Important Concepts . . .

Preview Review

Mathematics Grade 4

W3 - Lesson 4: Geometry 2

V5-07

Important Concepts of Grade 4 Mathematics

Materials Required

Mathematics Grade 4
Version 5
Preview/Review W3 - Lesson 4

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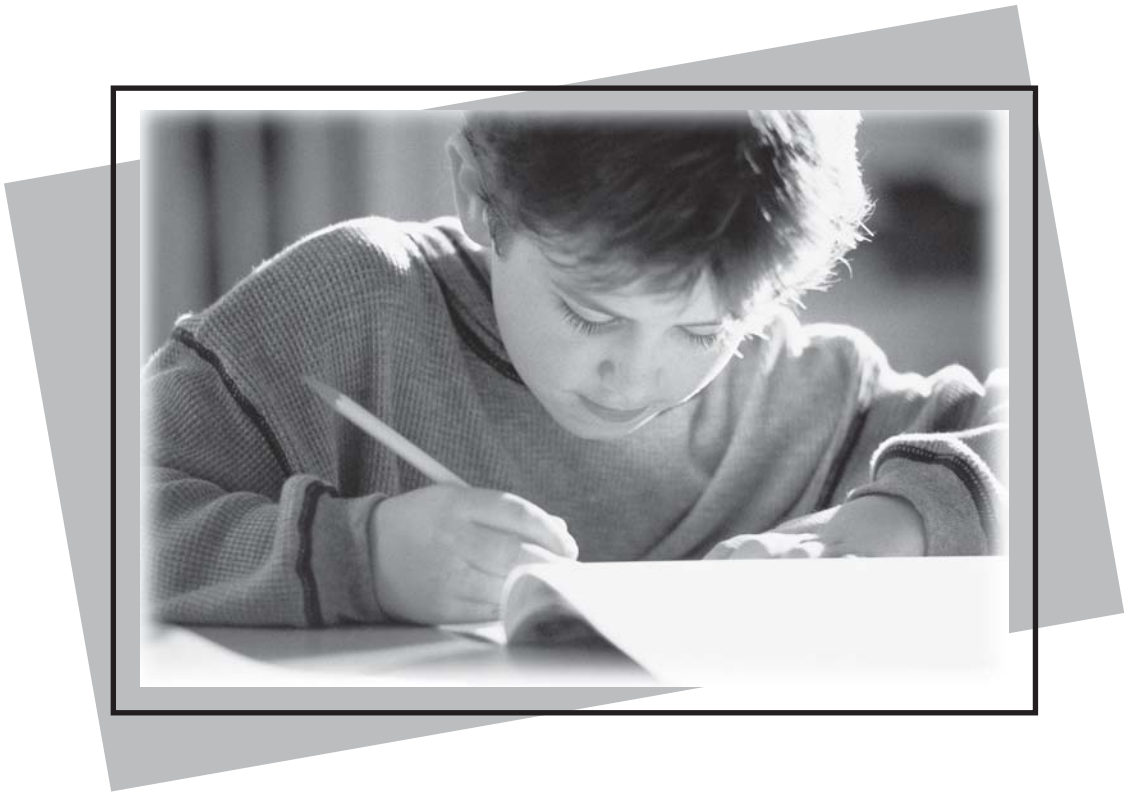
Preview/Review Concepts for Grade Four Mathematics



W3 - Lesson 4: Geometry 2

OBJECTIVES

By the end of this lesson, you should

- explain the difference between 2-D figures and 3-D objects
- distinguish *prisms* (at least two parallel sides) from *pyramids* (no parallel sides)
- compare and contrast *prisms* and/or *pyramids* using characteristics such as faces, edges, and vertices
- relate nets to 3-D objects
- locate an object on a grid using columns and rows
- use N, E, S, and W to communicate directions on a grid

GLOSSARY

cube - a solid with six equal, square sides 

edge - a line at which two faces of a solid meet

face - one of the plane surfaces of a solid

grid - intersecting parallel lines drawn on a map used to locate places on the map

hexagon - a six-sided 2-D figure 

pentagon - a five-sided 2-D figure 

polygon - a 2-D figure with three or more sides

prism - a 3-D solid with two similar parallel ends (or bases)

pyramid - a 3-D solid with one base (a polygon) and flat sides that meet at a point

