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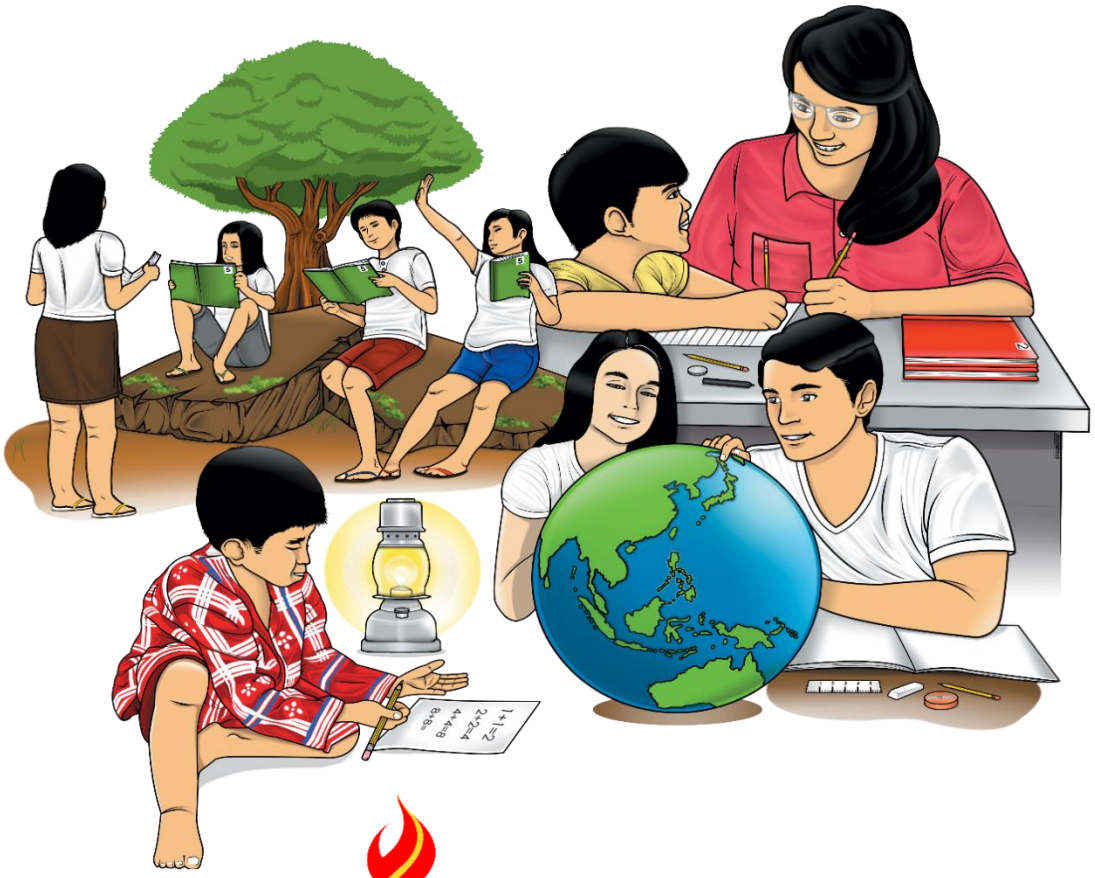
Mathematics

Quarter 3 – Module 7:
Surface Area of Solid/ Space Figures



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Mathematics

Quarter 3 – Module 7
Surface Area of Solid/Space Figures

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Introductory Message

This Self-Learning Module (SLM) is prepared so that you, our dear learners, can continue your studies and learn while at home. Activities, questions, directions, exercises, and discussions are carefully stated for you to understand each lesson.

Each SLM is composed of different parts. Each part shall guide you step-by-step as you discover and understand the lesson prepared for you.

Pre-tests are provided to measure your prior knowledge on lessons in each SLM. This will tell you if you need to proceed on completing this module or if you need to ask your facilitator or your teacher's assistance for better understanding of the lesson. At the end of each module, you need to answer the post-test to self-check your learning. Answer keys are provided for each activity and test. We trust that you will be honest in using these.

In addition to the material in the main text, Notes to the Teacher are also provided to our facilitators and parents for strategies and reminders on how they can best help you on your home-based learning.

