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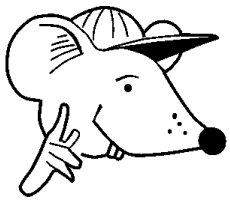
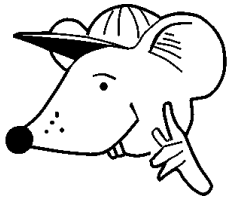


MATHEMATICS



N.S. Yr. 4 P.104

Making shapes and patterns with increasing accuracy.

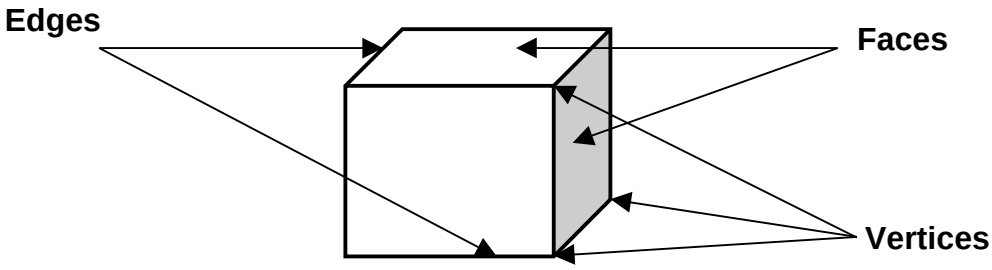
Equipment

Paper, pencil, boxes, range of 3-D shapes, straws and pipe cleaners or 3-D model construction kits. Optional: pinboard and elastic bands.

MathSphere

Concepts

Children need to spend time handling 3-D shapes and should be familiar with the terms 'edge', 'face' and 'vertex' (plural: 'vertices') when applied to 3-D shapes.



A range of boxes used for packaging such as chocolate boxes, tissue boxes etc, may be opened to see the nets used to construct them.

(A **net** is the 2-D shape that must be cut out and folded to make a 3-D shape. Eg. for a cube: )

Children should make 3-D shapes from suitable materials such as straws and pipe cleaners (used to join the ends) or kits designed for the purpose.

In this way, they will be able to see how many of each 2-D shape are needed as faces for a 3-D shape (Eg. six squares are needed to make a cube; a square and four isosceles triangles are needed to make a square based pyramid.)

Many shapes can be made from cubes. Cubes that join together are helpful here, but non-joining cubes are very useful too.

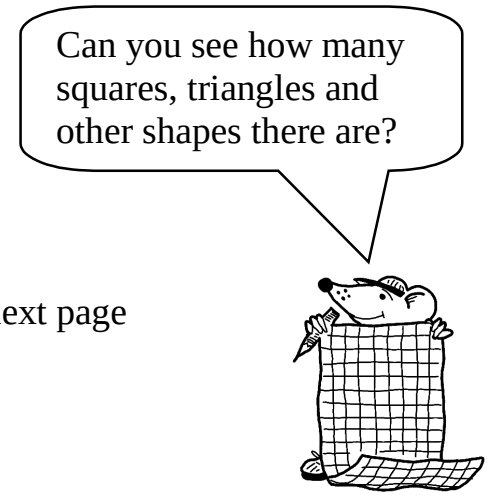
Other properties of shapes will be discovered, such as 'the number of faces of a prism is equal to two more than the number of edges on one of the end faces'.

A pin board may be simply made by nailing panel pins or small nails into a piece of plywood approximately 24cm × 24cm.

Cut out the plywood and mark a grid of lines at 2cm intervals in both directions across the plywood. Tap in the pins at the points where the lines of the grid meet. Leave enough of the pins protruding to accommodate elastic bands.

1. Find some interesting boxes such as chocolate boxes, tissue boxes or orange drink cartons. Carefully undo them and lay them out flat.

Draw round them on a large piece of paper.
Count the number of faces.



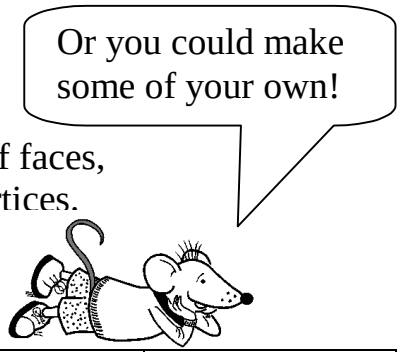
2. Make a cuboid from straws or from card. The next page shows a net for a cuboid if you need one.

How many faces does the cuboid have?
How many edges does the cuboid have?
How many vertices does the cuboid have?

