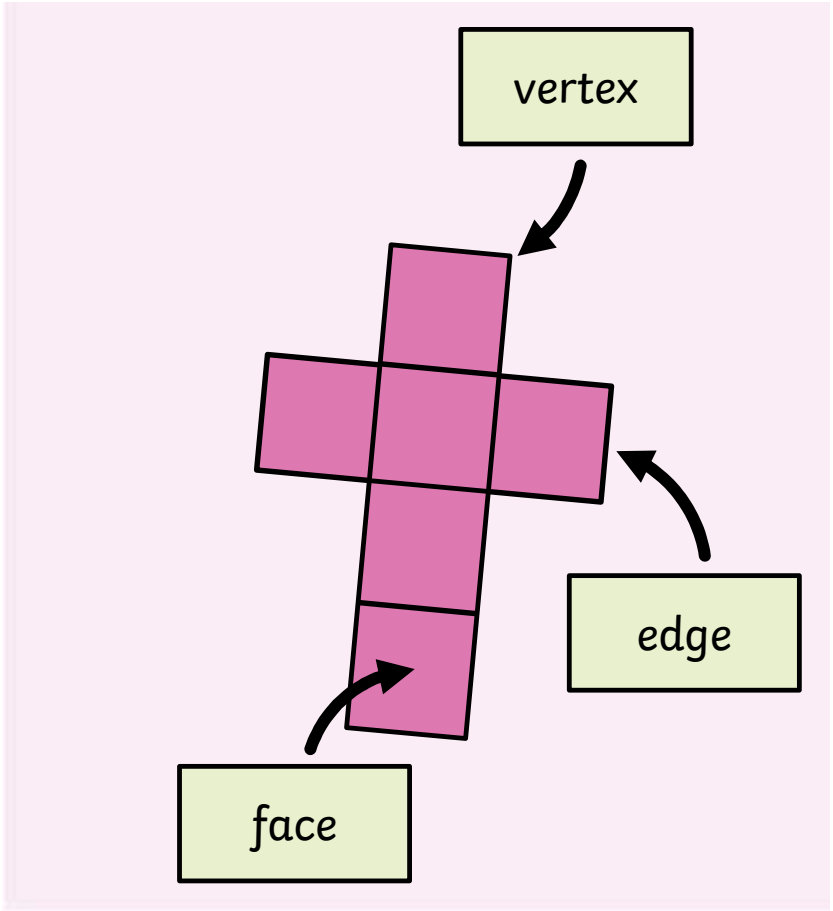
A cone has one curved surface and one curved edge.

A sphere has one curved surface.

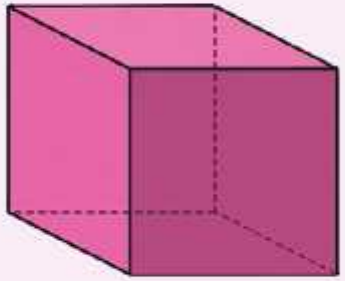
Shape Nets

A shape net is a 2D drawing of an unfolded 3D shape.
When you are drawing or reasoning about shape nets, think carefully about where the edges of the faces meet.



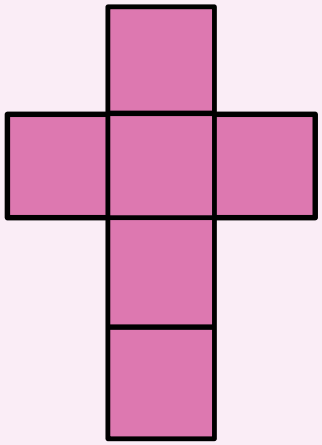


Shape Nets



What 2D shapes form the faces of this cube?

How many are there?



Do you think this is a shape net of a cube?
Explain your reasoning.

Yes, this is a shape net of a cube because:

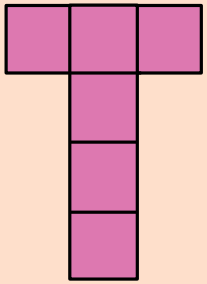
- A cube has 6 square faces.
- The net can fold up to make a cube.

Make a sketch and compare it to someone else's.

What is the same?
What is different?

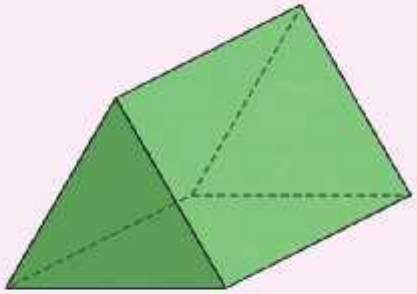
Did you think of any more reasons?

Can you think of a different way to draw a shape net of a cube?



Here is another shape net of a cube. There are actually 11 different ways!

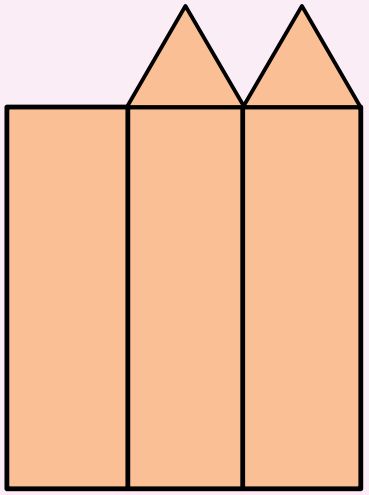
Shape Nets



What 2D shapes form the faces of this prism?

How many are there?

Do you think this is a shape net of a prism? Explain your reasoning.

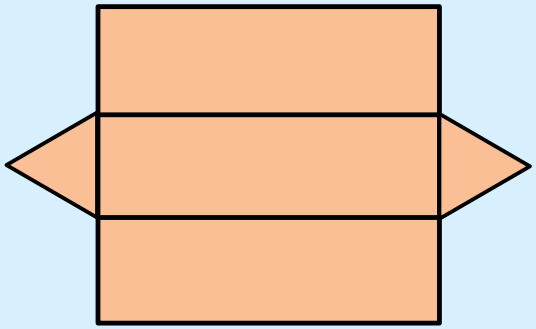


No, this is not a shape net of this prism because:

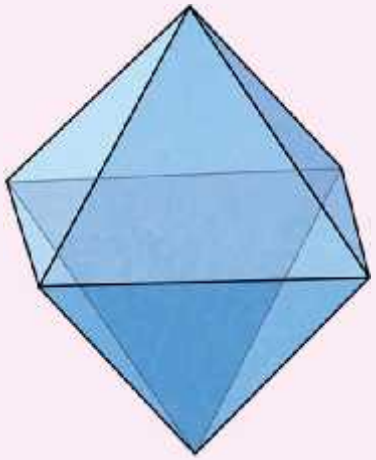
- The triangular faces need to be on either side of one of the rectangular faces.

How would you correct the shape net?
Make a sketch and compare it to someone else's.

What is the same?
What is different?



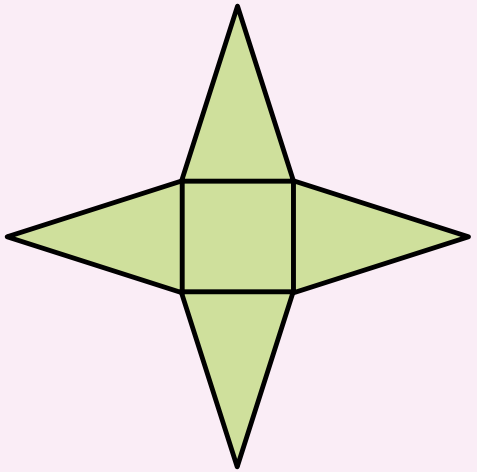
Shape Nets



What 2D shapes form the faces of this octahedron?

