JANUARY
Makugihon

FEBRUARY
Mahigugmaon

MARCH
Matinabangon

APRIL
Matinahuron

MAY
Mahapsay og Malinyo

JUNE
Maabtik og Masunod sa Hustong Oras

JULY
Maantigo og Maabilidad

AUGUST
Maginhunahunaon para sa Uban

SEPTEMBER
Madaginoton

OCTOBER
Matinud-anon

NOVEMBER
Masaligan

DECEMBER
Maalampuon

Republic of the Philippines
Department of Education
Regional Office IX, Zamboanga Peninsula

6

Zest for Progress
Zeal of Partnership

MATHEMATICS

4th QUARTER – Module 2:
VOLUME OF SOLID FIGURES

Name of Learner: ____________________________

Grade & Section: ____________________________

Name of School: ____________________________

Mathematics – Grade 6
Alternative Delivery Mode
Quarter 4 - Module 2: Volume of Solid 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 of lessons in each SLM. This will tell you if you can proceed on completing this module or if you need to ask your facilitator or your teacher's assistance for a 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 with 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. Read the instructions carefully before performing each task.

If you have any questions 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 written to find and solve the volume of solid figures lesson of the fourth quarter of grade 6 Mathematics. The module follows a step–by–step approach to find and solve the word problem, follow the different solid figures' formula, and examples and exercises support it. It covers the key concepts of finding and solving routine and non-routine problems involving volume of solid figures.

This module was designed to cater to diverse learners' academic needs to achieve and improve the twin goals of mathematics in basic education levels, which are critical thinking and problem-solving. The language used recognizes the vocabulary level of grade 6 pupils/learners. The lessons followed developmentally sequenced teaching and learning processes to meet the curriculum requirement.

After going through the module, you are expected to:

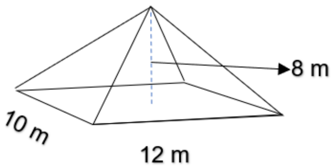
- find the volume of cylinders, pyramids, cones, and spheres. (M6ME-IVb-97); and
- solve routine and non-routine problems involving volumes of solids. (M6ME-IVc-98).

Believe that learning can continue amidst the health crisis. Good luck, stay safe, and God bless.

What I Know

Directions: Read and understand each question. Choose the letter of the best answer and write on your answer sheet.

1. Find the volume of the pyramid in the picture below in a cubic meter.



   A. 960 m^3
   B. 320 m^3
   C. 120 m^3
   D. 96 m^3

2. A cylindrical can of Evaporated Milk has a diameter of 4 inches and a height of 6 inches. What is the volume of the can?
   A. 301.44 in^3 B. 145.2 in^3 C. 75.36 in^3 D. 50.24 in^3
3. A clay model of a volcano is in the shape of a cone. The model has a circular base with a diameter of 36 centimeters and a height of 6 centimeters. Find the volume of the model volcano. $Use\ 3.14\ for\ \pi$.
   A. 678.24 cm^3 B. 2 034.72 cm^3 C. 4 069.44 cm^3 D. 6 104.16 cm^3
4. Which unit would NOT be appropriate for volume?
   A. cm^3 B. cubic feet C. square miles D. cubed
5. There are 30 balls in a box. Each ball has the same size. If one ball has a diameter of 25 cm, what is the volume of each ball?
   A. 8 177.08 cm^3 B. 1 953.12 cm^3 C. 6 132.81 cm^3 D. 24 531.25 cm^3

What's In

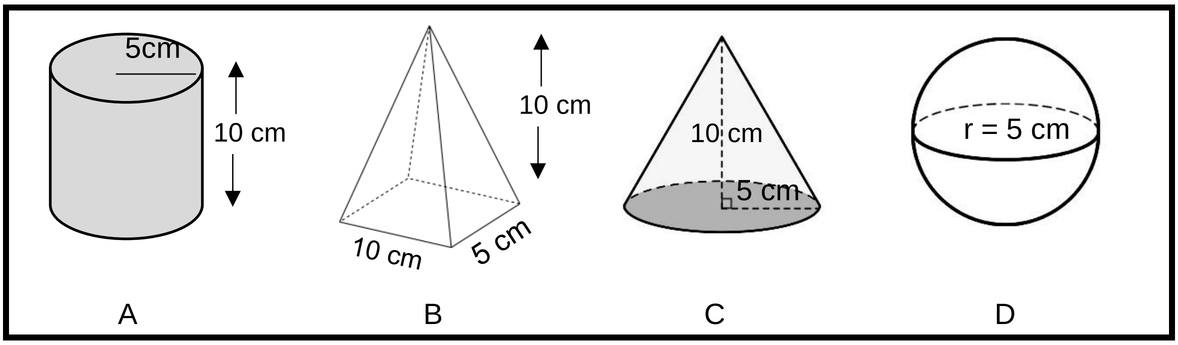
ACTIVITY MATCHING TYPE

Directions: Write True on the blank if the statement is correct and False if the statement is incorrect.

