

## CHAPTER

29

# Solids

### Vocabulary:

cross-section

### Chapter Outcomes:

- Describe solids in terms of their properties.
- Solve problems involving solids and plane shapes.

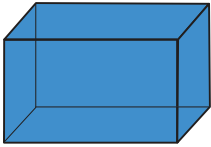
We live in three dimensional space. Our homes, school, place of business, all have height, depth, and width. The **Knowsley Building** is one such three dimensional space. It occupies a city block facing the Port of Spain, Queen's Park Savannah. It was designed and built in 1904 by Taylor and Gillies. The designers and architects used 3 dimensional figures to help them to define the spatial form of the building.



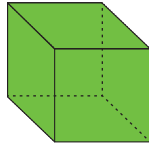
## Getting Ready for Chapter 29

Identify each figure.

1.



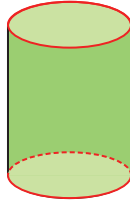
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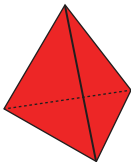
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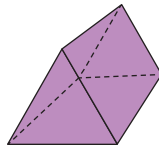
4.



5.



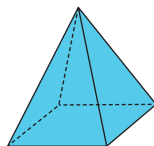
6.



7.

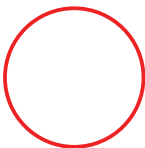


8.

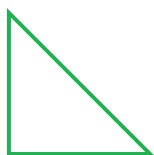


Identify the shapes below.

9.



10.



11.



12.

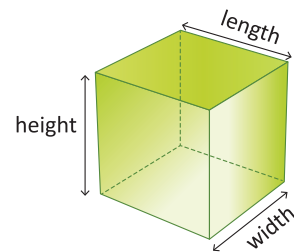


## Properties of Solids

### Teaching Point 1:

How do you describe the properties of solids?

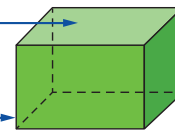
A solid is a three-dimensional figure. A **three-dimensional** figure has length, width and height.



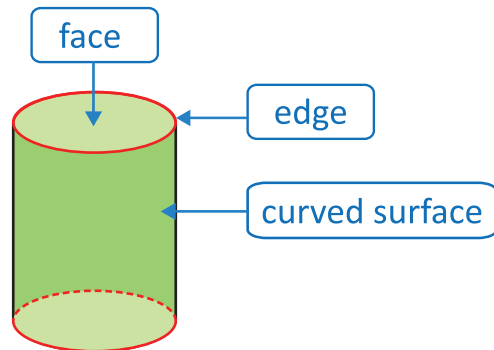
A **face** is a flat surface.

An **edge** is where two faces meet.

A **vertex** is a point where 3 or more faces meet.

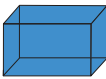
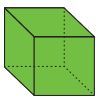


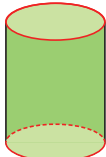
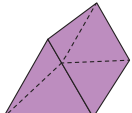
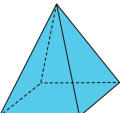
Some solids can have curved surfaces.



### Activity 1:

Copy and complete the tables.

|                    |                                                                                   |                                                                                   |                                                                                   |
|--------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| Solid              |  |  |  |
| Name               |                                                                                   |                                                                                   |                                                                                   |
| Number of Faces    |                                                                                   |                                                                                   |                                                                                   |
| Number of Vertices |                                                                                   |                                                                                   |                                                                                   |

|                    |                                                                                    |                                                                                    |                                                                                    |
|--------------------|------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|
| Solid              |  |  |  |
| Name               |                                                                                    |                                                                                    |                                                                                    |
| Number of Faces    |                                                                                    |                                                                                    |                                                                                    |
| Number of Vertices |                                                                                    |                                                                                    |                                                                                    |

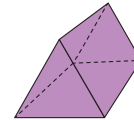
Solve the problems.

1. Chocolates are sold in triangular-based pyramid shaped boxes. How many triangles are needed to make 4 boxes?
2. Jaden used rectangles to make 6 cuboid boxes. How many rectangles did she use?
3. Name a solid that has no vertices.
4. Name a solid that have ONLY triangular faces.

