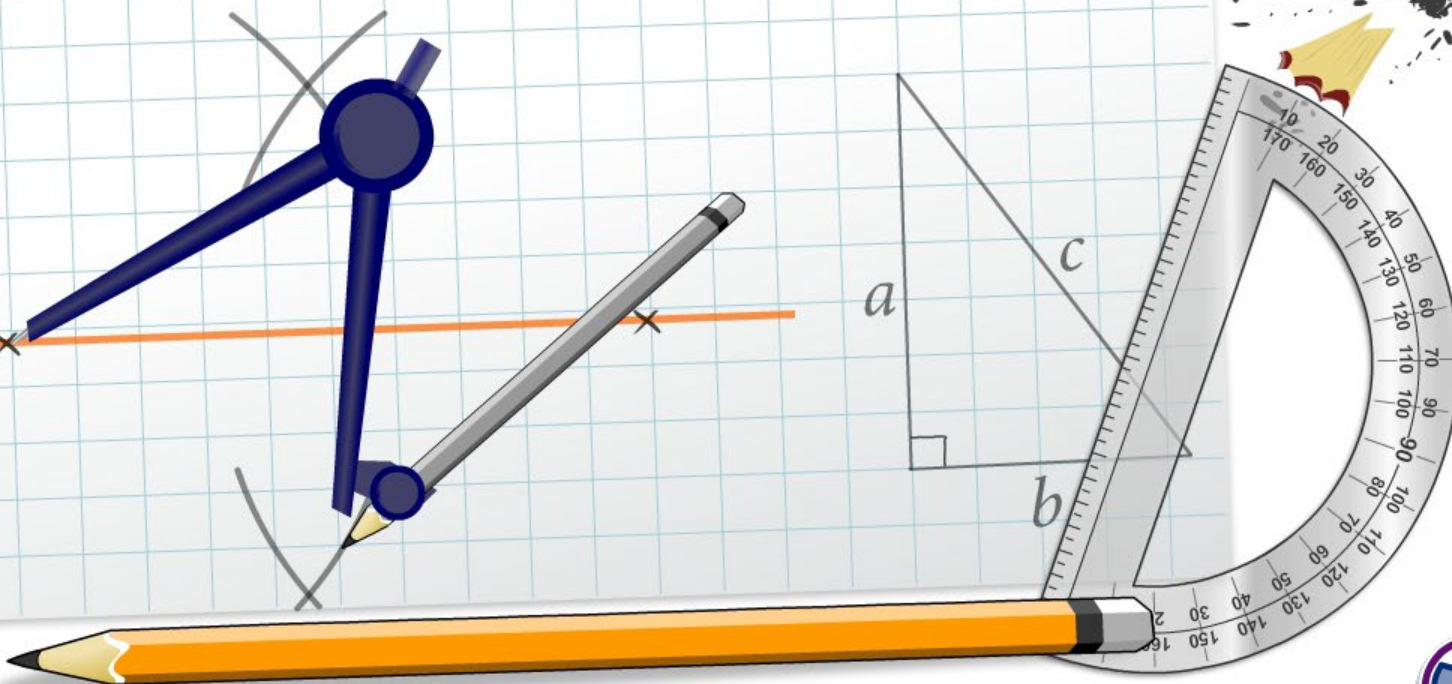# Classifying 3D Shapes

Common core icons

This icon indicates a slide where the Standards for Mathematical Practice are being developed. Details of these are given in the Notes field.

MODELING

Slides containing examples of mathematical modeling are marked with this stamp.

This icon indicates an opportunity for discussion or group work.

The **Standards for Mathematical Practice** outlined in the Common Core State Standards for Mathematics describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.

These are:

1) **Make sense of problems and persevere in solving them.**

2) **Reason abstractly and quantitatively.**

3) **Construct viable arguments and critique the reasoning of others.**

4) **Model with mathematics.**

5) **Use appropriate tools strategically.**

6) **Attend to precision.**

7) **Look for and make use of structure.**

8) **Look for and express regularity in repeated reasoning.**

This icon indicates that the slide contains activities created in Flash. These activities are not editable.

This icon indicates teacher's notes in the Notes field.

Three-dimensional (3D) shapes are objects with length, width and height. They are made of flat and/or curved surfaces. A **polyhedron** is a 3D shape with flat surfaces and straight edges.