How many are there?

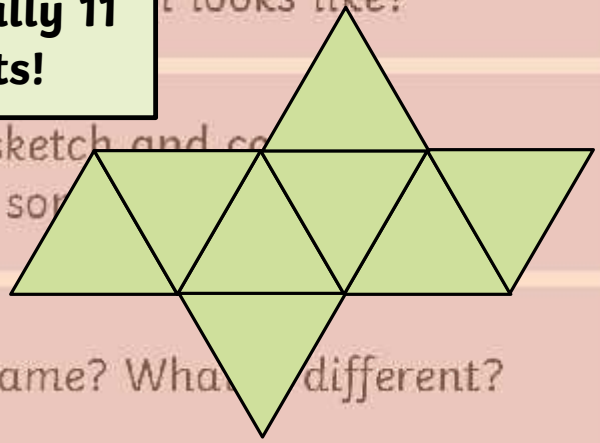
Do you think this is a shape net of a octahedron? Explain your reasoning.



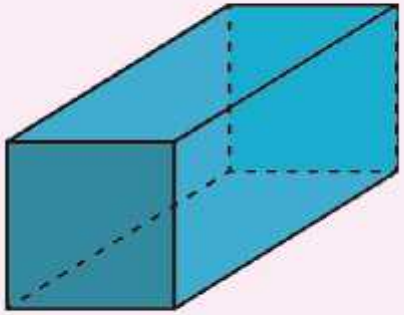
No, this is not a shape net of an octahedron because:

- An octahedron does not have a square face.
- An octahedron has more than 4 triangular faces.
- The faces of an octahedron are equilateral triangles, not isosceles triangles.

Here is a shape net of an octahedron. There are actually 11 different nets!



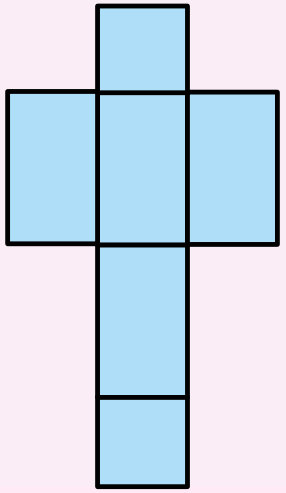
Shape Nets



What 2D shapes form the faces of this cuboid?

How many are there?

Do you think this a shape net of a cuboid?
Explain your reasoning.



No, this is not a shape net of this cuboid because:

- The edges of the two square faces are adjacent (next to each other) when the net is folded up to make a cuboid.

How would you correct the shape net?
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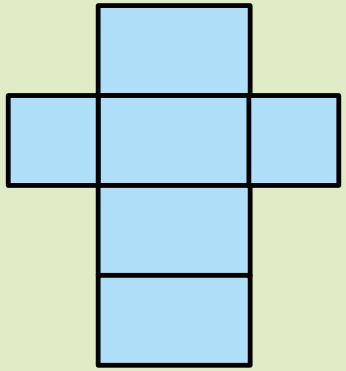
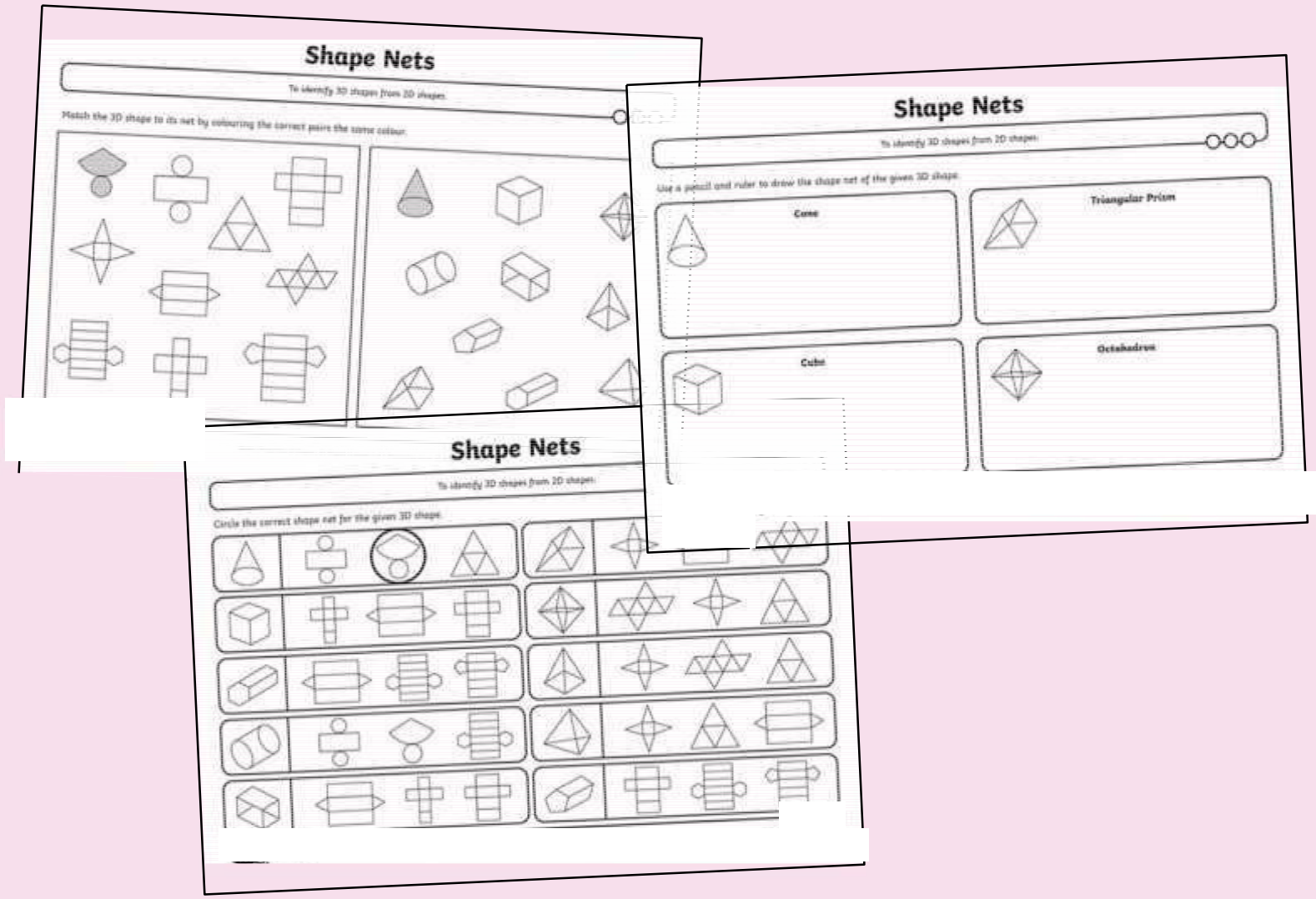
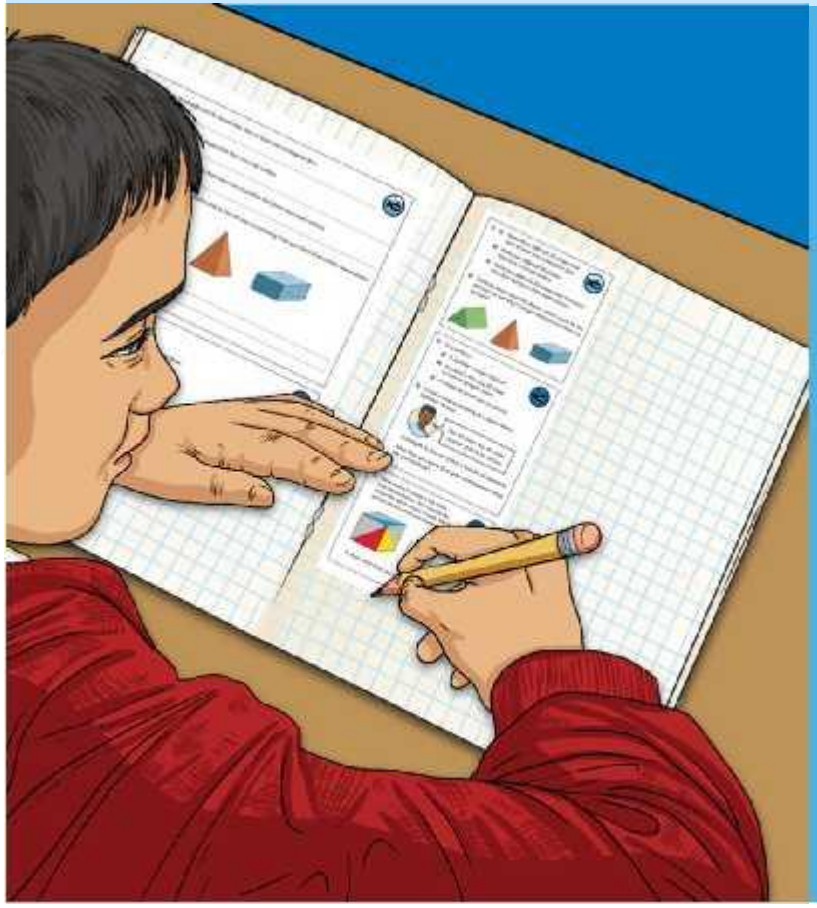