3. Look at some different **pyramids**.

Count the number of edges on the base, the number of faces, the number of edges altogether and the number of vertices.

Fill in the table:



Name	Edges on base	Faces	Edges	Vertices
Tetrahedron				
Square based pyramid				
Pentagonal based pyramid				
Hexagonal based pyramid				
Octagonal based pyramid				

What do you notice about the number of faces and vertices on a pyramid?
What do you notice about the number of edges on the base and the number of faces?
What do you notice about the number of edges on the base and the number of vertices?
What can you say about the number of edges on the base and the number of edges altogether?

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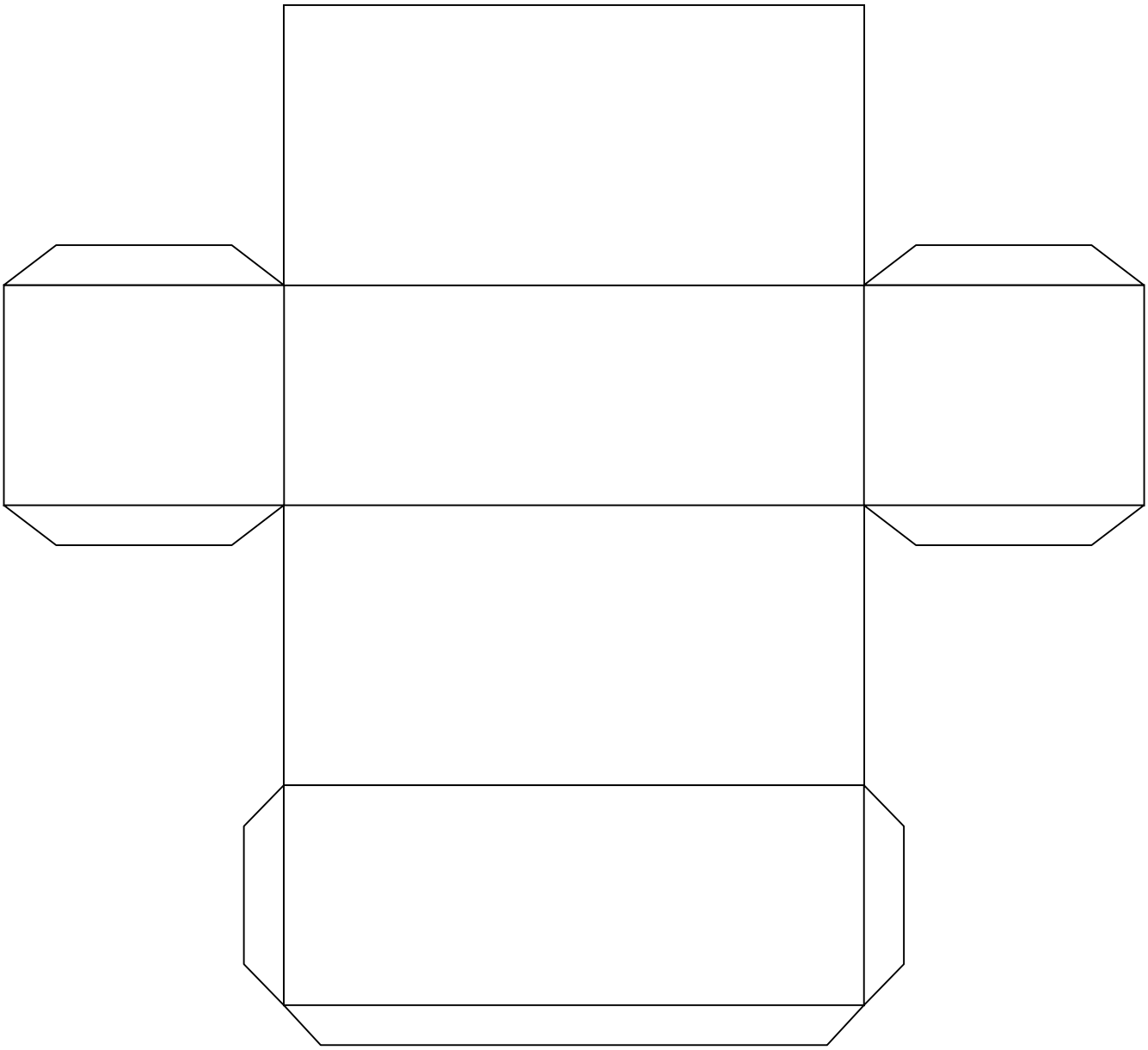
Here is a net of a cuboid for use in question 2 on the previous page.