Three-dimensional shapes have several features:

- **faces** are the flat surfaces of the shape

- **edges** are where two faces intersect

- a **vertex** is where three or more faces intersect.

Nets
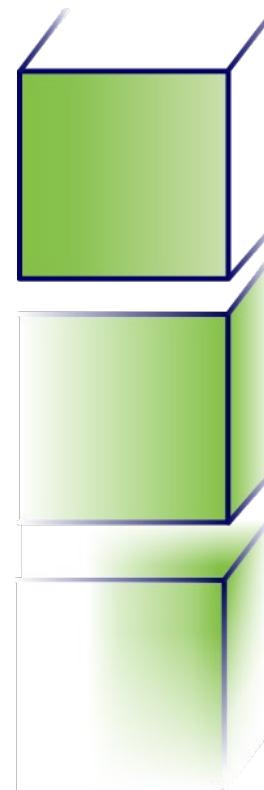
Three-dimensional shapes can be represented by a **net**, a two dimensional diagram of their surfaces. It can be folded to create the three-dimensional shape.

Can you picture what object the net below makes? How many faces, edges and vertices does it have?

This is the net of a rectangular pyramid.
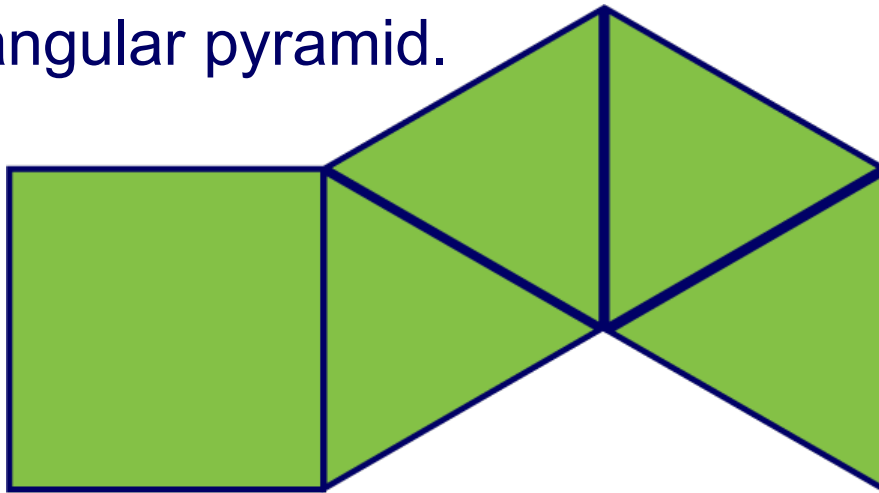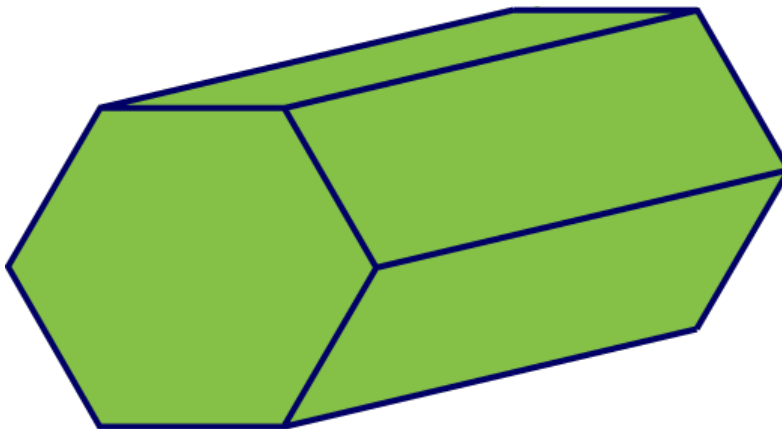
faces = 5

edges = 8

vertices = 5

A **prism** is a polyhedron with two parallel congruent faces, called bases.

The lateral faces are parallelograms formed by connecting the corresponding vertices of the bases.

A prism has the same cross-section throughout its length.

This is called a hexagonal prism because its cross-section is a hexagon.