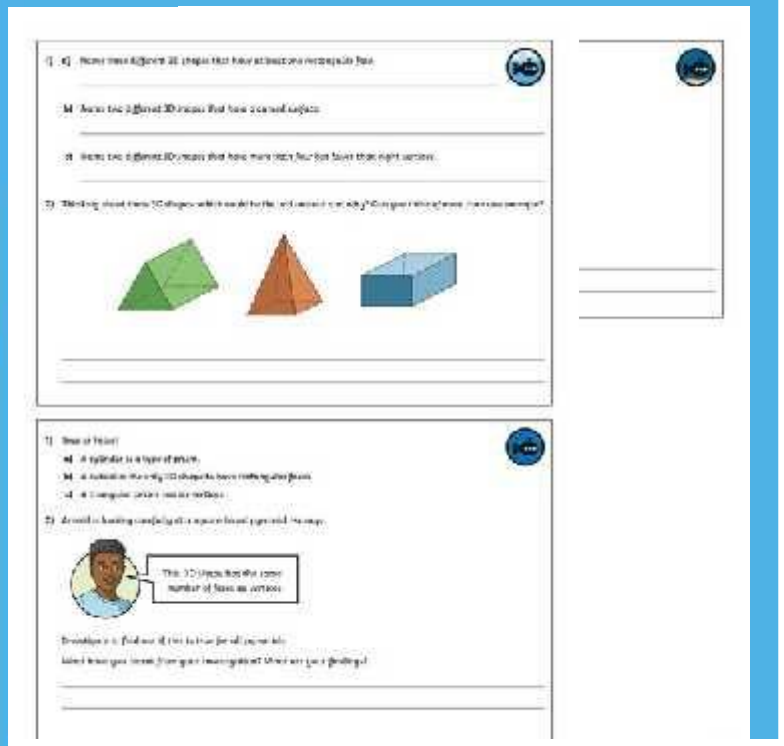
Shape Nets Activity Sheets



Diving into Mastery

Dive in by completing your own activity!





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- I can identify 2D shape nets of common 3D shapes.
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Aim: To identify 3D shapes from 2D shapes.				**Date:**					
				Delivered By:			**Support:**		
Success Criteria	**Me**	**Friend**	**Teacher**	**T**	**PPA**	**S**	**I**	**AL**	**GP**
I can identify 2D shape nets of common 3D shapes.				**Notes/Evidence**					
I can reason about the faces of common 3D shapes.									
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Next Steps

- _____
- _____

T	Teacher	**I**	Independent
PPA	Planning, Preparation and Assessment	**AL**	Adult Led
S	Supply	**GP**	Guided Practice

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1) a) Accept any correct answers, for example, triangular prism, cuboid, pentagonal prism.

b) Accept any correct answers, for example, cylinder, cone.

c) Accept any correct answers, for example, square-based pyramid, regular octahedron, triangular prism.

2) Accept any correct answer, for example the cuboid is the odd one out because it does not have any triangular faces.

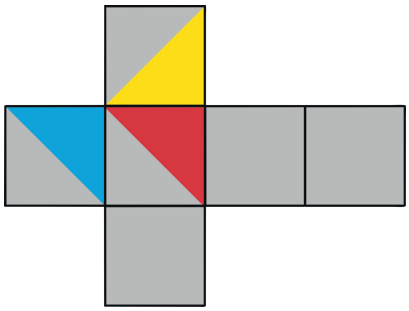
1) a) False – a cylinder has a curved surface so is not a prism. Prisms are polyhedrons made from faces, and faces are flat surfaces.

b) False – prisms have rectangular faces, for example, a triangular prism.

c) True

2) Yes, this is true for all pyramids.

1) Multiple answers possible - teacher to check. Example given below.



1) **a)** Name three different 3D shapes that have at least one rectangular face.

_____

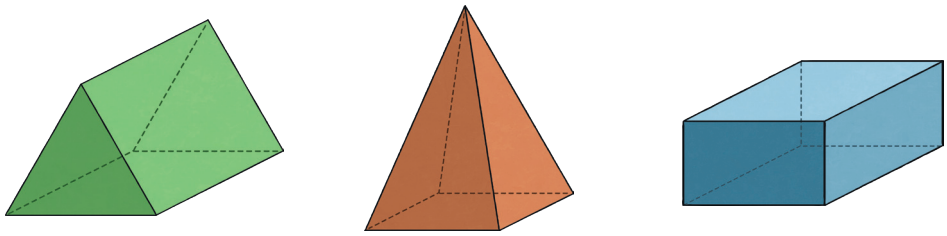
b) Name two different 3D shapes that have a curved surface.

_____

c) Name two different 3D shapes that have more than four but fewer than eight vertices.

_____

2) Thinking about these 3D shapes, which could be the odd one out and why? Can you think of more than one example?