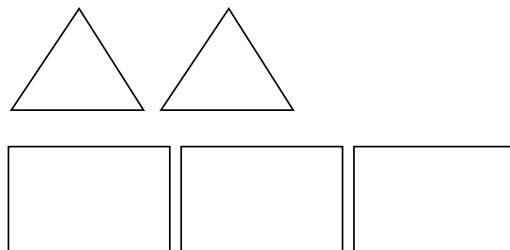
### Teaching Point 2:

How do you describe the properties of solids?

Describe the faces, edges and vertices of the solid.



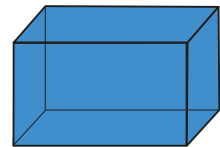
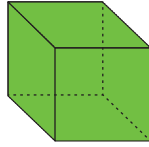
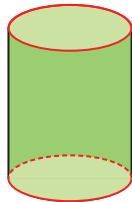
Count the edges and vertices. Trace each face of the solid.



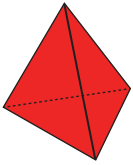
A triangular prism has 3 rectangular faces and 2 triangular faces, 9 edges and 6 vertices.

### Activity 2:

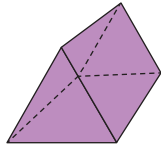
Trace the faces of each solid. Describe the faces, edges and vertices of each solid. Then identify it.

1. 
2. 
3. 
4. 

5.



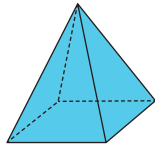
6.



7.

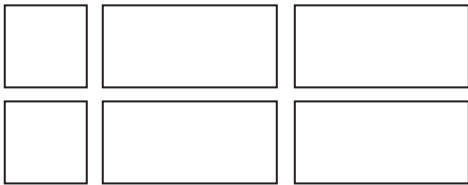


8.

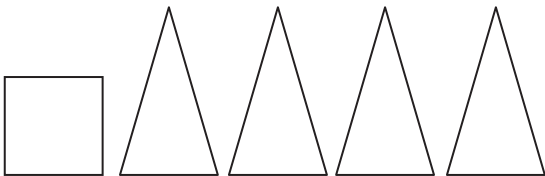


Name the solid that matches each set of faces.

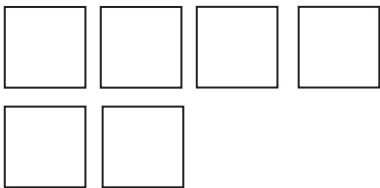
9.



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13.

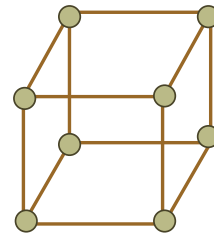


## Model Solids

### Teaching Point 1:

How do you model solids?

Use toothpicks and plasticine to model solids.



Model of a cube:

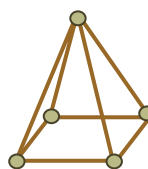
1. Get 12 toothpicks of the same length
2. Get 8 plasticine balls
3. Use plasticine to make 2 squares.
4. Use four toothpicks to join the two squares.

Use the properties of the solid, to help you create a frame of a solid.

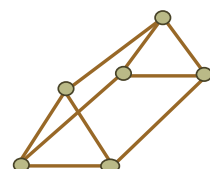
### Activity 4:

Which solid is shown by each frame.

1.

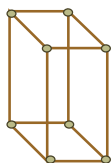


2.

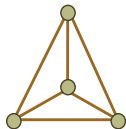




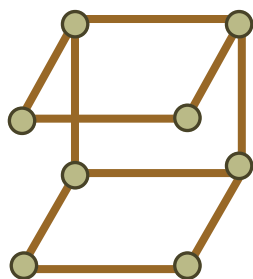
3.



4.



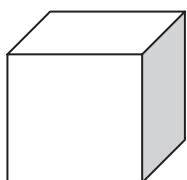
5. Carla made a solid using 12 toothpicks of the same length and 8 pieces of plasticine. Which solid did she make?
6. Alex was making the frame of a cube and didn't have enough toothpicks to finish it. His unfinished model is shown below.



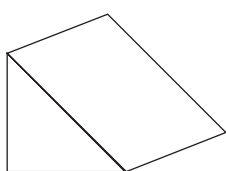
How many toothpicks does he need to finish the frame.

Draw dotted lines to show missing edges, faces and vertices.

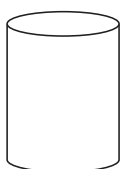
7.