A **rectangular prism** has two congruent rectangular bases in parallel planes.

face

edge

vertex
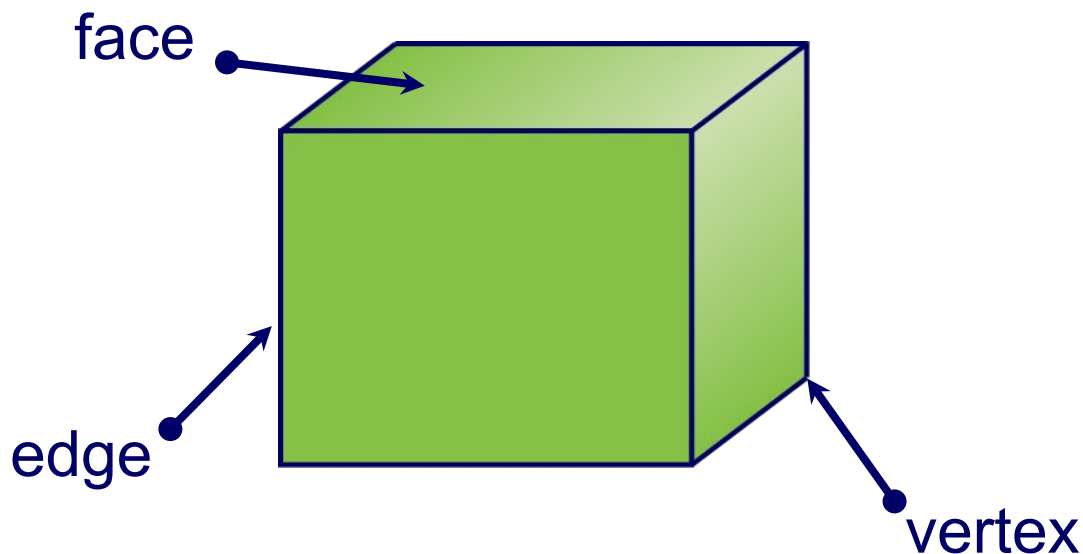
faces = 6

edges = 12

vertices = 8

A **cube** is a special type of rectangular prism with edges of equal length. All of its faces are square.
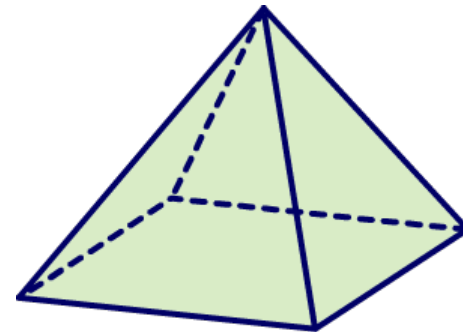
A **pyramid** is a polyhedron in which the base is a polygon. The lateral faces rising up from the base are triangles, which meet at a common vertex or **apex**.

A pyramid can have a base of any shape, but the most common pyramids are:
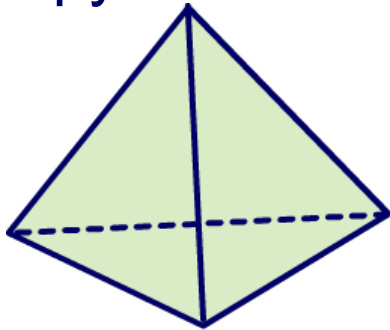
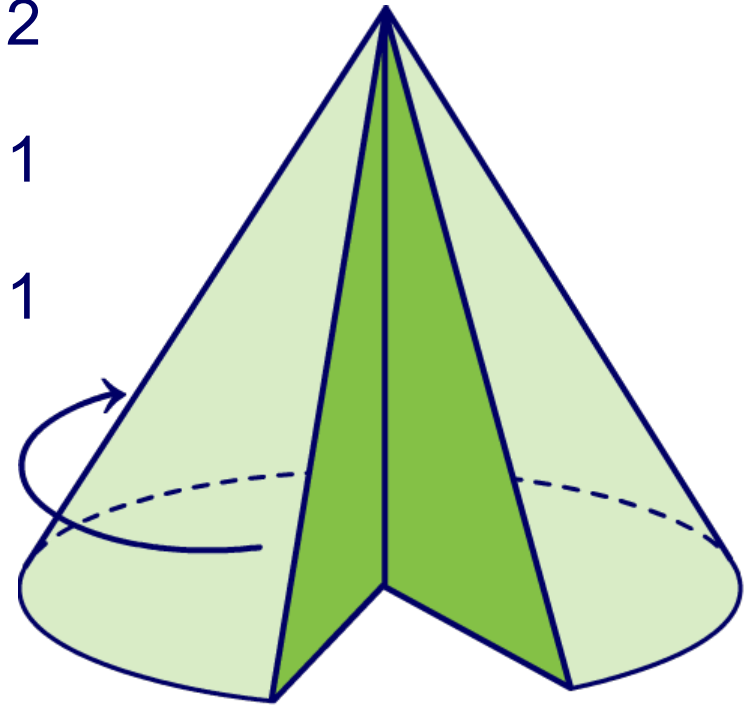**tetrahedron** or
triangular pyramid