1. Circle is the shape of the horizontal cross-section of a sphere.
2. The formula in finding the volume of Rectangular Prism is V = $\frac{1}{3}$ (s x s x s).
3. Volume is the number of cubic units needed to fill the space occupied by a solid.
4. A cylindrical container has a diameter of 5 inches and a height of 25 inches. The equation used to find the volume of the container is $V = \pi(2.5)^2\ (25)$.
5. $V = \frac{4}{3}\pi r^3$ is the formula for finding the volume of a pyramid.

What's New

Directions: Based on the figures below, which container occupies the greatest amount of space? Why?



What is It

A FINDING THE VOLUME OF SOLID FIGURES

The volume of a solid figure is the amount of space inside it. Volume is measured in cubic units, which means it tells you how many cubes of a given size it takes to fill the solid figure.

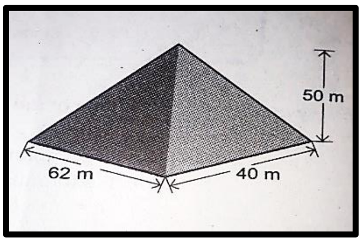
The volume of solid figures consists of different formulas:

NAME OF FIGURES	FORMULA
Rectangular Pyramid	$V = \frac{1}{3}\,(\,l\;x\;w\;x\;h)$
Cone	$V = \frac{1}{3}\,(\pi r^2 h)$
Cylinder	$V = \pi r^2 h$
Sphere	$V = \frac{4}{3}\,\pi r^3$

EXAMPLES:

EXAMPLE 1:
<u>RECTANGULAR PYRAMID</u>

A rectangular pyramid, which has a height of 50m, a width of 40m and a length of 62m. What is the volume of a rectangular pyramid?



SOLUTION:

$V = \frac{1}{3}\,(l \times w \times h)$

$V = \frac{1}{3} \times 62m \times 40m \times 50m$

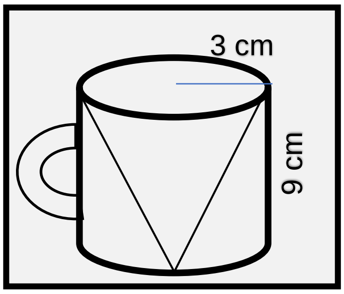
$V = \frac{1}{3} \times 124\,000$

$\boldsymbol{V = 41\,333.33m^3}$

EXAMPLE 2: <u>CONE AND CYLINDER</u>

Samira puts a cone inside the cylindrical mug, which has a height of (9cm) and a radius of 3cm.

a. What is the volume of a cone?
b. What is the volume of a cylinder?



SOLUTION 1: Volume of the Cone

$V = \frac{1}{3} \times (\pi r^2 h)$

$V = \frac{1}{3} \times (3.14 \times 3cm \times 3cm \times 9cm)$

$V = \frac{1}{3} \times (254.34cm^3)$

$\boldsymbol{V = 84.78\ cm^3}$

SOLUTION 2: Volume of the Cylinder

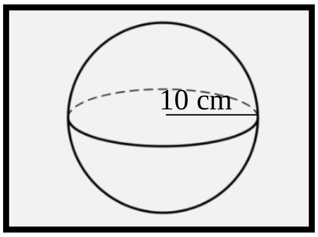
$V = \pi r^2 h$

$V = 3.14 \times 3cm \times 3cm \times 9cm$

$\boldsymbol{V = 254.34\ cm^3}$

EXAMPLE 3: SPHERE

Find the volume of a sphere which has a radius of 10cm.