1. Look at some different **prisms**.

Count the number of edges on the ends, the number of faces, the number of edges altogether and the number of vertices.

Fill in the table:

Name	Edges on end	Faces	Edges	Vertices
Triangular prism				
Cuboid				
Pentagonal prism				
Hexagonal prism				
Octagonal prism				

What do you notice about the number of faces compared to the number of edges on the ends?

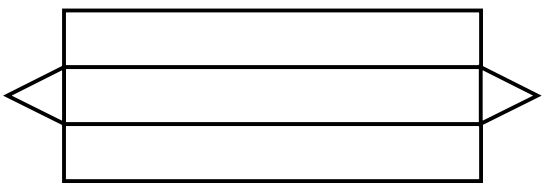
What do you notice about the number of edges altogether compared to the number of edges on the ends?

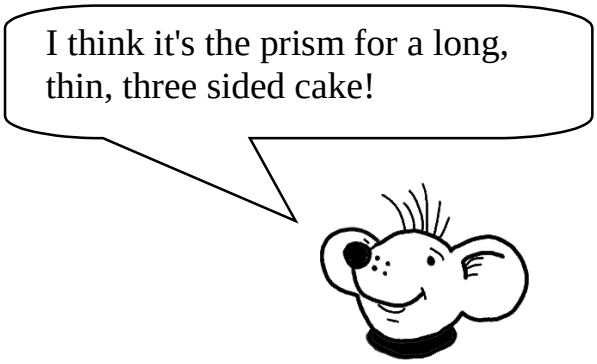
What do you notice about the number of vertices compared to the number of edges on the ends?

What happens if you add the number of faces and the number of vertices together for each shape?

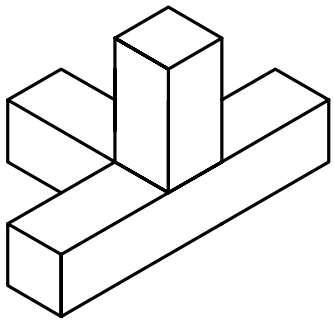
Are any of the columns of number in the times tables?

2. Which prism is this the net for?





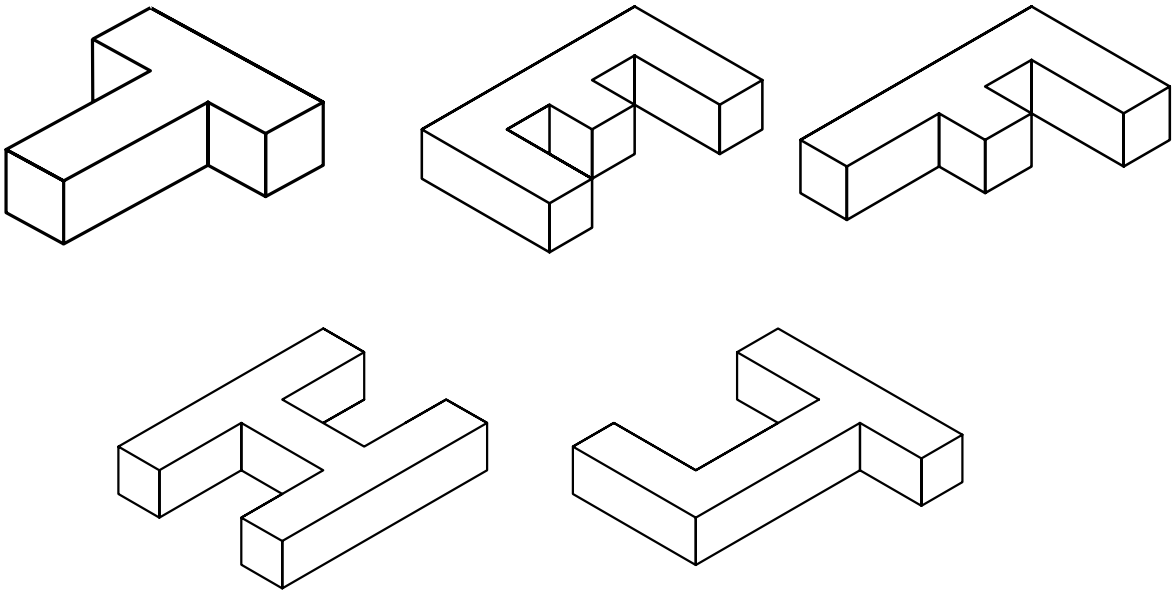
1.



Can you make this shape from small cubes?

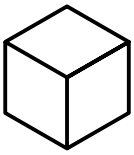
How many cubes did you need? Is this the smallest number you need?