Please use this module with care. Do not put unnecessary marks on any part of this SLM. Use a separate sheet of paper in answering the exercises and tests. And read the instructions carefully before performing each task.

If you have any questions in using this SLM or any difficulty in answering the tasks in this module, do not hesitate to consult your teacher or facilitator.

Thank you.

What I Need to Know

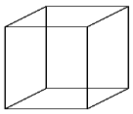
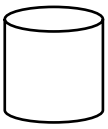
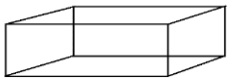
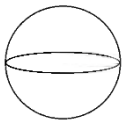
This module was designed and written with you in mind. It is here to help you master the skills in visualizing and describing surface area and naming the unit of measure used for measuring the surface area of solid/space figures.

The scope of this module allows you to use it in many different learning situations. The language used recognizes your diverse vocabulary level. The lessons are arranged to follow the standard sequence of your course. But the order in which you read them can be changed to match with the textbook you are now using.

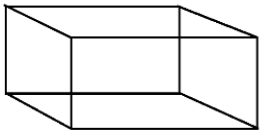
After going through this module, you are expected to visualize and describe surface area and names the unit of measure used for measuring the surface area of solid/space figures. (M6ME-IIIi-91)

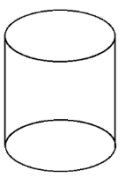
What I Know

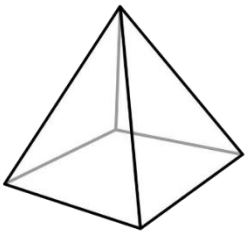
A. Match column A with column B. Write your answers on your answer sheet.

Column A		Column B
1.)		a. sphere
2.)		b. rectangular prism
3.)		c. cube
4.)		d. cylinder
5.)		e. cone
		f. pyramid

B. Write the number of surfaces that make up each of the following figures. Write your answers on your answer sheet.

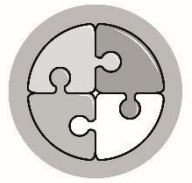
6. 

7. 

8. 

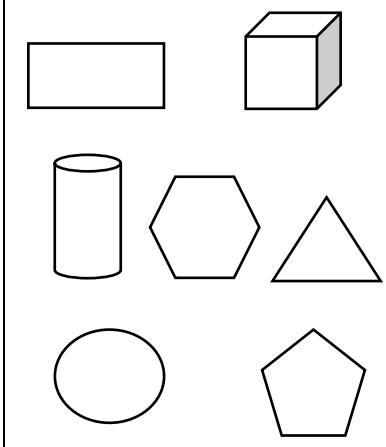
Lesson 1 Surface Area of Solid/ Space Figures

In the previous lessons you have learned the area of composite figures. This time, we will focus on how to visualize or describe the surface area and name of the unit of measure used for measuring the surface area of solid/space figures.



What's In

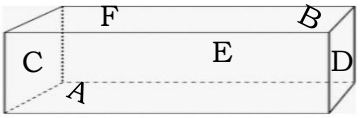
Examine the given in the following table. Classify the figures into their corresponding columns. Write your answers on your answer sheet.

Given Figures	Two-Dimensional Figures	Three- Dimensional Figures
		

What's New

Study the problem below. Answer the questions that follow. Explain your answers to a family member.

What kind of solid figure is this?



What is the shape of the bottom part of box? Is it the same with the shape of the top part?

A	B
BOTTOM	TOP

What is the shape of the right side of the box? Does it have the same shape with the one on the left side?

C	D
Left	Right

Do the back and front sides of the box have the same shape?

E	F
FRONT	BACK

How many faces does the box have?

How many edges and vertices does the box have?

What is It

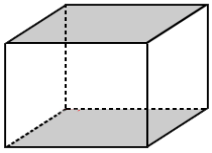
Surface Area (S.A.) is the sum of the areas of the base(s) and the lateral faces of a solid figure. Surface area is measured in square units such as cm^2, ft^2, m^2 and other units. One way to find the surface area of a solid figure is to find the area of its nets.

A. Surface Area of Prism

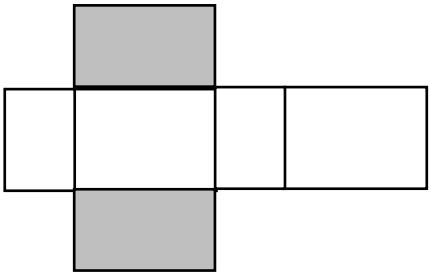
A prism is a polyhedron that has two congruent parallel faces called bases. There are many kinds of prism. A prism is named according to the shape of its base.