square pyramid

Can you draw the net for a pyramid with a) a rectangular base, b) a pentagonal base and c) a hexagonal base?

A **cone** is a special type of pyramid with a circular base and a curved surface connecting the base to the apex.
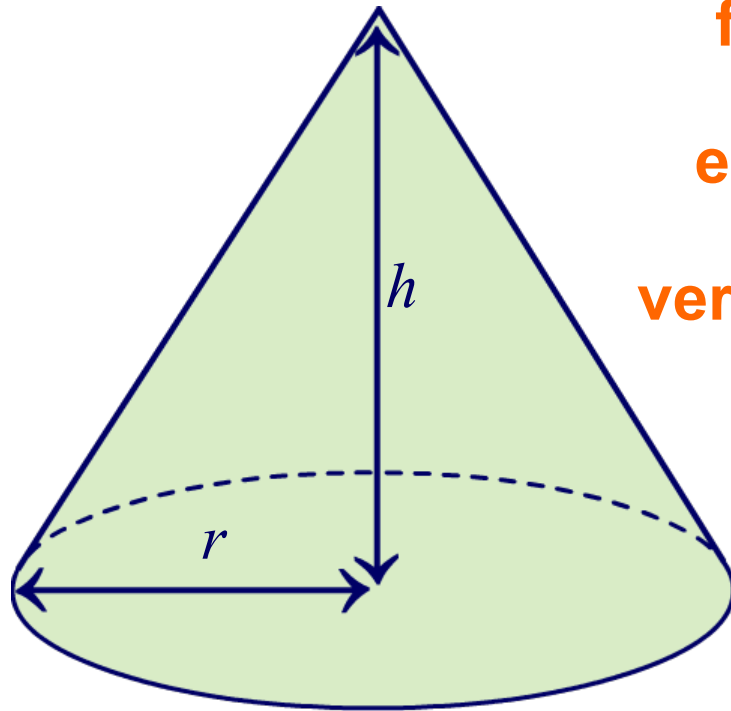
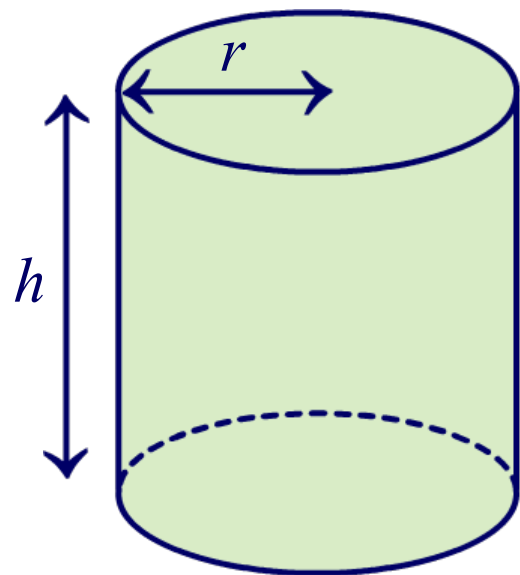**faces =** 2

edges = 1

vertices = 1

h

r

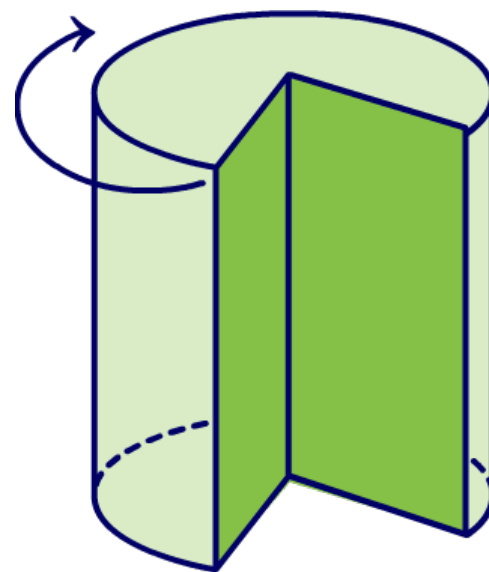A cone is generated by rotating a triangle around an axis.