quadrilateral - a four-sided 2-D figure

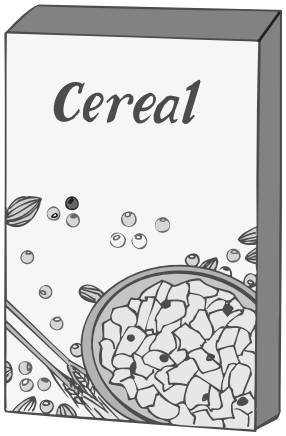
W3 - Lesson 4: Geometry 2

A. Three-dimensional solids

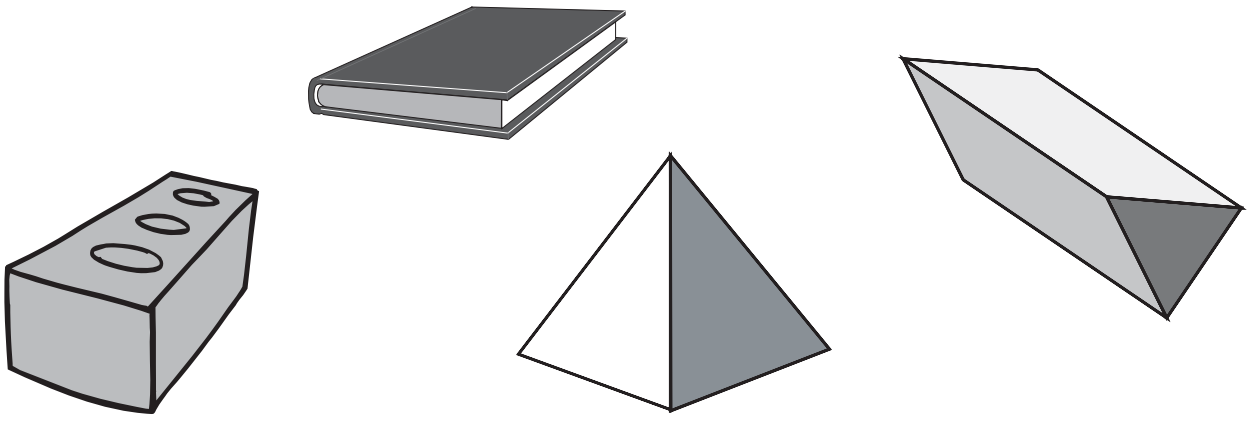
In W3 - Lesson 3, you learned about points, lines, angles, and 2-D figures. These are all very important to the study of geometry. In this lesson, you will continue to learn more about geometry by studying **three-dimensional** solids.

Three-dimensional solids are also known as 3-D solids. They have length, width, and depth (or thickness).

A box, such as a box of cereal, is a 3-D solid. It has 3 dimensions. You can measure its length, width, and depth.



Three-dimensional objects are all around us. Here are some more examples:



1. Look around your classroom. Find five more 3-D solids and list them.

   a. _____

   b. _____

   c. _____

   d. _____

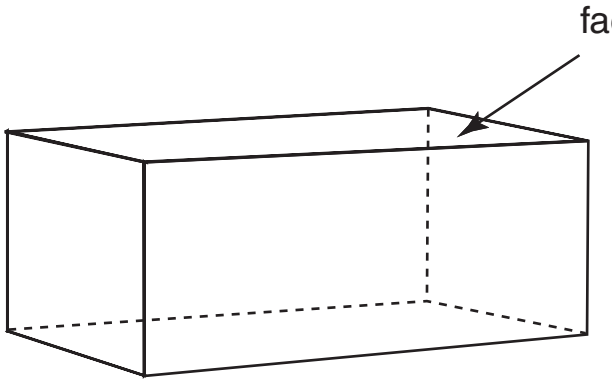
   e. _____

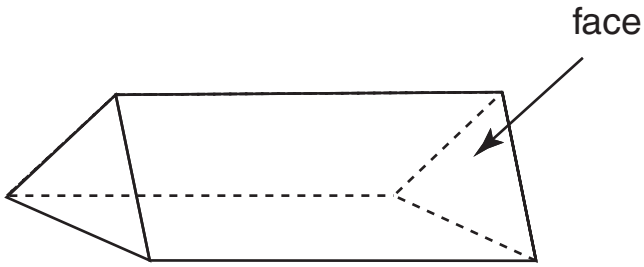
To understand 3-D solids better, you need to know three special terms or characteristics used to describe all 3-D solids.

The first term is ***face***. A face is a flat surface (or side) on a 3-D object.

All solids have at least 4 faces or sides. Most solids have more. Some solids have 10 or more faces.

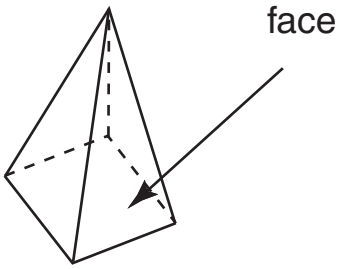
Look at each of the 3-D solids below. Count how many faces there are in each shape. Remember to count the faces that you cannot see as well.

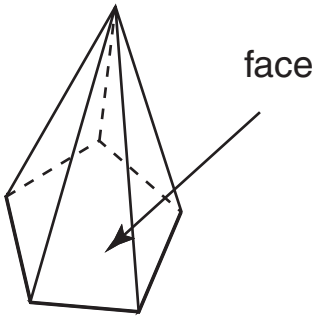




2. a. This prism has ____ faces.