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_____

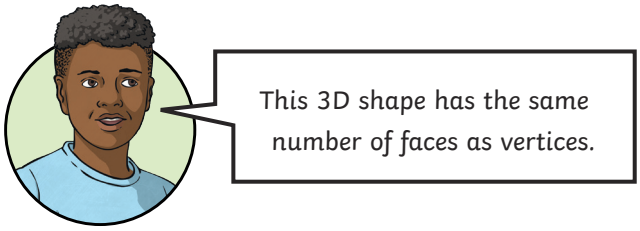
1) True or False?

a) A cylinder is a type of prism.

b) A cuboid is the only 3D shape to have rectangular faces.

c) A triangular prism has six vertices.

2) Arnold is looking carefully at a square-based pyramid. He says:



Investigate to find out if this is true for all pyramids.

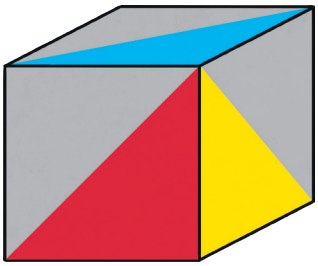
What have you learnt from your investigation? What are your findings?

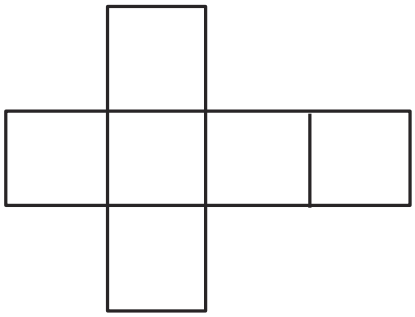
_____

_____

1) Saira wants to create a net of the cube shown below. How should she colour the net to ensure it looks like the picture shown when constructed?

Is there more than one way to achieve this?





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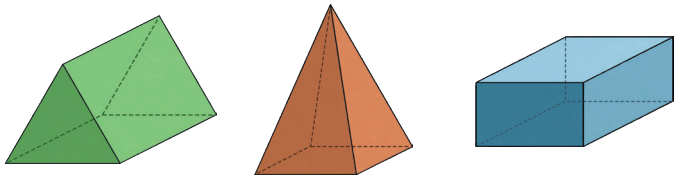

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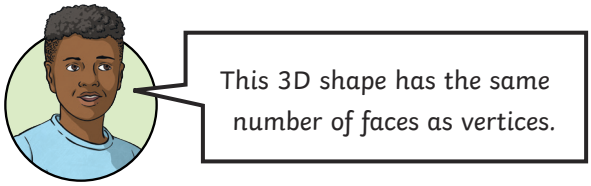

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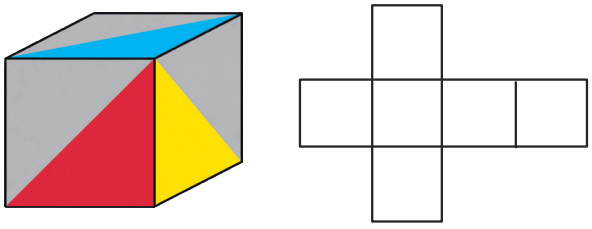

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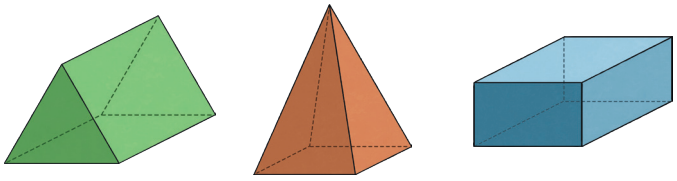

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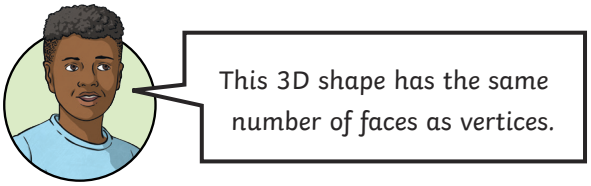

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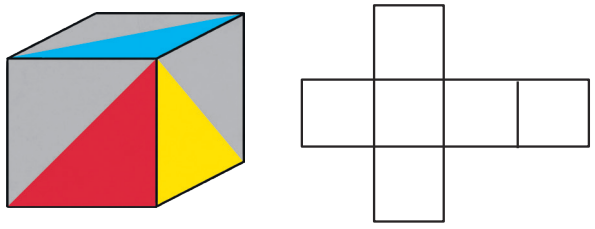
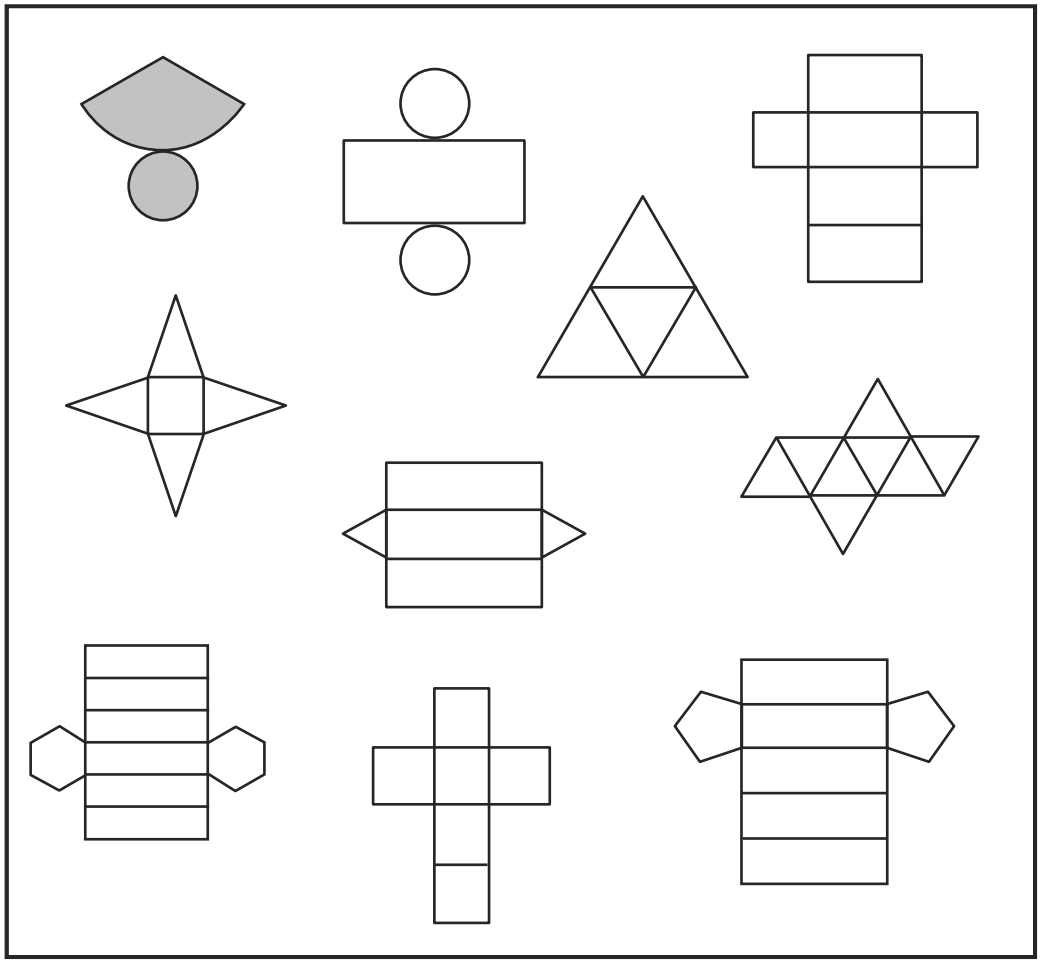