- Rectangular prism

Rectangular Prism



Net of Rectangular Prism

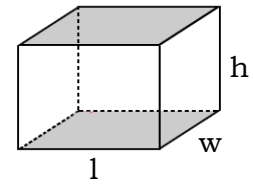


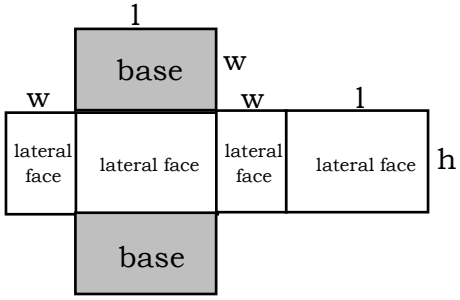
There are six surfaces in a rectangular prism. It is composed of two rectangular bases and four rectangular lateral faces. Rectangular prism has 8 vertices and 12 edges.

The surface area of rectangular prism is the total area of the top, bottom, front, back, left side and right side of rectangles.

Another way to find the surface area of the rectangular prism is to use the lateral area and base areas. Lateral (L.A.) of a prism is the sum of the areas of lateral faces. It is important to find the lateral area of prism first. Lateral faces are the faces in a prism that are not bases.

Rectangular Prism





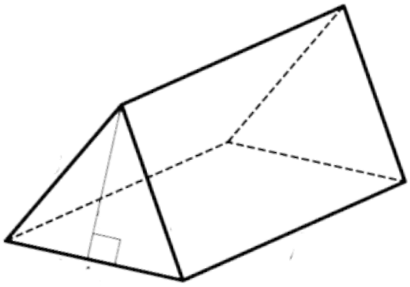
The surface area of rectangular prism is the sum of the lateral area and the area of the two bases. S.A. = 2B + L.A. or S.A. = 2lw + 2lh + 2wh

S.A. = 2lw + 2lh + 2wh

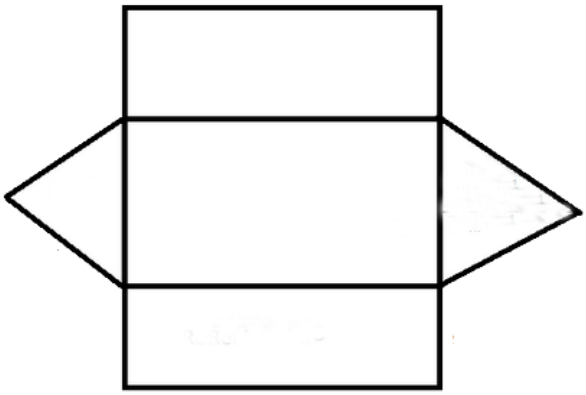
Areas of bases | Areas of lateral faces

- Triangular Prism

Triangular Prism



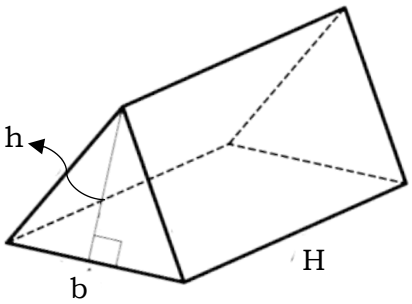
Net of Triangular Prism

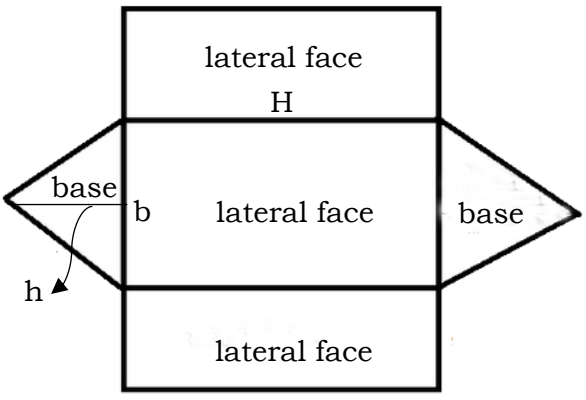


A triangular prism has five faces. These five faces are composed of two triangular bases and three rectangular lateral faces. It has also 6 vertices and 9 edges.