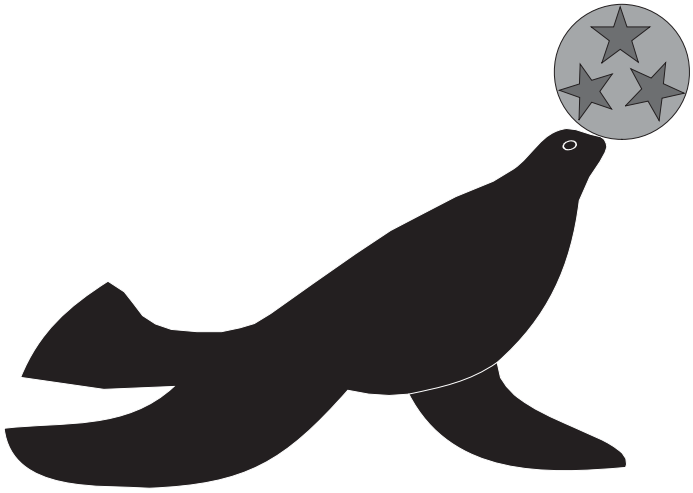
b. This prism has ____ faces.





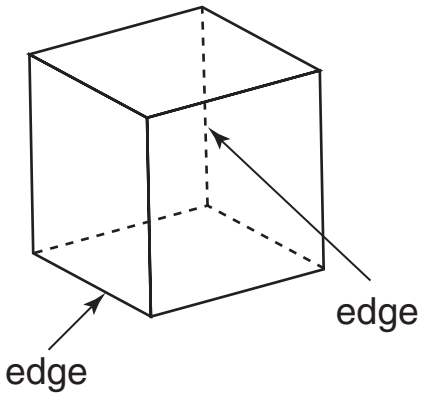
c. This pyramid has ____ faces.

d. This pyramid has ____ faces.



Another term used to describe solids is ***edge***. The edges of any 3-D object are the lines where the faces of the object join (or touch).

Study the cube below carefully. Find all of the edges in the cube. The dotted lines show the edges that are hidden from view.

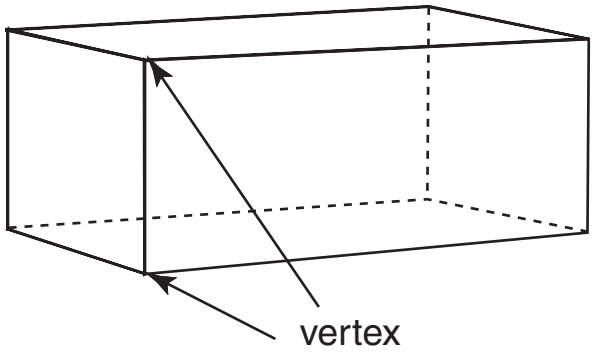


3. a. In this cube, how many edges would you actually be able to see? ____

   b. What is the total number of edges in this cube? _____

One more term used when describing solids is **vertex**. The vertex on a 3-D object is each "corner" of that object. The corner is wherever three or more edges connect. To refer to more than one vertex, we say **vertices**.

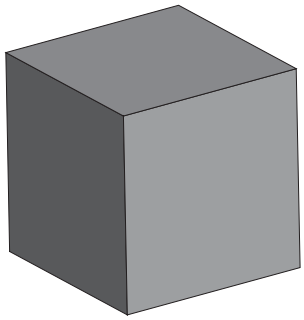
This 3-D solid is called a rectangular prism.



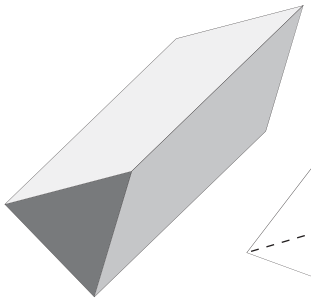
4. a. In this rectangular prism, how many vertices are visible to you? ____

   b. How many vertices does a rectangular prism have? _____

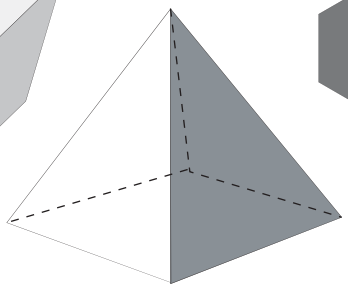
5. Study the solids below. Fill in the chart to show how many faces, edges, and vertices are in each solid.



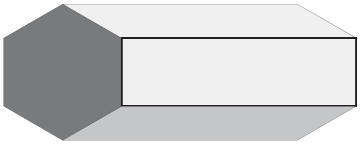
cube



triangular prism

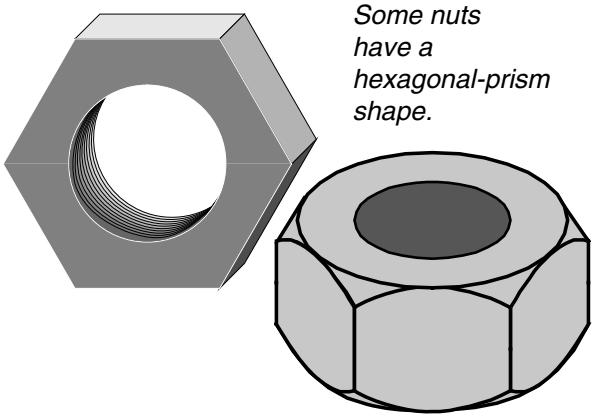


square-based pyramid



hexagonal prism

Object	Number of Vertices	Number of Edges	Number of Faces
Cube			
Triangular prism			
Square-based pyramid			
Hexagonal prism			



Some nuts have a hexagonal-prism shape.