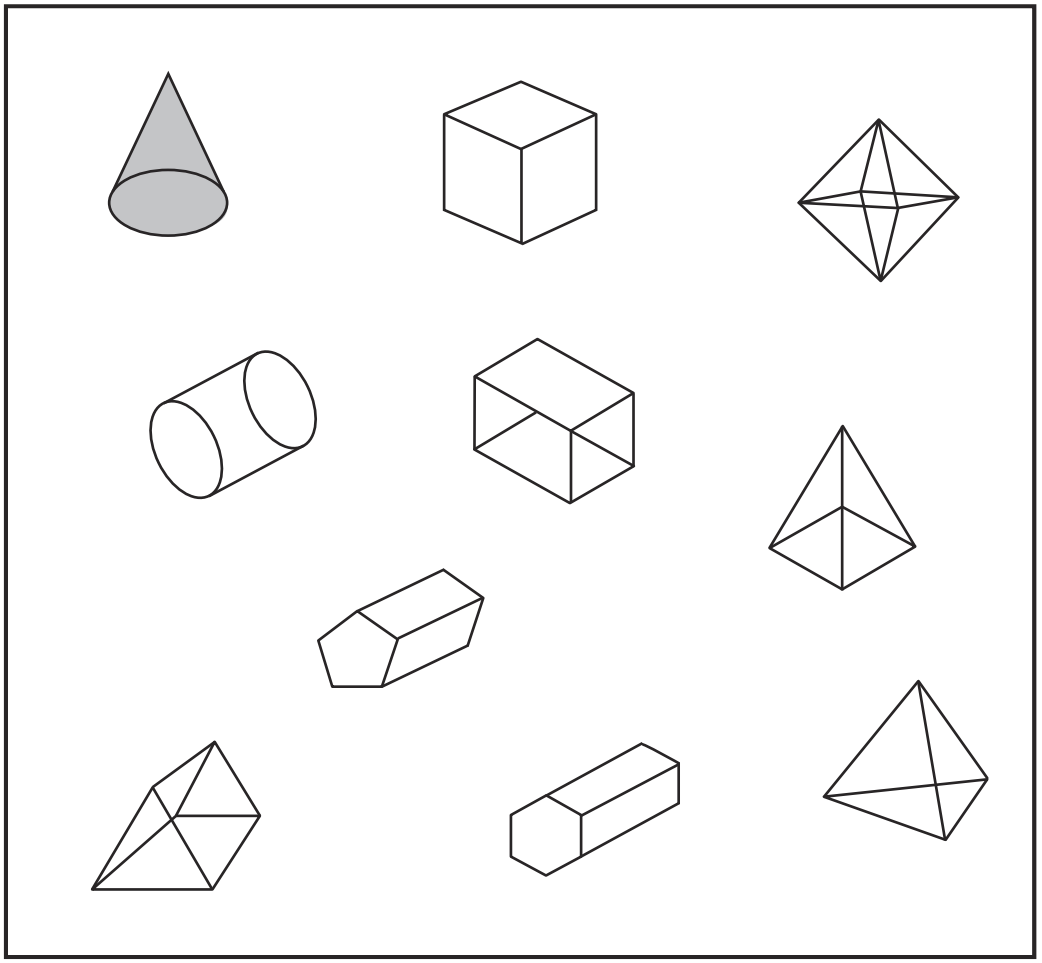
Is there more than one way to achieve this?

Shape Nets

To identify 3D shapes from 2D shapes.

Match the 3D shape to its net by colouring the correct pairs the same colour.