A **cylinder** is a 3D shape with two parallel congruent bases, which are circular, with a curved surface connecting the bases.
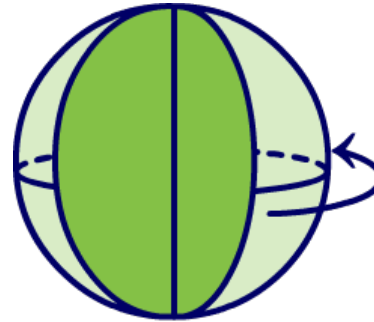
faces =   3

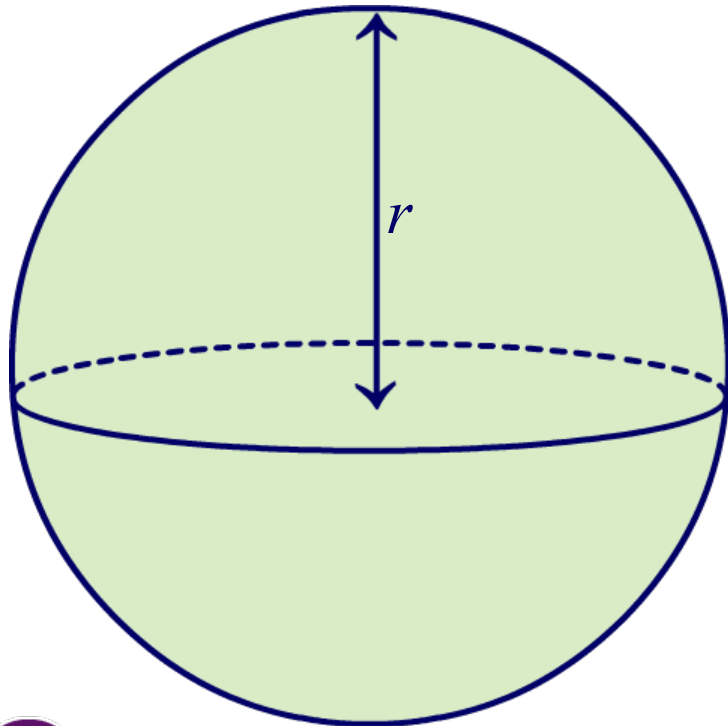**edges =**   2

vertices =   0

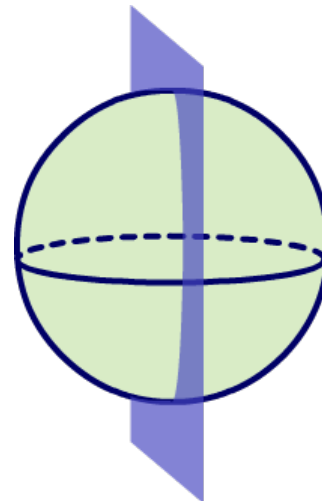A cylinder is generated by rotating a rectangle around an axis.

A **sphere** is a 3-D shape with a surface the same distance from the center at every point. This distance is the radius.

A sphere has one curved face and no edges or vertices.

r

A sphere can be generated by rotating a circle or half circle around an axis.
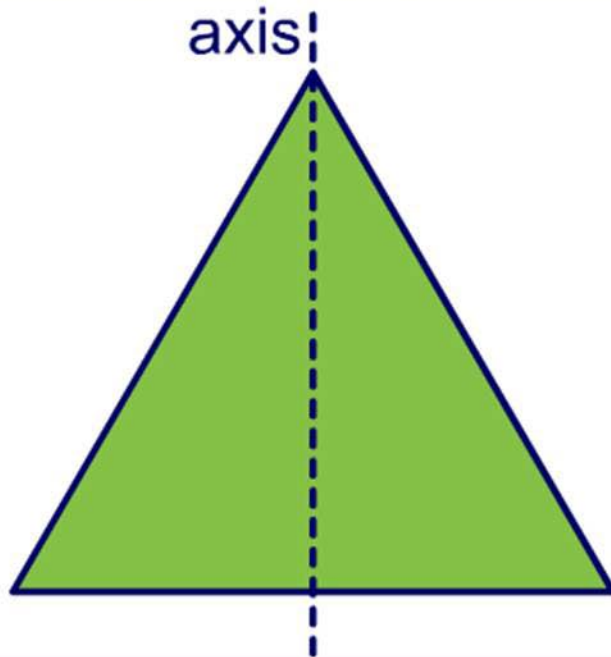
Any cross-section of a sphere is a circle.

