Monday 1st June

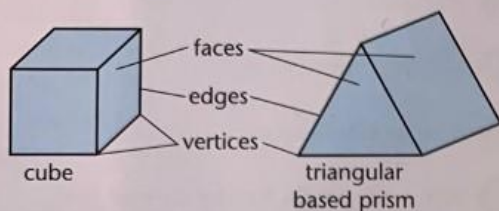## THREE-DIMENSIONAL SHAPES

TARGET To describe the properties of 3-D shapes.
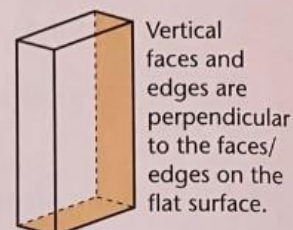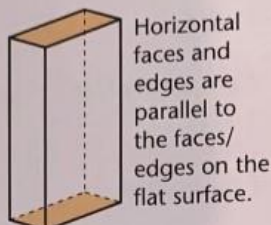
POLYHEDRA
A polyhedron is a 3-D shape with straight edges.

faces
edges
vertices
cube
triangular based prism

A prism has two identical end faces and the same cross section throughout its length.

PARALLEL AND PERPENDICULAR FACES/EDGES
Parallel and perpendicular faces and edges can be identified by placing one face of a shape on a flat surface.

Horizontal faces and edges are parallel to the faces/ edges on the flat surface.

Vertical faces and edges are perpendicular to the faces/ edges on the flat surface.

A

1 Match each of the shapes A to L with one of the names of 3-D shapes.

cone	hemisphere	pentagonal based prism
cube	hexagonal based prism	square based pyramid
cuboid	octagonal based prism	tetrahedron
cylinder	octahedron	triangular based prism

A   B   C   D

E   F   G   H

I   J   K   L
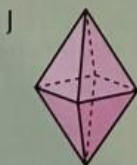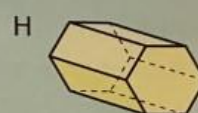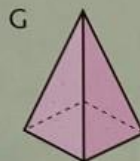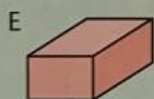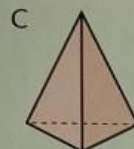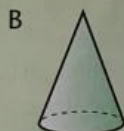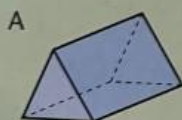
2 Copy and complete this sentence.
An octagonal based prism has ☐ identical octagonal end faces and 8 identical ☐ side faces.

3 Write a similar sentence for each of the other five prisms shown in the above diagrams.

1 Copy and complete this table showing the properties of nine different polyhedra.

Shape	Sides	Edges	Vertices
	7		
			4
cube		24	
		9	
			6
	8		
			8
		8	

2 For each of the shapes in the above table write down:
   a) how many pairs of parallel faces there are in the shape
   b) how many pairs of perpendicular faces there are in the shape?

C

Copy and complete the following formulae where:

S = number of sides of end face of prism
F = number of faces of a prism
E = number of edges of a prism
V = number of vertices of a prism

1 $F = S + \square$

2 $E = \square S$

3 $V = \square S$

4 $E = F + V - \square$

Use your formulae to find:

5 the number of faces and edges of a prism with 24 vertices

6 the number of vertices and edges of a prism with 12 faces

7 the number of faces and vertices of a prism with 45 edges.

For each of the following shapes write down how many faces have:
   a) pairs of parallel edges
   b) pairs of perpendicular edges.

8 a heptagonal prism

9 a hexagonal pyramid

10 a 10 sided (decagonal) prism

11 a pentagonal pyramid

12 a 9 sided (nonagonal) prism

13 an octagonal pyramid

14 Look at the shapes in Section A.
   a) Which shape has parallel edges in the shape but not in any face?
   b) How many pairs of parallel faces does this shape have?

15 How many edges are there on the end face of a prism with:
   a) 20 faces with parallel edges
   b) 20 faces with perpendicular edges.