In the triangular prism shown above, the front triangle face is connected to the rear triangle face by the three rectangle faces. The triangle faces are considered the bases, and the rectangle faces are considered lateral faces.

Triangular Prism

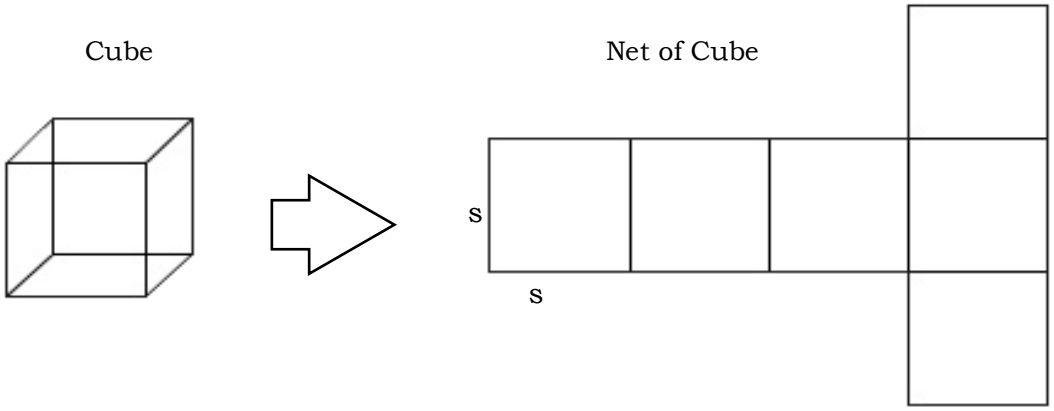




In finding the surface area of the triangular prism, find its Lateral Area (L.A.) first. The lateral area of the triangular prism is the product of the perimeter (p) of the base and height (h). *(L.A. = ph)*

Surface Area (S.A.) of triangular prism is equal to the sum of its Lateral Area (L.A.) and area of 2 bases. *(S.A. = L.A. + 2B)*

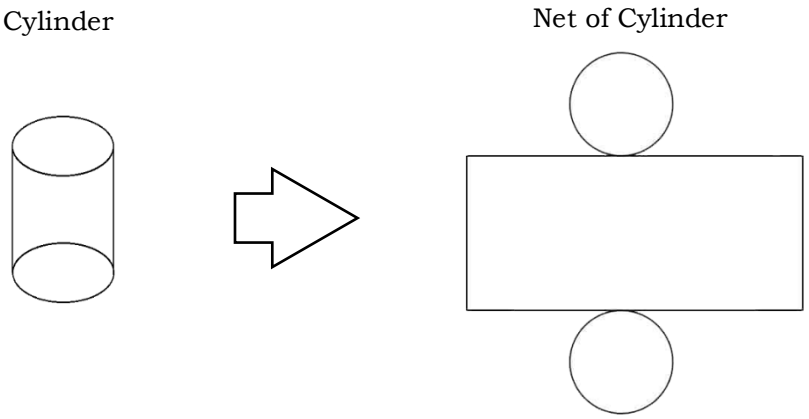
- Cube



A cube is square prism. There are six surfaces of a cube. The bases and the faces have equal sizes. Cube has 8 edges and 12 edges.

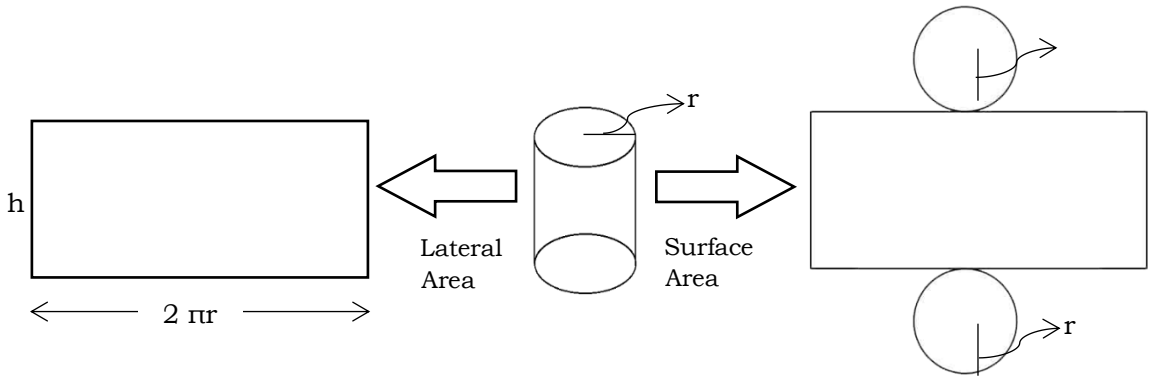
To get the Surface Area (S.A.) of a cube, the six faces is multiplied to the square of the length or side (s). *(S.A. = $6s^2$)*