Using rotation to create 3D objects

Question: 1/5

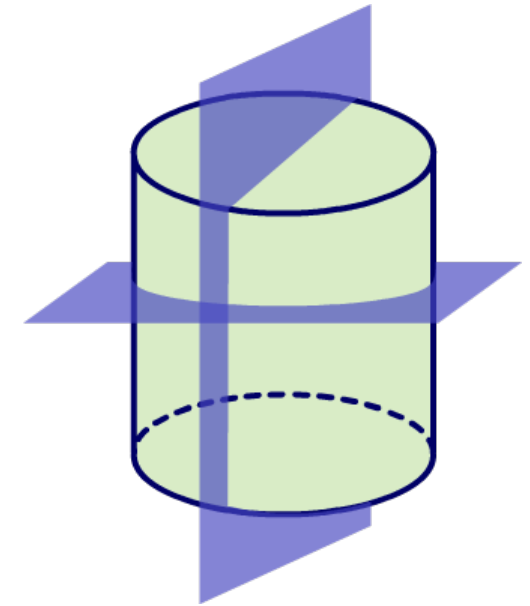What 3D object is created by rotating the shape below around the axis shown?

axis

A) tetrahedron

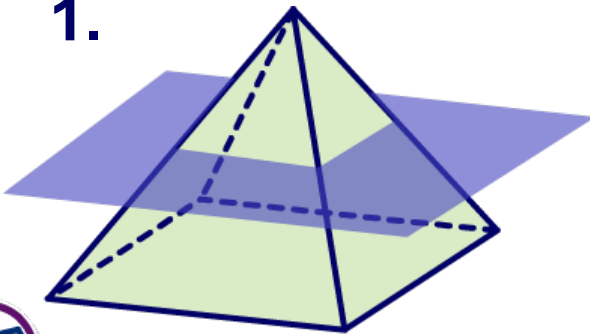**B)** square pyramid

C) cone

Cross-sections

A **cross-section** is a two-dimensional slice of a three-dimensional object. Cross-sections of different objects provide different shapes.
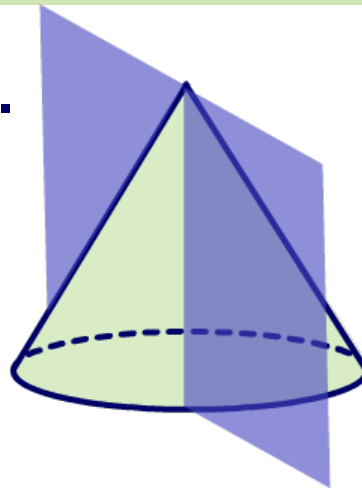
The cross-section of a cylinder can be a circle or a rectangle.