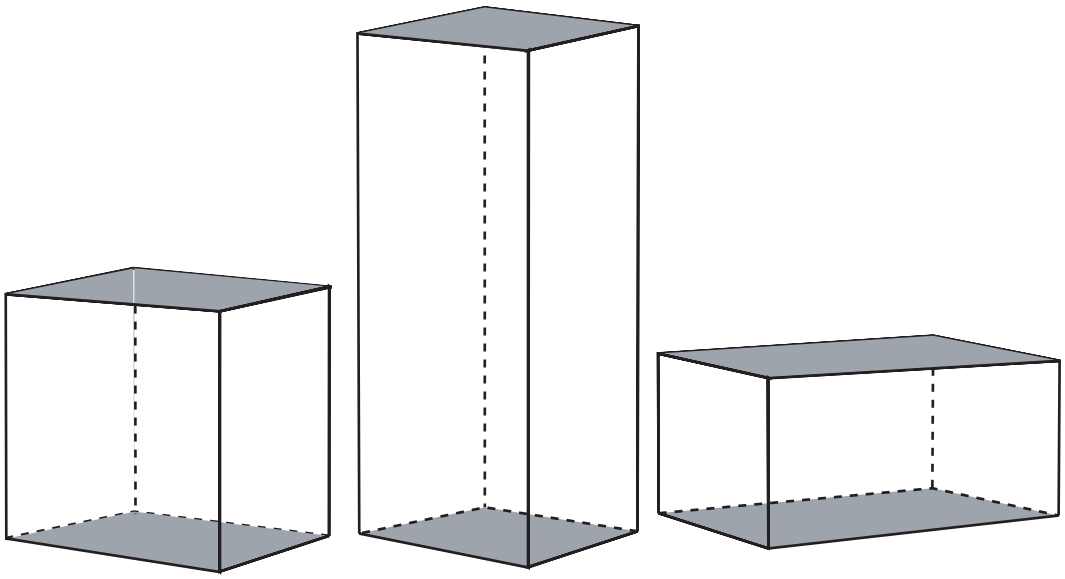
B. Prisms and Pyramids

In this section, you will learn about two kinds of solids: **prisms** and **pyramids**. Let's look at prisms first.

Prisms

Prism in geometry describes a solid that has at least two faces parallel to each other.

The most common kind of prism is the **rectangular prism**. Notice that rectangular prisms look like blocks or boxes.



1. a. What is the shape of each shaded face? _____

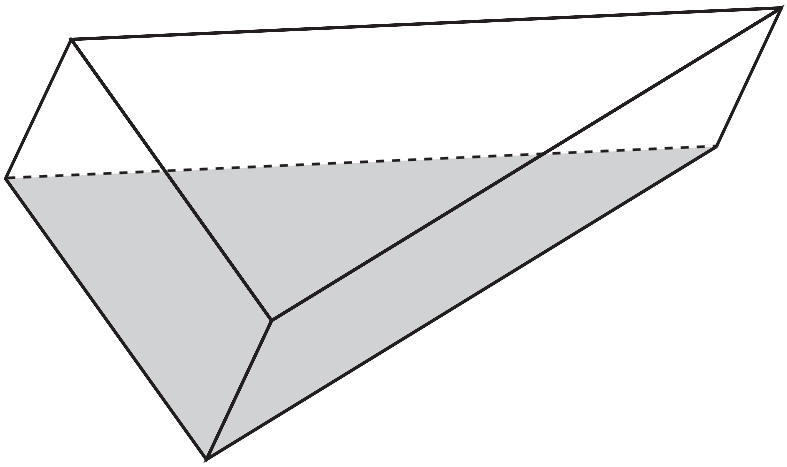
   b. Are the two shaded faces parallel to each other? _____

   c. How many rectangular faces are there? _____

Because there are at least two faces are parallel to each other, the solid can be called a prism. Because the parallel faces are rectangular, the prisms are called rectangular prisms.

Below are some other kinds of prisms. Each has at least two faces parallel to each other.

2.

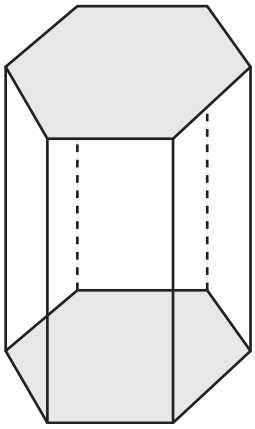


a. Are there two faces parallel to each other in this solid? _____

b. What is the shape of those parallel faces? _____

c. What is the name of this solid? _____

3.



a. Are the two shaded faces parallel to each other in this solid? _____

b. What is the shape of those parallel faces? _____

c. What is the name of this solid? _____

Pyramids

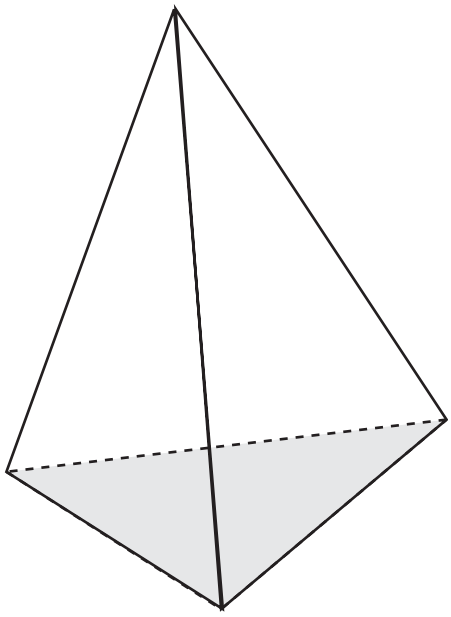
Pyramids are very famous structures. The ancient pyramids in Egypt are fantastically huge. It is still a mystery how they were built. They have four steep sides or faces. People consider them one of the Great Wonders of the World.