B. Surface Area of Cylinder



A cylinder has three surfaces: the two bases and one curved surface or lateral surface. It has no vertex and edge. The bases form circles. The curved or lateral surface forms rectangle. The height (or width) of the rectangle is the height of the cylinder. The base length of the rectangle is the circumference of the cylinder.

r

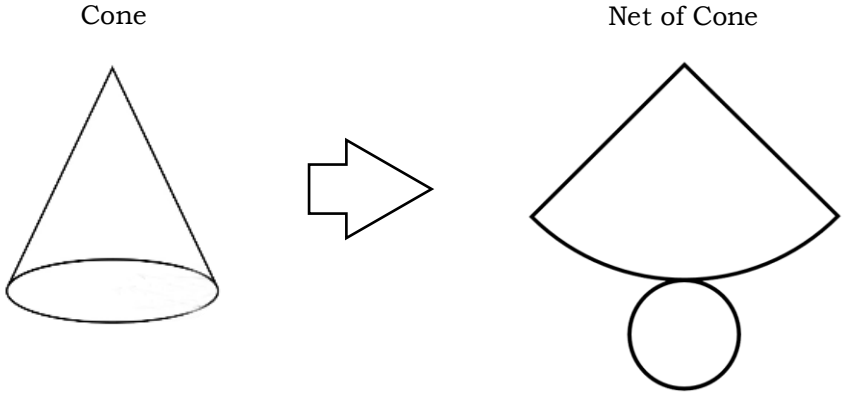


L.A. = 2πrh Area of a base (B) = πr² S.A. = L.A. + 2B

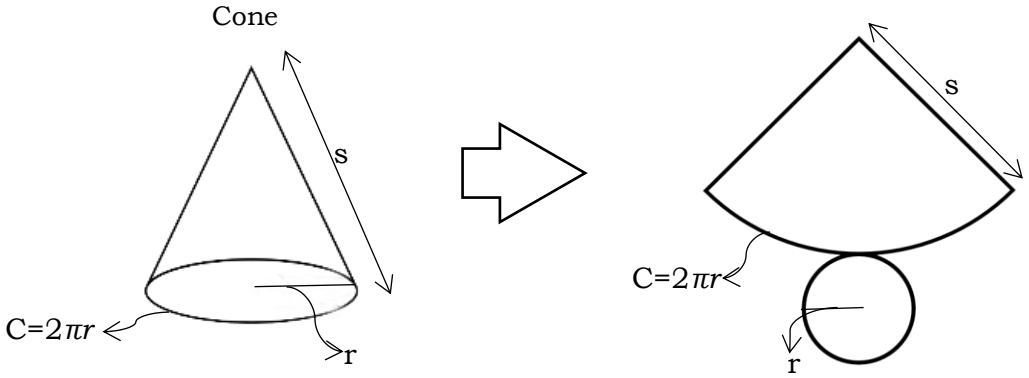
The lateral area of a cylinder is the product of the circumference of the base and the height of the cylinder. *(L.A. 2πrh)*

The surface area of a cylinder is the sum of the lateral area and the areas of the two bases. *(S.A. = L.A. + 2B) or (S.A. = 2πr² + 2πrh)*

C. Area of a Cone

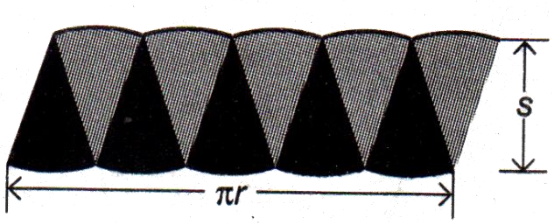


A cone has one circular base and a curved surface with apex or vertex. It has no edge. The area of the circuar base and the area of the curved surface determine the surface area of a cone.