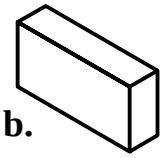
2. Can you make these letters of the alphabet using small cubes?



3. Quick test: What are these shapes called?

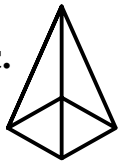
a.

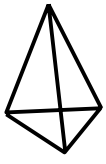




b.

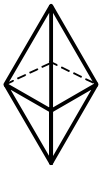
c.



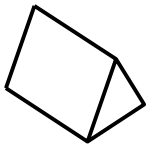


d.

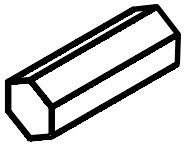
e.



f.



g.



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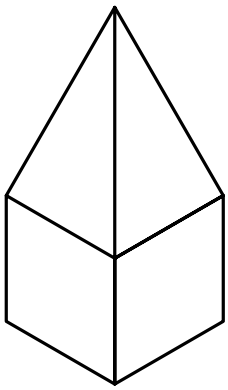
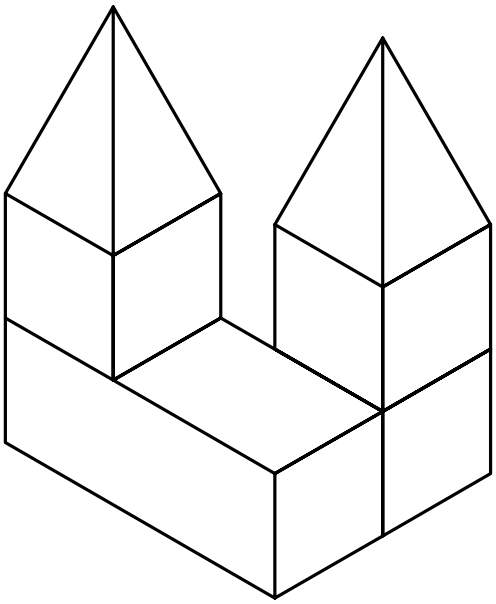
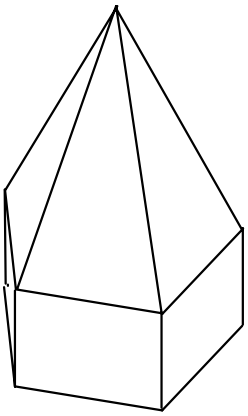
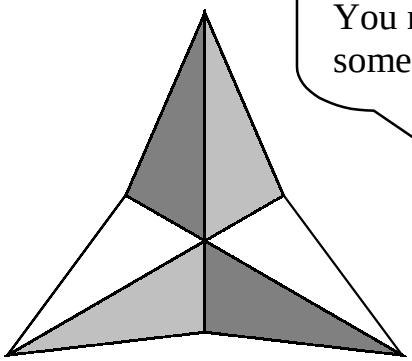
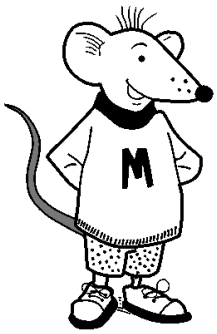
1. Try to make these three dimensional shapes using shapes you already have such as cubes, cuboids, pyramids and prisms.











Try making some shapes of your own. We had fun making these!