Pyramids are different from prisms. They do not have any parallel sides. Pyramids are named for the shape of their bases.

Because the pyramids in Egypt have square bases, they are called **square-based pyramids**.

There are many other kinds of pyramids as well. The name of a pyramid depends on the shape of its base.

4.

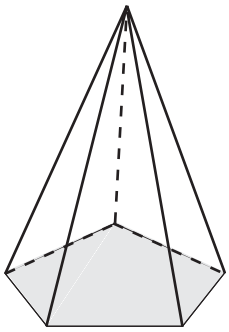


a. Are there two faces parallel to each other in the solid? _____

b. What is the shape of the base? _____

c. What is the name of this solid? _____

5. a. Are there two faces parallel to each other in the solid shown at the right? _____

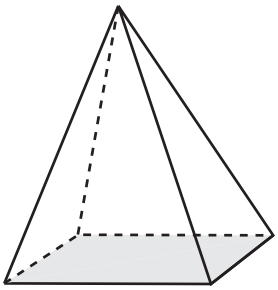


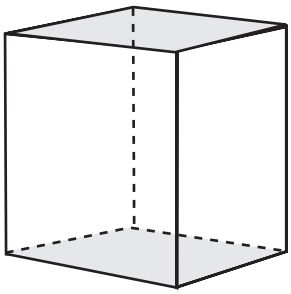
b. What is the shape of the base? _____

c. What is the name of this solid? _____

There is another way to compare prisms and pyramids. You can compare them by comparing how many faces, edges, and vertices each solid has. You can also look for any parallel faces, and you can look at the shape of the base.

6. Compare these two solids by completing the chart below them. If you have classroom models of the solids available, you may wish to use them.





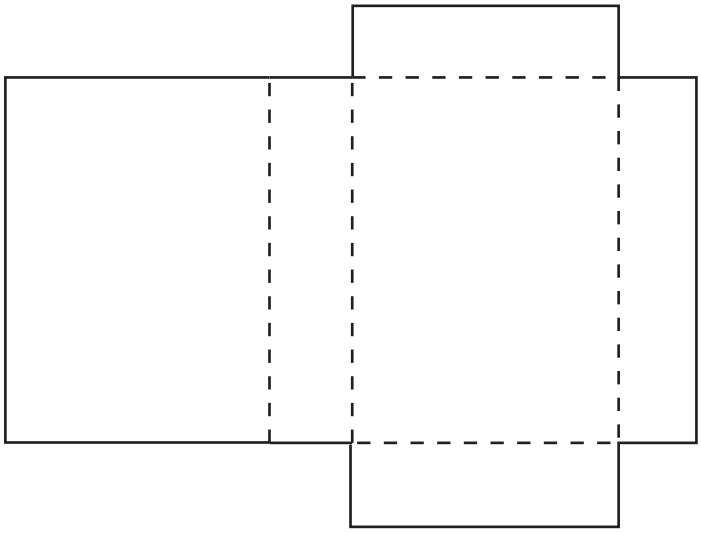
	Rectangular-based Pyramid	Rectangular Prism
Number of Faces		
Number of Edges		
Number of Vertices		
Shape of the Base		
Any Parallel Faces?		

C. Nets

A **net** is a pattern that can be used to make a solid shape. A net is like a plan or a blueprint used to build any kind of solid. It is a 2-D plan for a 3-D solid.

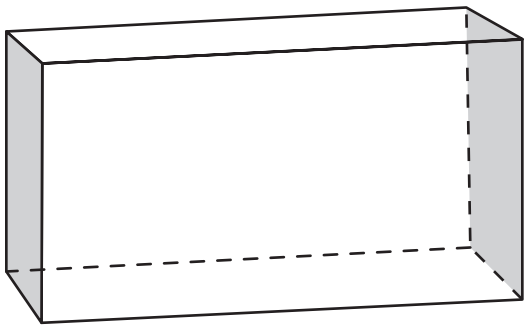
Look at this net. It has 6 faces. All of them are rectangles.

Net for a Rectangular Prism



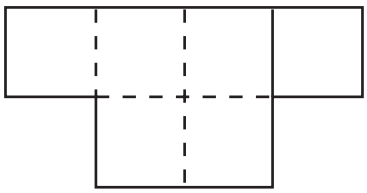
If you cut out this net and carefully fold it along the dotted lines, you would make a 3-D solid. The 3-D shape would be a rectangular prism.