The surface area of a cone is the sum of the lateral area (L.A.) and the area of its base (B). *(S.A. = L.A. + B)*

To find the lateral area (L.A.), imagine cutting the lateral surface into wedges and arranging the wedges to form a figure like a parallelogram.

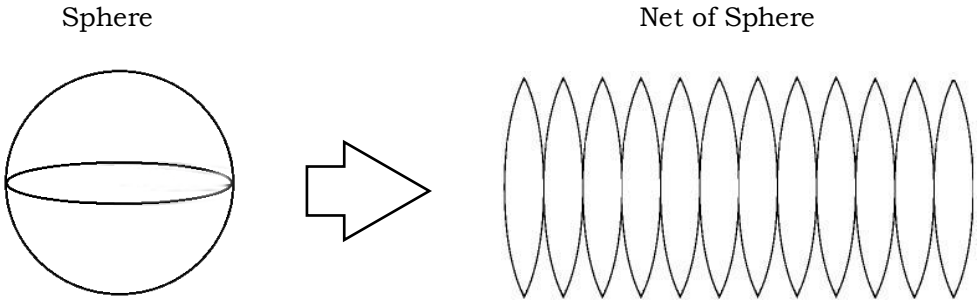


The base of the new figure is πr and the height is the slant height of the curved surface. So, L.A. = πrs

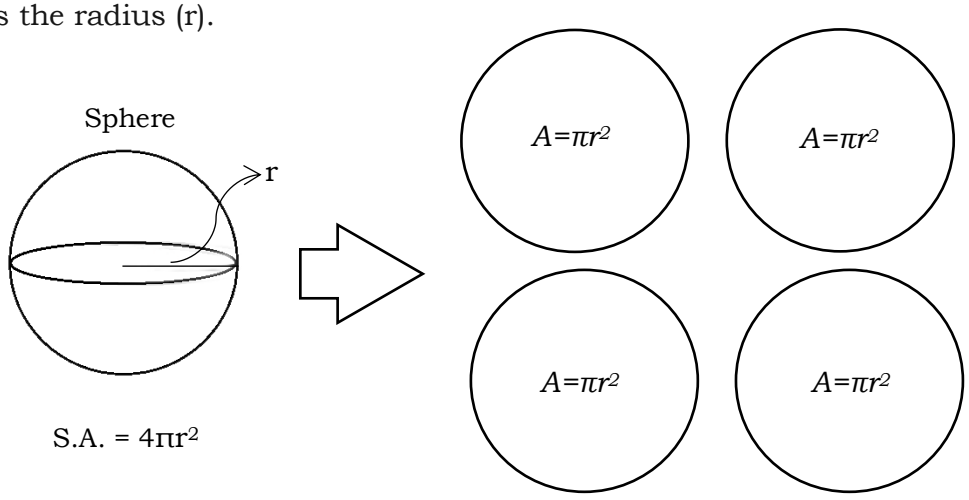
.

Thus, the surface area of cone is S.A. = L.A. + B or S.A. = πrs + πr²

D. Surface Area of Sphere



A sphere is perfectly round and symmetrical solid figure. It has no edges and vertices. It is a curved surface of points that are all of the same distance from the center. Like a circle, the distance from the center of a sphere to the surface is known as the radius (r).

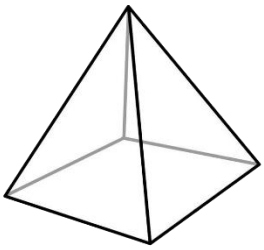


The area of the circle that contains the center of the sphere is πr^2. It would take exactly 4 of these circles to wrap the sphere completely.

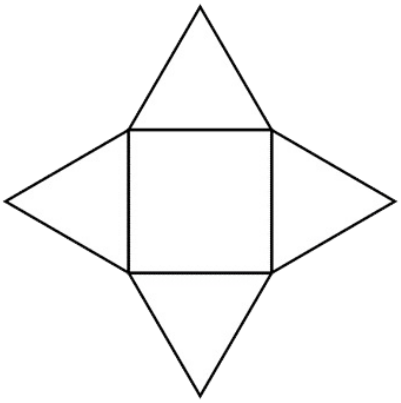
The surface area of a sphere with radius (r) is S.A. = $4\pi r^2$.