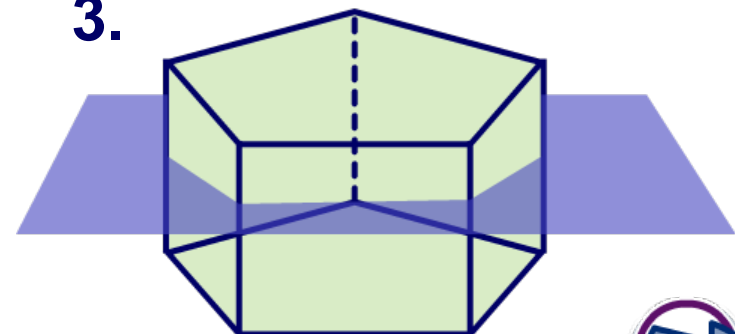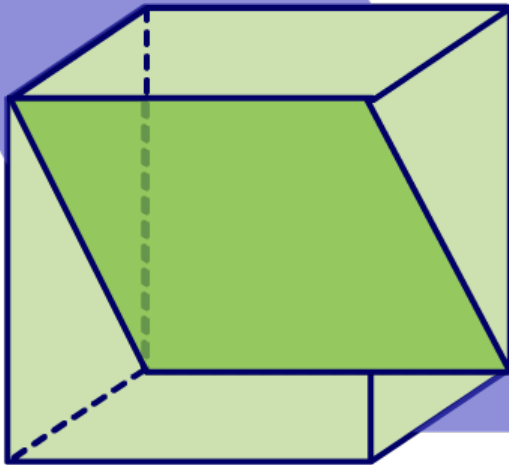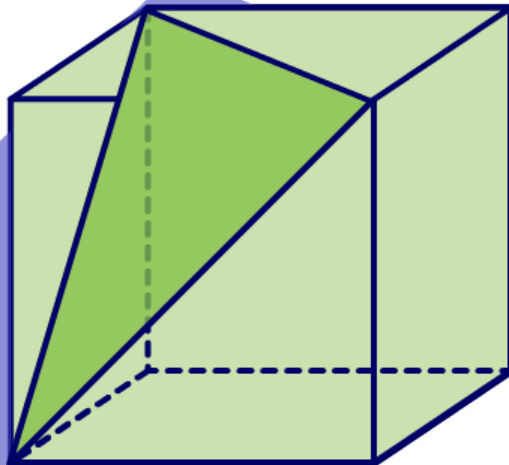**What shape do the following cross-sections make?**

1.

2.

3.

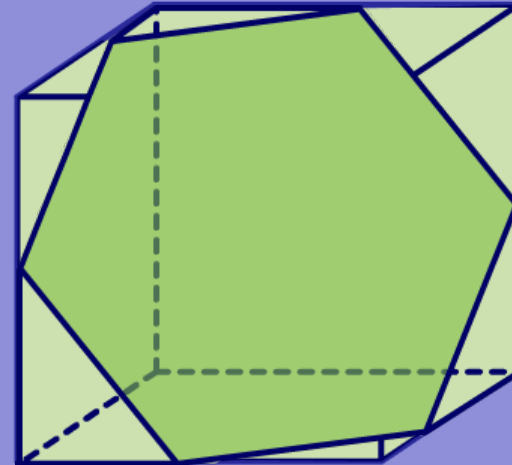**Identify the shape of these cross-sections of a cube.**
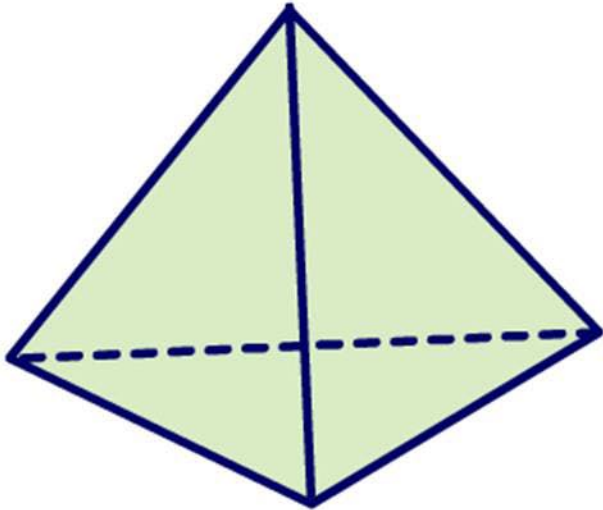
a.

b.

c.

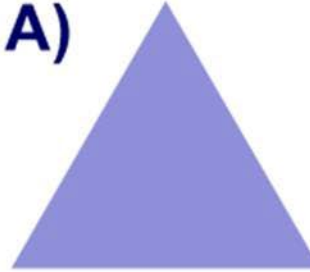**Think of other shapes that a cross-section through a cube could make.**

Cross-sections

Question: 1/6:
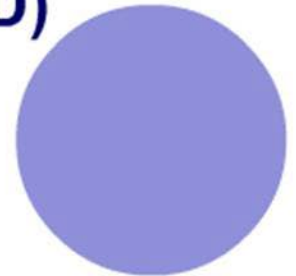
What is a possible cross-section of the figure below?