Rectangular Prism

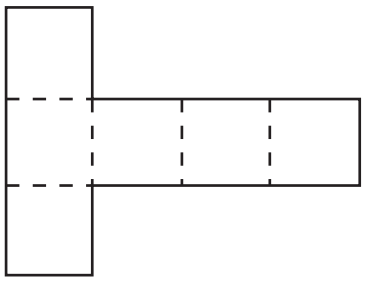


1. Look at the four nets below. Which of these nets could be put together to make a cube? Circle as many correct answers as you can find.

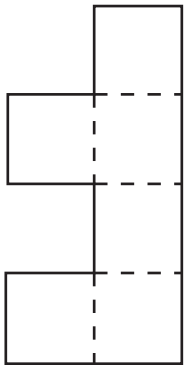
a.



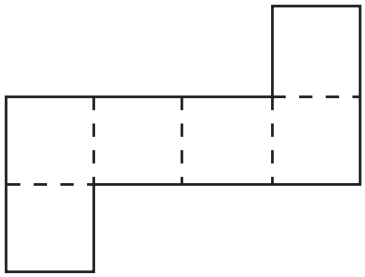
b.



c.

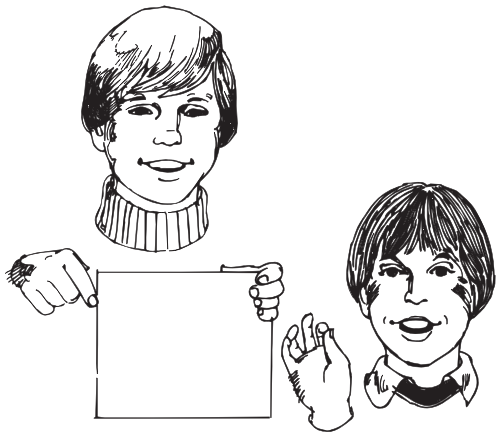


d.



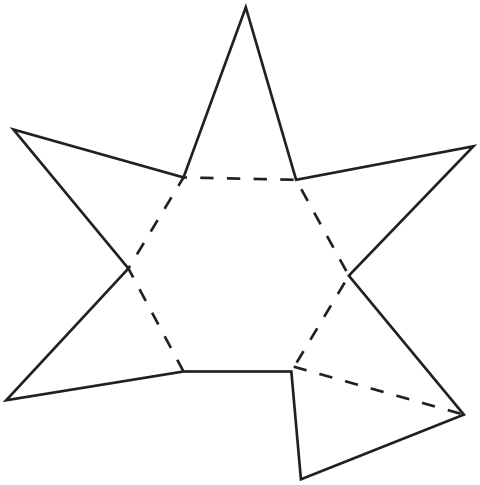
Did you notice that some of the nets in Question 1 cannot be made into a solid cube? Only two of the nets can be folded to form a cube.

Nets can be used for pyramids as well. The base of the net will show what kind of a pyramid the net will make.

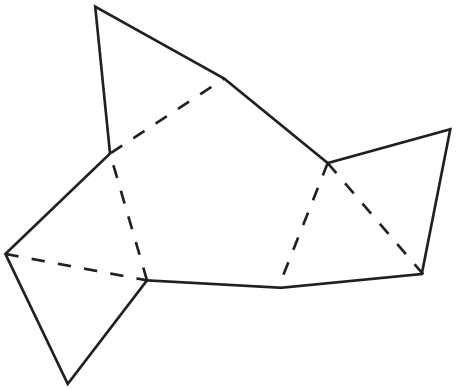


2. Carefully look at the nets below. Then write the name of the correct pyramid below each net. Choose from the following five names:

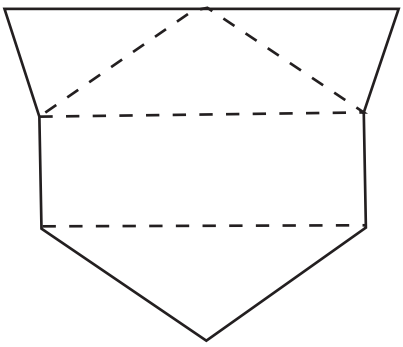
   - triangular-based pyramid
   - square-based pyramid
   - rectangular-based pyramid
   - pentagonal-based pyramid
   - hexagonal-based pyramid



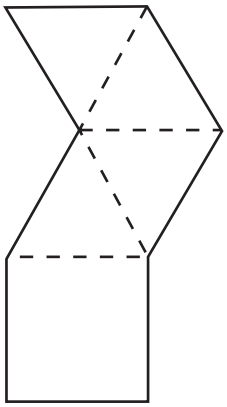
a. _____



b. _____



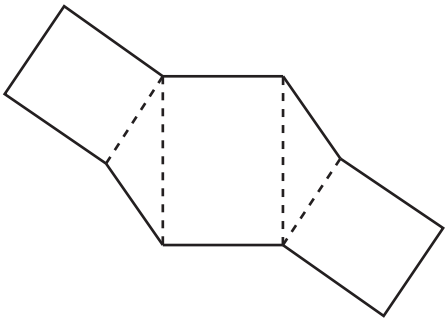
c. _____



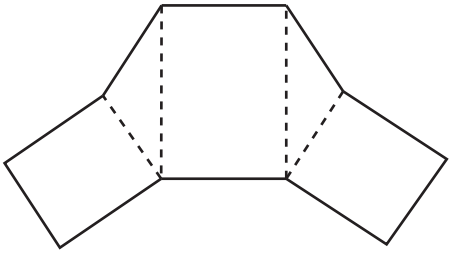
d. _____

3. Look at the two nets below. Circle the net that could be used to make a triangular prism.

a.