E. Pyramid

Pyramid

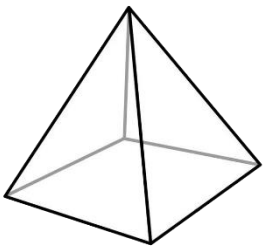


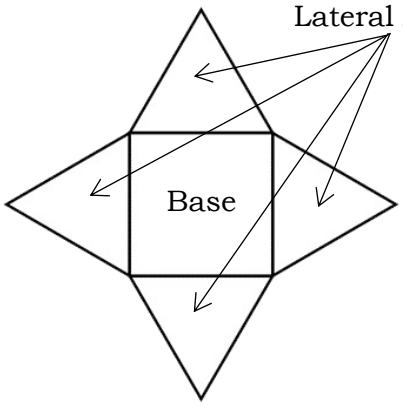
Net of Pyramid



Pyramids are named according to the shape of its base. Examples of pyramids include square pyramid, rectangular pyramid and triangular pyramid. The surface area of any pyramid is the sum of the areas of all the faces, including the base. We can use the net to find a general formula that will help us find the surface area of any pyramid.

Pyramid

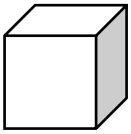




The surface area of any pyramid is the sum of the lateral area and the area of the base. *(S.A. = L.A. + B)*

What's More

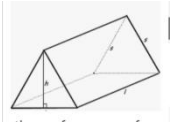
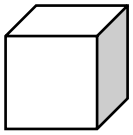
Complete the data in the table below. Example is given for your reference. Write your answers on your answer sheet.

Solid Figures	**Illustration**	**Description**	**No. of faces**	**No. of edges**	**No. of vertices**
Example: cube		Each face is a square	6	12	8
1. Rectangular prism					
2. Triangular prism					
3. Cube					
4. Cylinder					

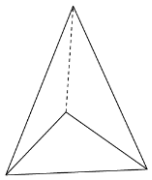
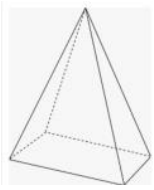
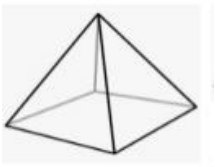
What I Have Learned

Surface Area (S.A.) is the sum of the areas of the base(s) and the lateral faces of a solid figure.

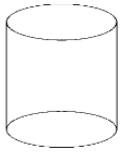
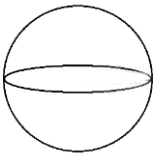
A **Prism** is a polyhedron that has two congruent parallel faces called bases. There are many different kinds of prism. A prism is named according to the shape of its base.

Name	**Shape of the base**	**Description**	**Surface Area**	**Example**
Triangular prism	Triangle	Composed of two triangular bases and three rectangular lateral faces.	$S.A. = L.A. + 2B$	
Rectangular prism	Rectangle	Composed of two rectangular bases and four rectangular lateral faces.	$S.A. = 2B + L.A.$ *or* $S.A. = 2lw + 2lh + 2wh$	
Cube	Square	A cube is a prism with a square base. All its faces are square.	$S.A. = 6s^2$	

A **Pyramid** is a polyhedron whose base is a polygon and the lateral faces are parallelograms. Pyramids are named according to the shape of its base.

Name	Shape of the Base	Surface Area	Example
Triangular pyramid	Triangle	$S.A. = L.A. + B$	
Rectangular pyramid	Rectangle	$S.A. = L.A. + B$	
Square pyramid	Square	$S.A. = L.A. + B$	

Other solid figures have curved surfaces.

Name	Definition	Surface Area	Example
Cylinder	Has two circular bases that are congruent and parallel.	S.A. = L.A. + 2B or S.A. = $2\pi r^2 + 2\pi rh$	
Cone	Has one circular base.	S.A. = L.A. + B or S.A. = $\pi rs + \pi r^2$	
Sphere	Is a curved surface of points that are all of the same distance from the center.	S.A. = $4\pi r^2$	

What I Can Do

Identify the solid figure describe below. Write your answer in your answer sheet.

SOLID FIGURES

1. _____
It is a prism with a square base. All its faces are square.