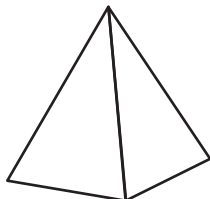
8.



9.



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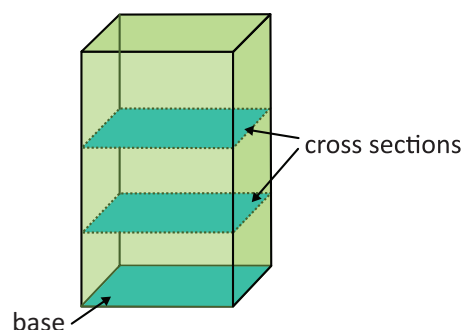
## Cross Section of Solid Figures

### Teaching Point 1:

How do you describe the cross-section of solids?

Each slice through a solid figure is called a **cross section**.

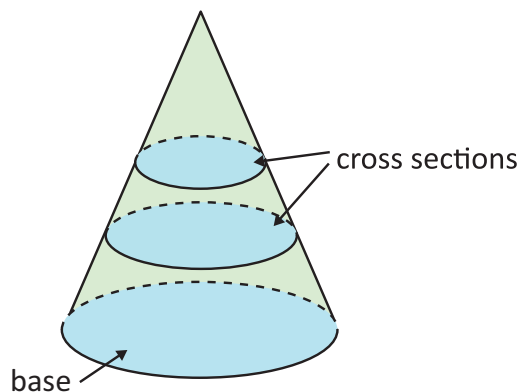
### Cross section of a cuboid



Any cross section that is parallel to the bases of the cuboid has the same shape and size of the base of the cuboid.

The cuboid has **uniform cross sections**.

### Cross section of a cone

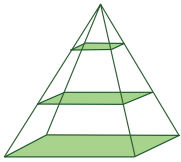


Each cross section is a different size to its base. The cone does not have uniform cross sections.

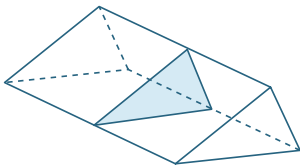
### Activity 1:

Describe each cross section. Write uniform cross section or cross section not uniform.

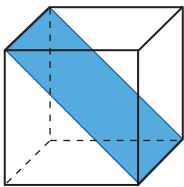
1.



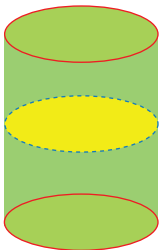
2.



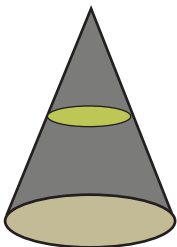
3.



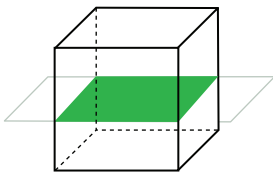
4.



5.



6.

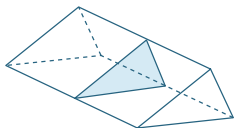
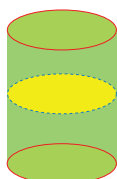
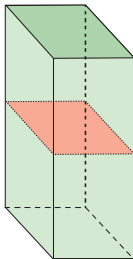
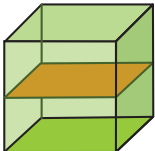


### Teaching Point 2:

How do you describe the cross-section of solids?

A **prism** has uniform cross sections when it is sliced parallel to its base.

#### Prisms

|                                                                                                        |                                                                                                 |
|--------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| <br>triangular prism | <br>cylinder |
| <br>cuboid         | <br>cube   |

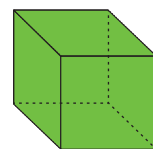
### Activity 2:

Name each solid figure that has uniform cross sections?

1.



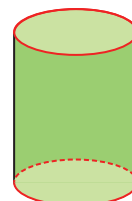
2.



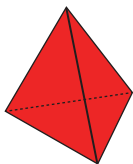
3.



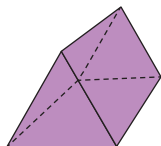
4.



5.



6.



## Drawing Solids

### Teaching Point 1:

How do you draw solid figures?

Draw a cuboid.