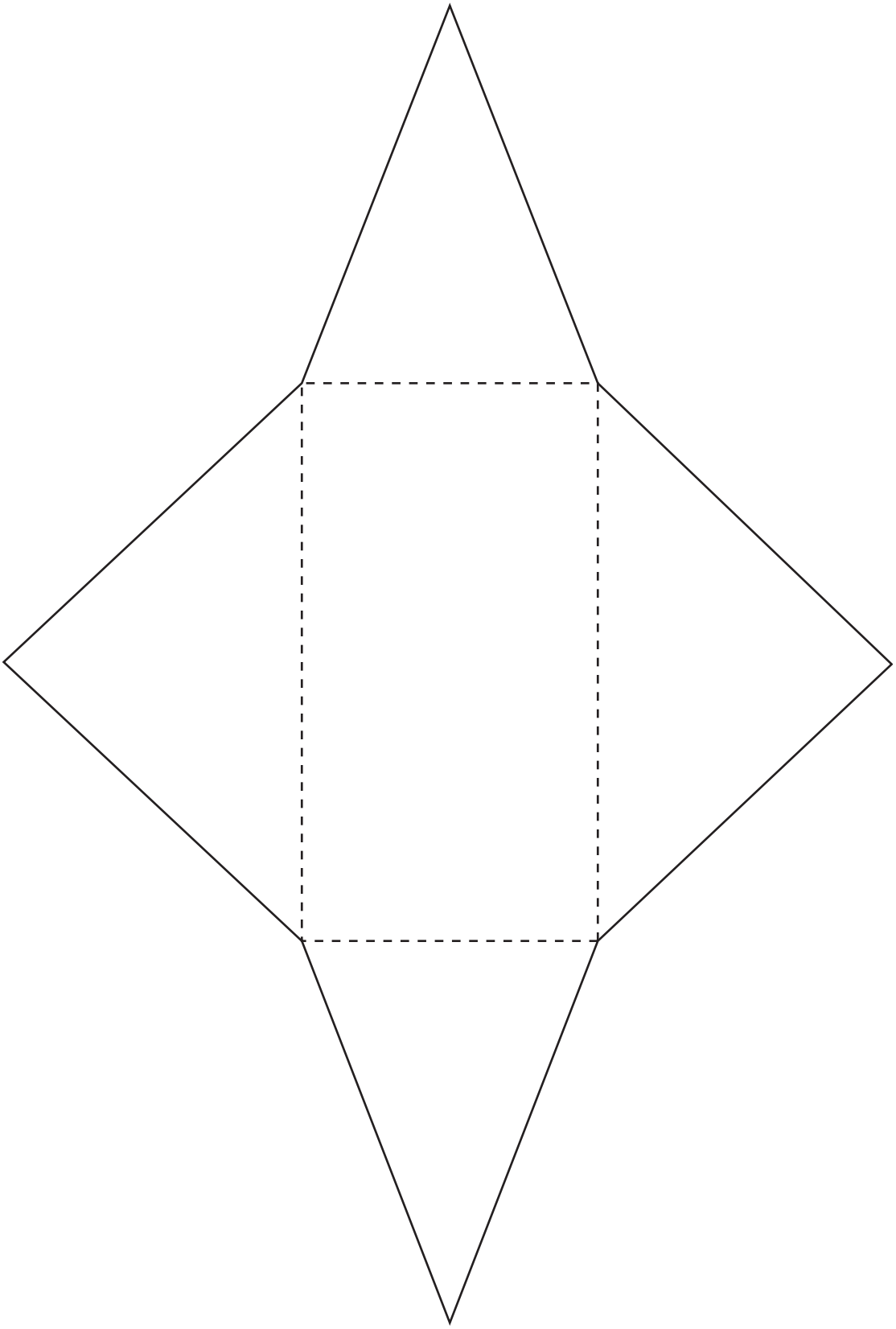
b.



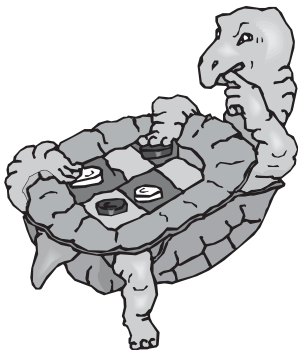
4. Carefully construct your own rectangular-based pyramid using the net on the next page.

   Cut out the net, and carefully fold along each dotted line. Tape it together to see if your net actually does make a rectangular-based pyramid.

Rectangular-Based Pyramid Net



D. Grids



A **grid** is a set of crossed lines. Chessboards and checkerboards all have grids of squares to play on. Maps often have grids. The lines of the grid help to locate places on the map. Many cities are built like grids with avenues and streets separating the blocks.