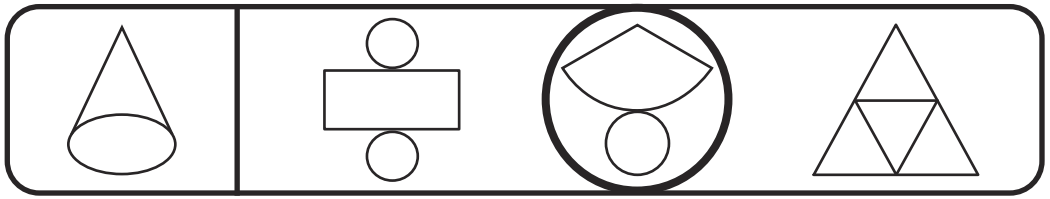
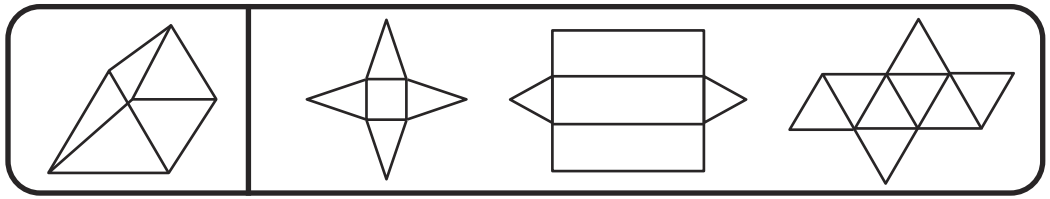
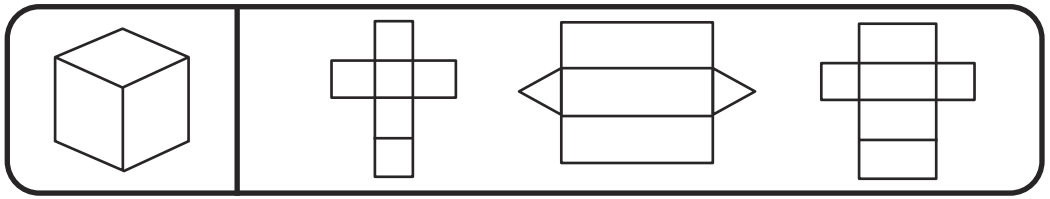
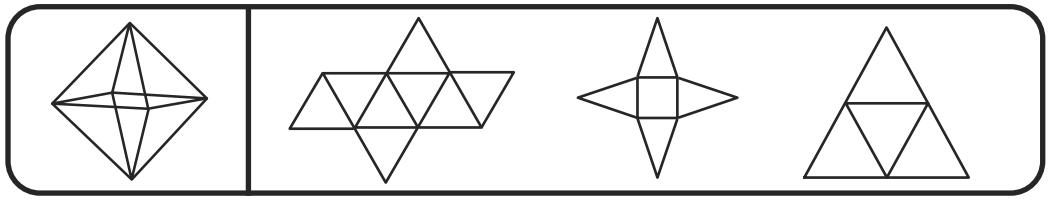
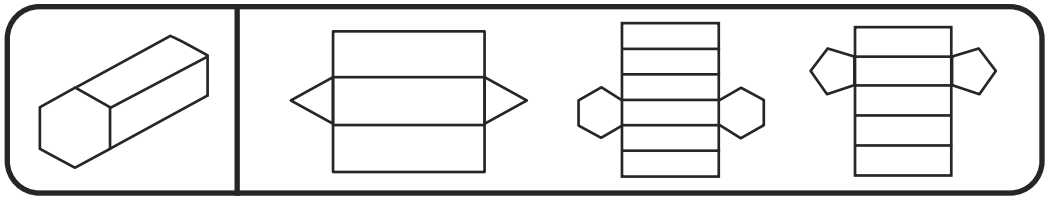
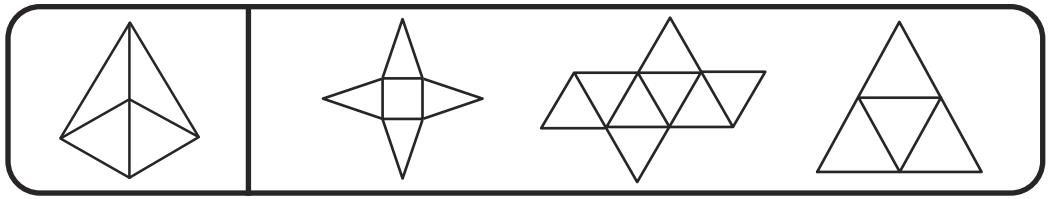
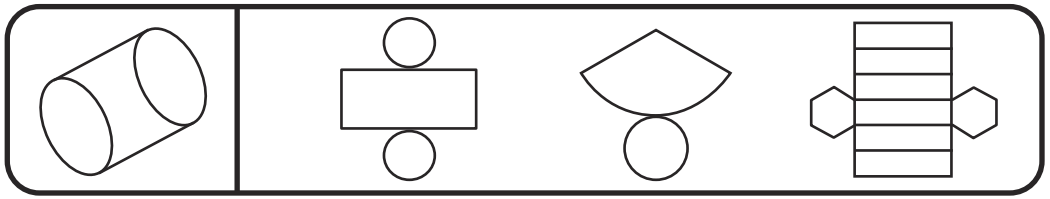
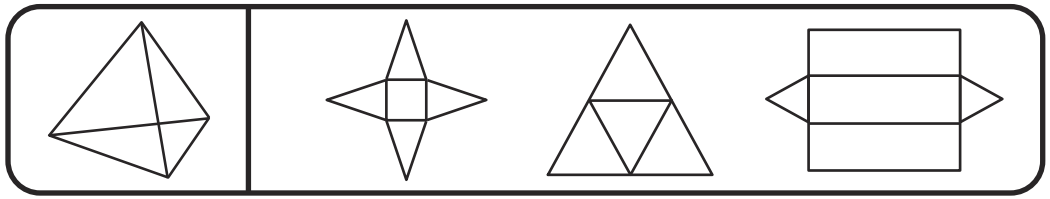
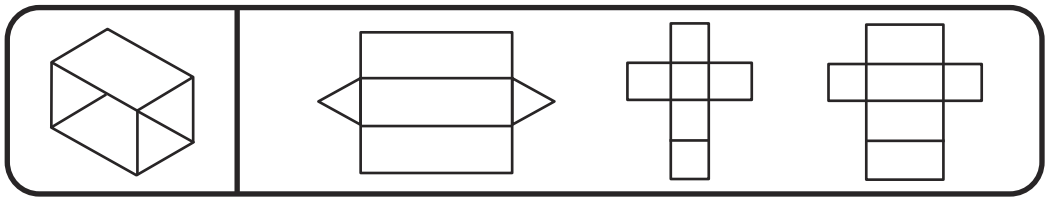
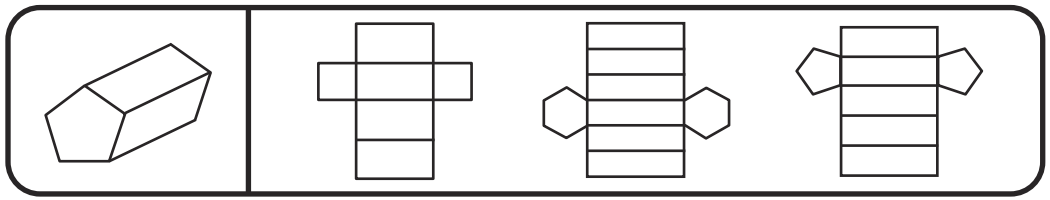




Shape Nets

To identify 3D shapes from 2D shapes.

Circle the correct shape net for the given 3D shape.

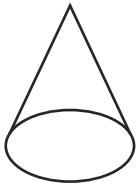











Shape Nets

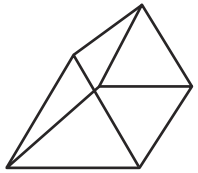
To identify 3D shapes from 2D shapes.

Use a pencil and ruler to draw the shape net of the given 3D shape.

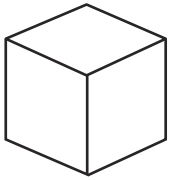
Cone



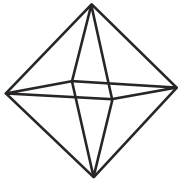
Triangular Prism



Cube

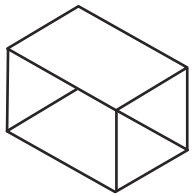


Octahedron

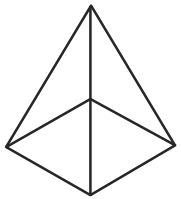


Use a pencil and ruler to draw the shape net of the given 3D shape.