2. _____
It has one circular base.

3. _____
It is a polyhedron whose base is a polygon and the lateral faces are parallelograms.

4. _____
It is a curved surface of points that are all of the same distance from the center.

5. _____
It has two circular bases that are congruent and parallel.

6. _____
It has triangle base with 3 lateral faces

Assessment

A. Match Colum A with Column B. Write the letter of your answer in your answer sheet.

A	B
1. The base is a polygon and its faces are triangles.	a. rectangular prism
2. It is composed of two rectangular bases and four rectangular lateral faces	b. cone
3. A spatial figure having a circular base and one vertex.	c. pyramid
4. A spatial figure which is perfectly round and symmetrical solid figures with no edge and vertex.	d. cylinder
	e. triangular prism
5. A spatial figure with 2 circular bases, no edge and no vertex.	f. sphere

B. Write T if the statement is true and F if it is false. Write your answer on your answer sheet.

6. All the faces of a cube are squares.

7. A prism is a polyhedron with no congruent bases.

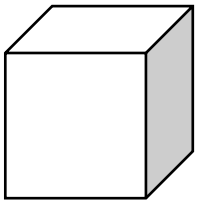
8. A pyramid has no vertex.

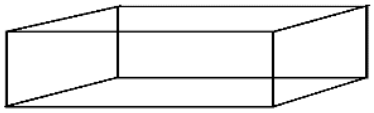
9. Solids have no flat surface.

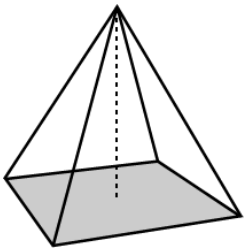
10. A cylinder is a two-dimensional solid figure with two congruent circular base that are parallel.

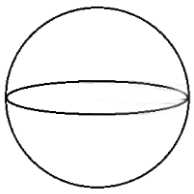
Additional Activities

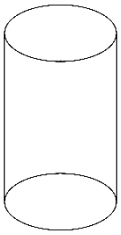
Name the following figures and write the correct formula on finding their surface area. Write your answer in your answer sheet.

1.) 

2.) 

3.) 

4.) 

5.) 

Answer Key

What I Know

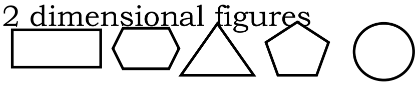
1. c
2. d
3. e
4. b
5. a
6. 6
7. 3
8. 5

What I Can Do

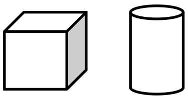
1. Cube
2. Cone
3. Pyramid
4. Sphere
5. Cylinder
6. Triangular Prism

What's In

2 dimensional figures



3 dimensional figures



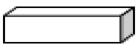
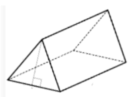
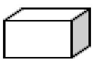
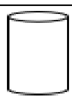
Additional Activities

1. Cube S.A. = $6s^2$
2. Rectangular Prism
   S.A. = 2B + L.A. or
   S.A. = 2lw + 2lh + 2wh
3. Pyramid S.A. = L.A. + B
4. Sphere S.A. = $4\pi r^2$
5. Cylinder
   S.A. = L.A. + 2B or
   S.A. = $2\pi r^2 + 2\pi rh$

Assessment

A.	B.
1. c	6. T
2. a	7. F
3. b	8. F
4. f	9. F
5. d	10. T

What's more

Solid Figures	illustration	description	No. of faces	No. of edge	No. of vertices	No. of sides on each faces
1. Rectangular prism		Composed of two rectangular bases and four rectangular lateral faces.	6	12	8	4
2. Triangular Prism		Composed of two triangular bases and three rectangular	5	9	6	5
3. cube		A cube is a prism with a square base. All its faces are square.	6	12	8	4
4. cylinder		Has two circular bases that are congruent and parallel	2	2	0	3

References:

A. Book

1. M Caingat, *Enjoying Mathematics 6* (Philippines, Jedigar Enterprises, 2005).

2. M Perez et. al., *21st Century MATHletes 6* (Philippines, Vibal Group Inc., 2016).

3. *Most Essential Learning Competencies in Mathematics 6* (Philippines, Department of Education, 2021).

4. *Lesson Guide in Elementary Mathematics for Grade 6* (Philippines, Department of Education, 2010).

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