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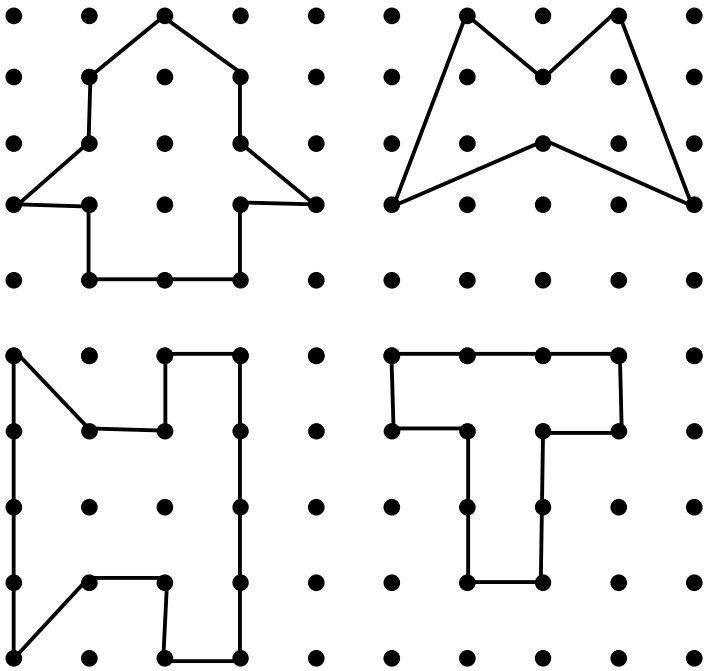
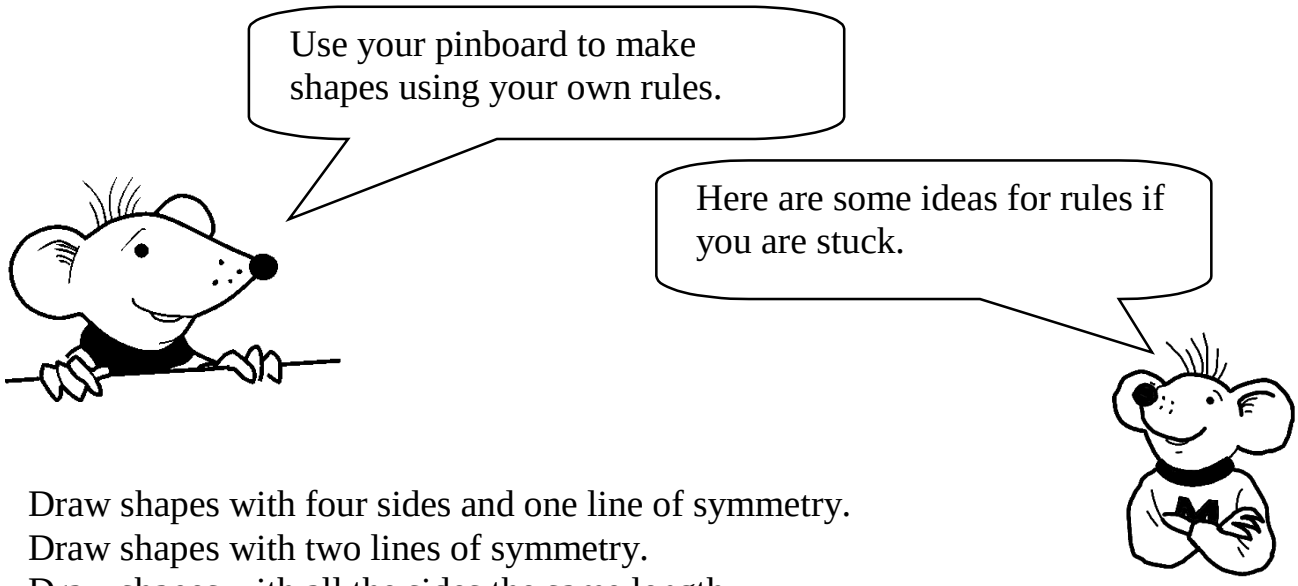
1. Here are some shapes on a pinboard.
Use your pinboard and elastic bands to copy the shapes.



All these shapes have one line of symmetry.



Draw shapes with four sides and one line of symmetry.
Draw shapes with two lines of symmetry.
Draw shapes with all the sides the same length.
Draw shapes with one right angle.
Draw shapes with an area of six squares on the pinboard.

Answers

Page 3

2. A cuboid has six faces, twelve edges and eight vertices.

3.

Name	Edges on base	Faces	Edges	Vertices
Tetrahedron	3	4	6	4
Square based pyramid	4	5	8	5
Pentagonal based pyramid	5	6	10	6
Hexagonal based pyramid	6	7	12	7
Octagonal based pyramid	8	9	16	9

On a pyramid the number of faces and vertices are the same.

On a pyramid the number of faces is one more than the number of edges on the base.

On a pyramid the number of vertices is one more than the number of edges on the base.

On a pyramid the number of edges altogether is twice the number of edges on the base.

Answers (Contd)

Page 5

1.

Name	Edges on end	Faces	Edges	Vertices
Triangular Prism	3	5	9	6
Cuboid	4	6	12	8
Pentagonal Prism	5	7	15	10
Hexagonal Prism	6	8	18	12
Octagonal prism	8	10	24	16

On a prism the number of faces is two more than the number of edges on the end.

On a prism the number of edges altogether is three times the number of edges on the ends.

On a prism the number of vertices altogether is twice times the number of edges on the ends.

If you add the number of faces and the number of vertices for each shape it is two more than the number of edges.

2. This is the net for a triangular prism.

Page 6

3. **a.** Cube **b.** Cuboid **c.** Square based pyramid **d.** Tetrahedron
e. Octahedron **f.** Triangular prism **g.** Hexagonal prism