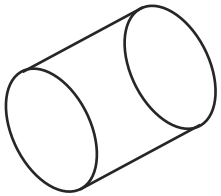
Cuboid



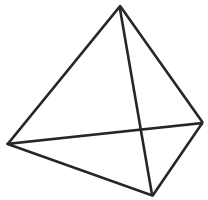
Square-Based Pyramid



Cylinder

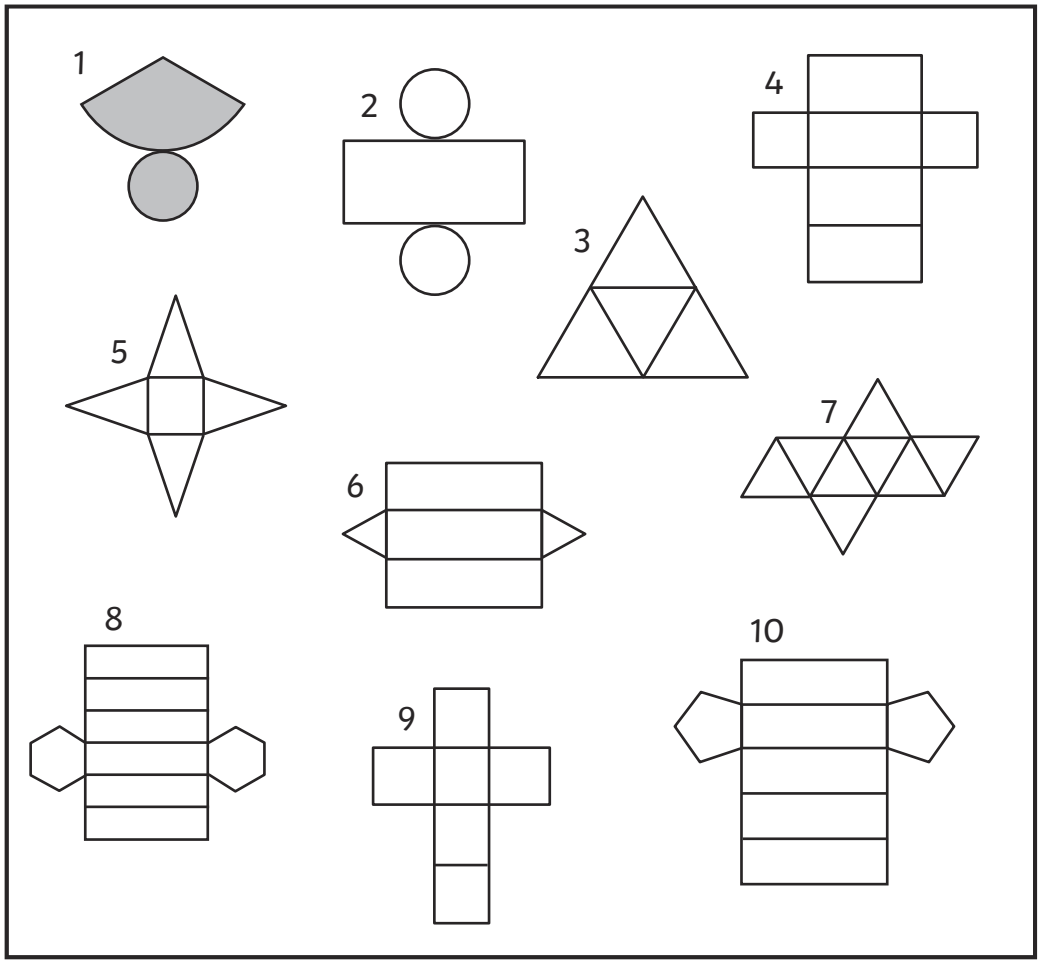


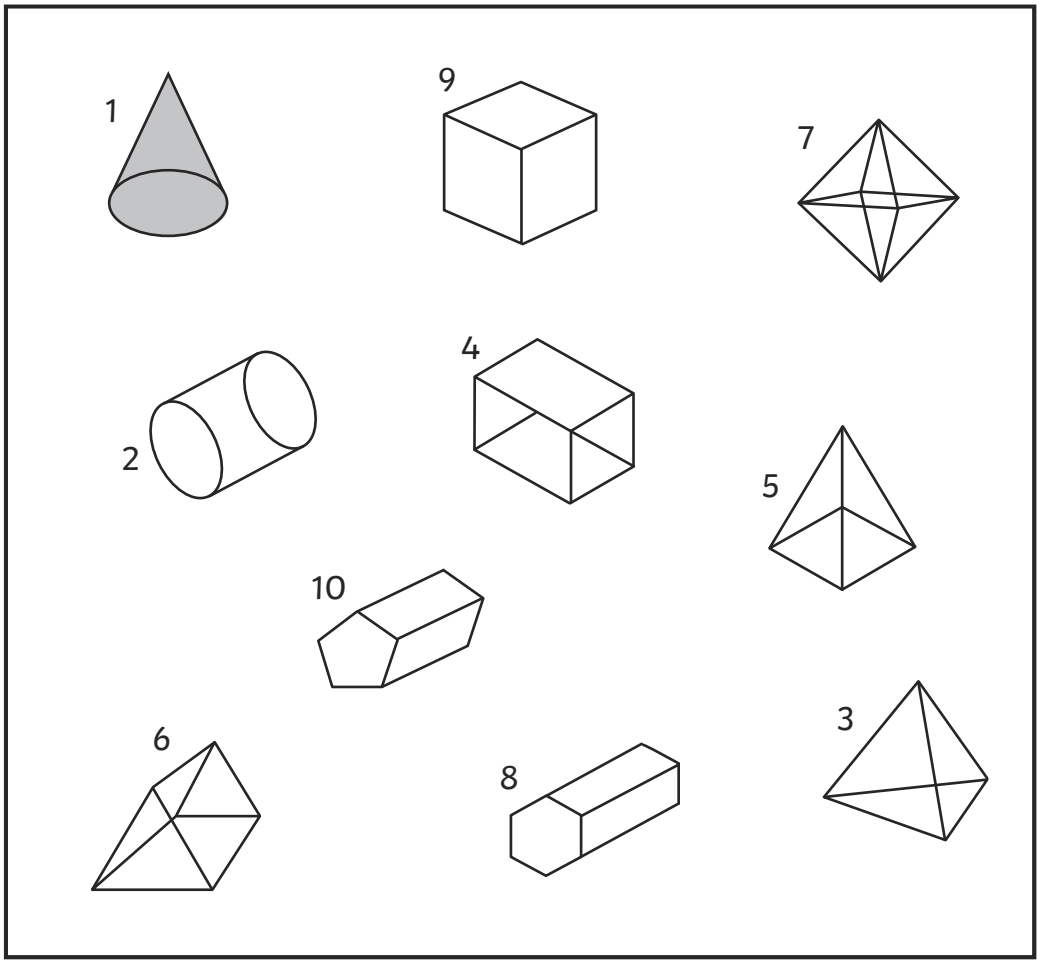
Tetrahedron



Shape Nets **Answers**

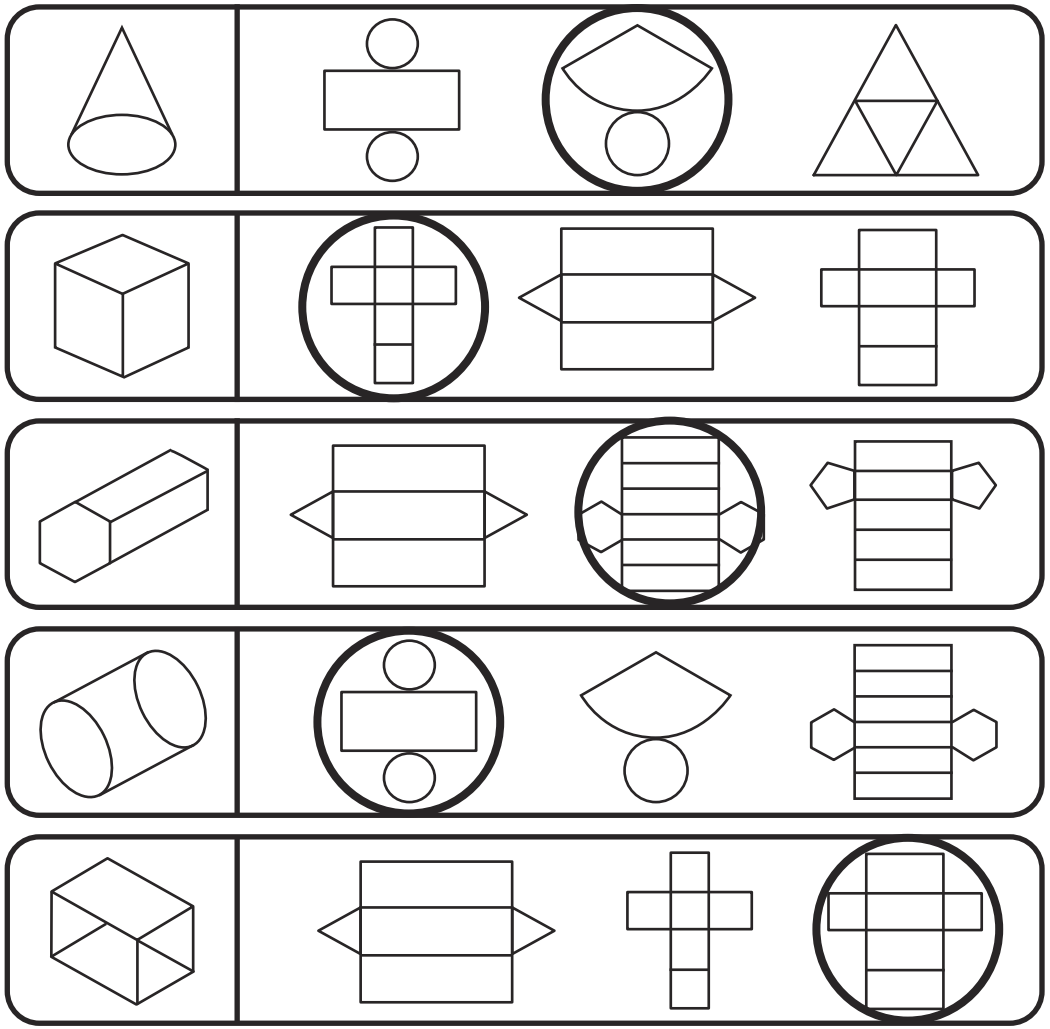
Match the 3D shape to its net by colouring the correct pairs the same colour.