A) (triangle)

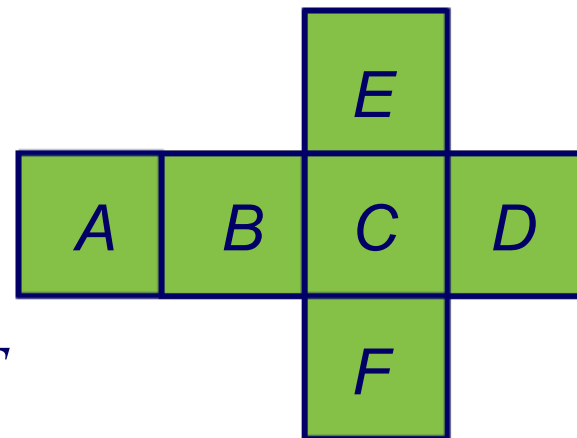B) (square)

C) (rectangle)

D) (circle)

Surface area of a three-dimensional shape is the combined area of all its faces. This is easiest seen by looking at the object's net.

The surface area of this net:

$\quad$ = area of each face

$\quad$ = $A + B + C + D + E + F$

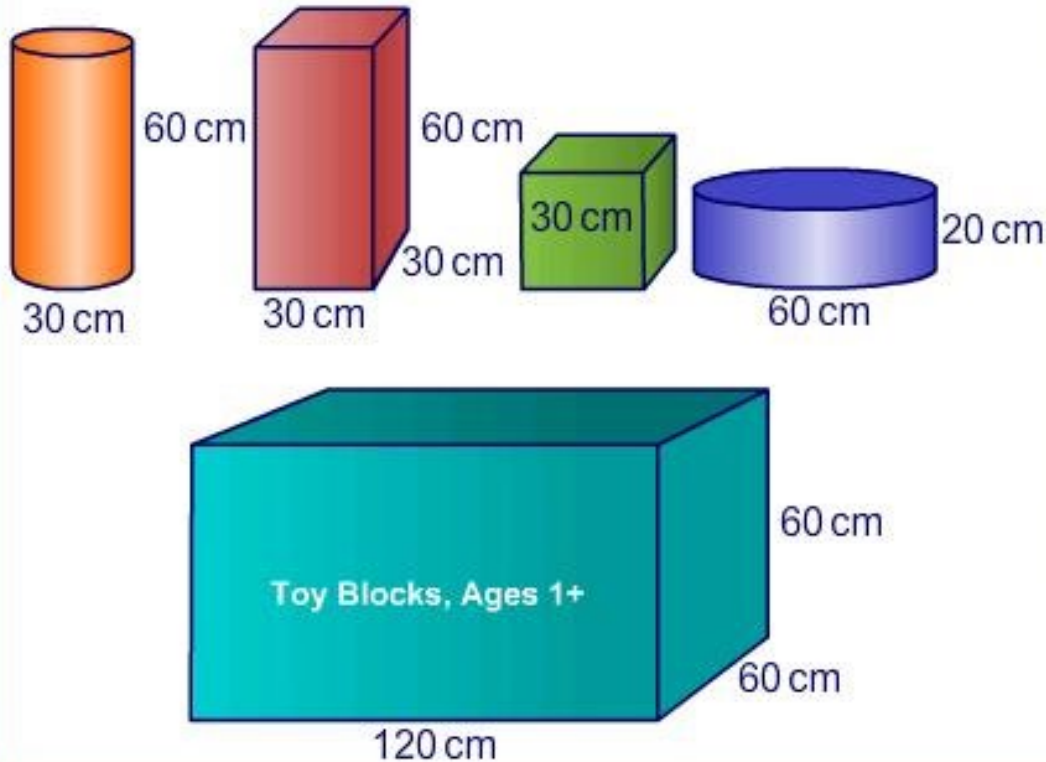|	E	
A	B	C	D
	F	

Volume is the space taken up by a 3D object. It can be thought of as the number of unit cubes that can exactly fill the shape.

Think of a cylindrical glass holding water. The amount of water the glass can hold is the volume.

How many of each type of block will fit in the large holder at the bottom?

60 cm

30 cm

60 cm

30 cm

30 cm

30 cm

20 cm

60 cm

60 cm

Toy Blocks, Ages 1+

60 cm

120 cm

green cubes	----------
red blocks	----------
orange cylinders	----------
blue cylinders	----------

Type the numbers of each toy into the text boxes.