The horizontal lines on a grid form **rows**. The vertical lines on a grid form **columns**. All of the lines must be spaced evenly across the grid.

The following grid has five horizontal rows numbered from 1 to 5. There are ten vertical columns lettered A to J.

5						!				+
4		$					#		¢	
3				X	%					
2			=	*				□		
1	÷							◁		
	A	B	C	D	E	F	G	H	I	J

To locate an object on the grid, look for the square where the row and the column intersect.

For example, to find the * sign, look for the square where column **D** and row **2** intersect. The square with the star in it is called **D2**.

Always write the column letter first and the row number last. In other words, slide your finger OVER the letters at the bottom first. Then move UP to the correct row. OVER and UP!

***Remember**: On a grid, you always go **OVER** first, then **UP**.*

1. Use the *Over and Up* method to find the following objects on the grid.

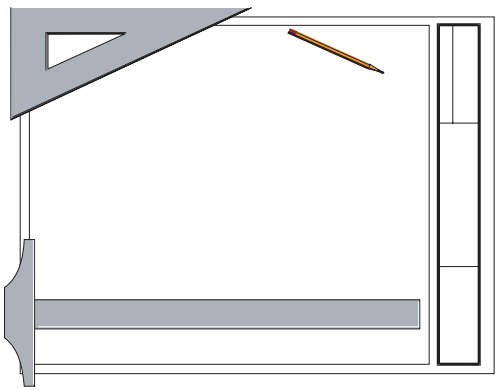
   a. The **$** sign is located at the intersection of Column _____ and Row _____.

   b. The % sign is located at the intersection of Column _____ and Row _____.

   c. What sign is located at J5? _____

   d. What sign is located at G4? _____

   e. The ◁ mark is located at the intersection of Column _____ and Row _____.



2. You already know that the **$** sign is at **B4**. Now name the location of the following signs. Use the information from question 1 to help you.

   a. the X sign _____ b. the ! sign _____

   c. the ÷ sign _____ d. the = sign _____

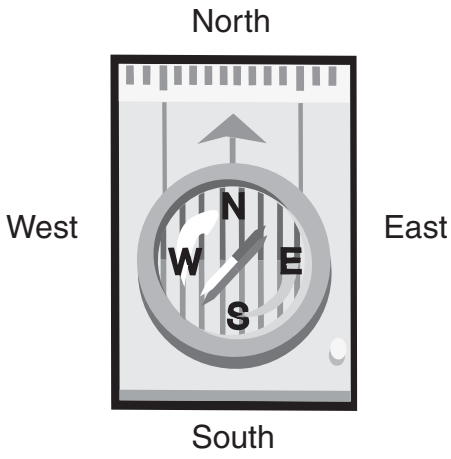
   e. the □ mark _____ f. the ¢ sign _____

Many towns and cities are like grids. They have blocks that are shaped like the squares or rectangles on a grid. They also have intersections.

In many cities, the avenues run east and west like the horizontal lines and rows. The streets run north and south like the vertical lines and columns on a grid.

Using Compass Directions

The compass points on a grid are the same as they are on a map. North is at the top, and South is at the bottom. East is to the right, and West is to the left.



3. Using the grid from Question 1, write directions for the routes that you are asked to take below. Write each of your directions in two different ways:

   - Use the words North, South, East, and West for one set of directions.
   - Use *up, down, left, and right* for the second set of directions.

Example: What route would you take to go from the ✱ to the $? Give the directions in two different ways.

Go left 2 blocks, then go up 2 blocks.
Go West 2 blocks, then go North 2 blocks.

a. What route would you take to go from the **$** to the **+** ? Give the directions in two different ways.

   i. _____

   ii. _____

b. What route would you take to go from the % to the ◁ ? Give the directions in two different ways.

i. _____

ii. _____

c. What route would you take to go from the # to the * ? Give the directions in two different ways.

i. _____

ii. _____

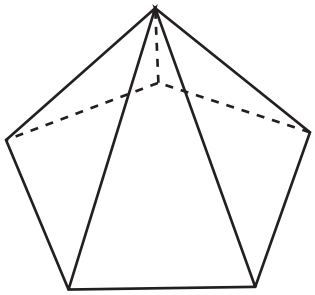
d. What route would you take to go from □ to the ! ? Give the directions in two different ways.

i. _____

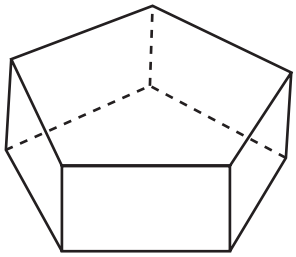
ii. _____

Homework

1. Compare these two solids by completing the chart below.



Pentagonal-Based Pyramid



Pentagonal Prism

	Pentagonal Pyramid	Pentagonal Prism
Number of Faces		
Number of Edges		
Number of Vertices		
Shape of the Base		
Any parallel faces?		

2. Use the net drawing on the next page to make a hexagonal prism. Cut around the outlines of the net, and then carefully fold the net along each dotted line. Crease each fold smoothly between your fingers. Then tape some of the edges together. Bring your completed prism to class tomorrow.

Hexagonal Prism Net