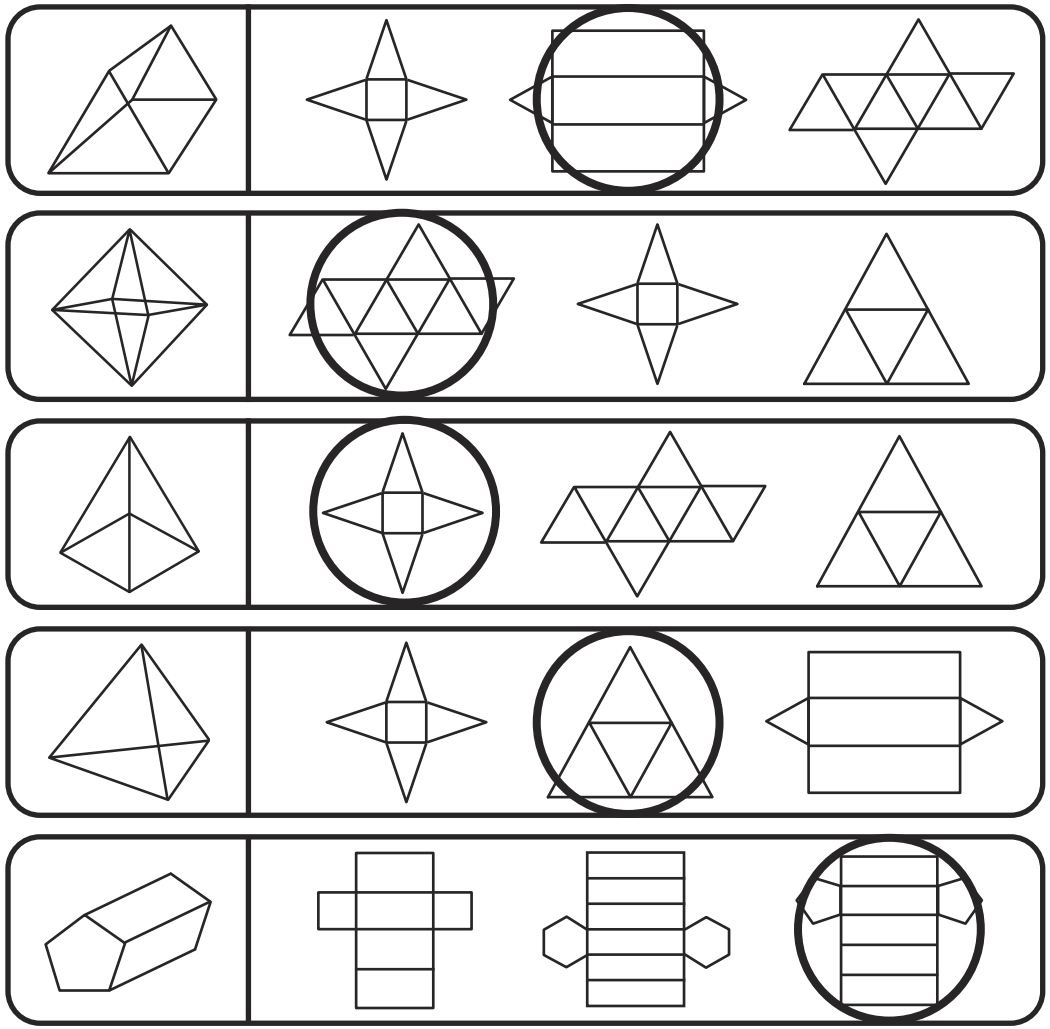




Shape Nets **Answers**

Circle the correct shape net for the given 3D shape.

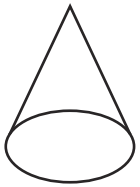


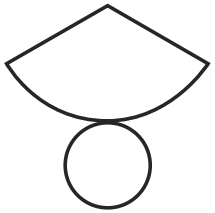


Shape Nets **Answers**

Use a pencil and ruler to draw the shape net of the given 3D shape.

Cone





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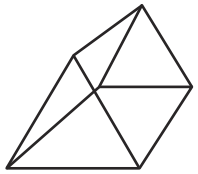

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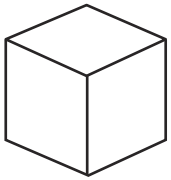

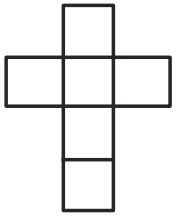

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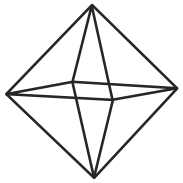

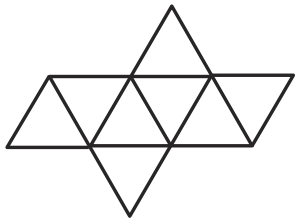

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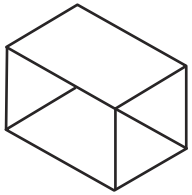

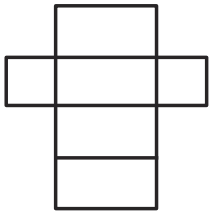

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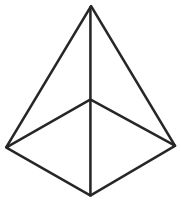

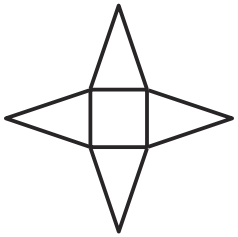

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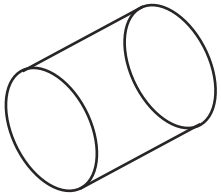

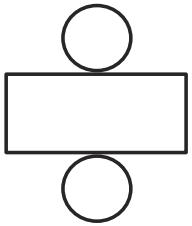

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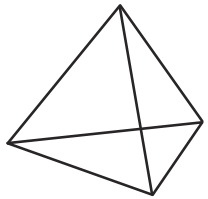

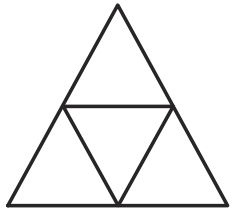

Properties of Shapes | Reasoning about 3D Shapes

To identify 3D shapes from 2D shapes.		
I can identify 2D shape nets of common 3D shapes.		
I can reason about the faces of common 3D shapes.		
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