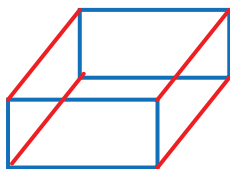
#### Step 1

Draw identical rectangular bases.



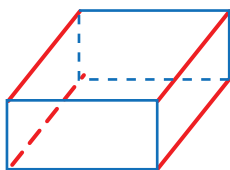
#### Step 2

Connect corresponding vertices.



#### Step 3

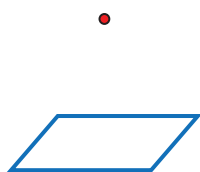
Change any hidden lines to dashed lines.



Draw a pyramid.

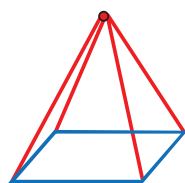
#### Step 1

Draw a square base and a point.



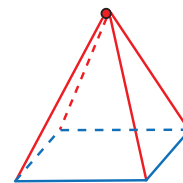
#### Step 2

Connect the vertices of the square to the point.



#### Step 3

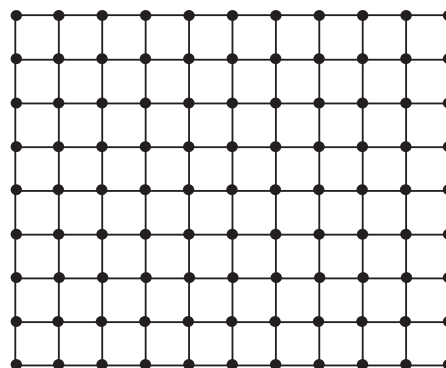
Change any hidden lines to dashed lines.



### Activity 1:

#### Solve.

1. Draw two different solids with 5 faces on the grid below.

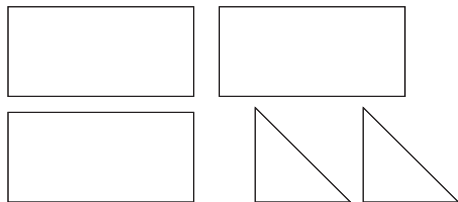


2. Draw the following solids.
  - (a) cube
  - (b) cuboid
  - (c) cone
  - (d) triangular based pyramid
  - (e) triangular based prism

## Chapter Review

Answer the questions.

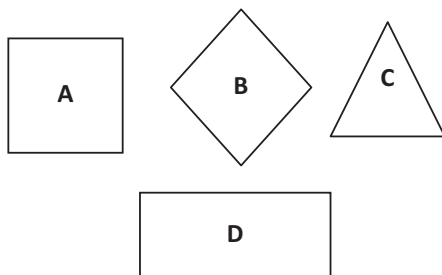
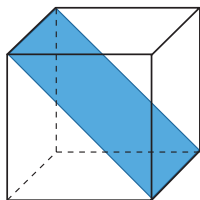
1. Five plane shapes are shown below.



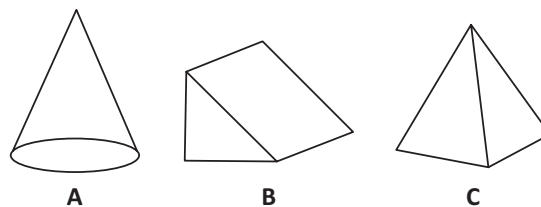
- (a) Which solid has these faces?  
 (b) How many edges and vertices does this solid have?
2. What is the name of the solid that the can of soda best represents?



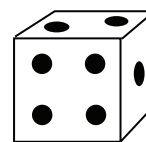
3. A solid has 4 triangular faces, 6 edges and 4 vertices. What is the name of the solid?
4. Which plane shape matches the shape of the cross section of the cube below?



5. Three solids are shown below.



- (a) Which solid has a uniform cross section?  
 (b) Which solid has two faces?  
 (c) Which solid is a pyramid?
6. The diagram below shows a die which is used in board games.



- (a) What solid does the die represent?  
 (b) How many faces does it have?  
 (c) This solid has a uniform cross section. Draw it.
7. A hat box is shown below.



- (a) Name the solid figure that the hat box represents.  
 (b) Write the number of faces, edges and vertices.
8. Joshua is making a frame of a solid. He uses nine pieces of sticks for the edges and six pieces of plasticine for the vertices.
- (a) What is the name of the solid that Joshua is making?  
 (b) Draw the solid.