SOLUTION:

$V = \frac{4}{3} \pi r^3$

$V = \frac{4}{3} \times (3.14 \times 10cm \times 10cm \times 10cm)$

$V = \frac{4}{3} \times (3140cm^3)$

$\boldsymbol{V = 4\,186.67cm^3}$

B PROBLEM SOLVING INVOLVING

In solving word problems involving volume of solid figures, we need to follow the following steps:

Understand → Plan → Solve → Check

1. **UNDERSTAND THE PROBLEM**. Read and understand the problem in order to know the following:
   - **What is asked in the problem?**
   - **What are the given facts in the problem?**
2. **MAKE A PLAN**. Use strategies to find solution to the problem. Determine the following:
   - **What operation or operations to use in the problem?**
   - **What is the number sentence?**
3. **SOLVE.** Solve for the answer. Don't forget to label your answer.
4. **CHECK.** To check your answer, you may use other strategies or go back and check if your solution is correct. Check also if your answer is reasonable.

EXAMPLE 1

James and Dave pitched a tent that had a shape of a pyramid. The rectangular base is a rectangle that is 3.5 meters wide, 3.8 meters long, and 3 meters high. What is the volume of the tent?

FOUR – STEP PLAN	ILLUSTRATIVE EXAMPLE
UNDERSTAND	
• Know what is asked	What is the volume of the tent?
• Know what are the given facts	The length of the rectangular base is 3.8m, the width of the rectangular base is 3.5 m and the height of the tent is 3 m
PLAN	
• Which formula(s) shall we use to solve the problem?	The tent is a rectangular pyramid. Let us use the formula below to find the volume of the tent. $V = \frac{1}{3} \times (l \times w \times h)$
SOLVE	
• Show how the solution is done	$\boldsymbol{V = \frac{1}{3} \times (l \times w \times h)}$ $V = \frac{1}{3} \times (3.8m \times 3.5m \times 3m)$ $V = \frac{1}{3} \times 39.9m^3$ $V = 13.3\ m^3$
• Answer	The volume of the tent is $13.3m^3$
CHECK AND LOOK BACK	
• Verify using check and balance	$\boldsymbol{V = \frac{1}{3} \times (l \times w \times h)}$ $V = \frac{(\boldsymbol{l \times w \times h})}{\boldsymbol{3}}$ $V = \frac{3.8m \times 3.5m \times 3m}{3}$ $V = 13.3m^3$. Therefore, the answer is reasonable.

EXAMPLE 2

Nena is experimenting on the volumes of a cylinder and a cone. The cylindrical container has a base radius of 5 dm and a height of 12 dm while the conical container has a base radius of 5dm and a height of 6 dm. If the cylindrical container is to be filled with water using the conical container, about how many times the conical container must be filles with water to fill the cylindrical container?

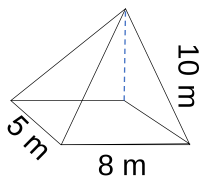
FOUR – STEP PLAN	ILLUSTRATIVE EXAMPLE
UNDERSTAND	
• Know what is asked	How many times the container must be filled with water to fill the cylindrical container?
• Know what are the given facts	Cylindrical container: r= 5 dm, h= 12 dm Conical container: r= 5 dm, h= 6 dm
PLAN	
• Which formula(s) shall we use to solve the problem?	$\boldsymbol{V_{cylinder} = \pi r^2 h}$ $\boldsymbol{V_{cylinder} = \frac{1}{3}\pi r^2 h}$
SOLVE	
• Show how the solution is done	$V_{cylinder} = \pi r^2 h$ $= 3.14 \times 5\text{ dm} \times 5\text{d m} \times 12\text{ dm}$ $= 942\text{ dm}^3$ $V_{cone} = \frac{1}{3}\pi r^2 h$ $= \frac{1}{3} \times (3.14 \times 5\text{dm} \times 5\text{dm} \times 6\text{dm})$ $= 157\text{ dm}^3$ $942\text{ dm}^3 \div 157\text{ dm}^3 = 6$
• Answer	The conical container must be filled with water 6 times to fill the cylinder container .
CHECK AND LOOK BACK	
• Verify using check and balance	$942\text{ dm}^3 = 6 \times (\frac{1}{3} \times 3.14 \times 5\text{dm} \times 5\text{dm} \times 6\text{dm})$ $942\text{ dm}^3 = 942\text{ dm}^3$ Therefore, the answer is reasonable.

What's More

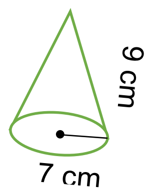
Directions: Find the volume of solid figures. Write your answer on a separate sheet.

1. Find the volume of a cylinder with dimensions $h = 10m, r = 9$.

2. A boy scout's tent is 10 meters high, 8 meters long, and 5 meters wide. Find its volume.



3. Find the volume of a cone-shaped toy with a height of 9cm and a base radius of 7 cm.



What I Have Learned

A. Directions Base from the activities, identify the formula of the solid figures below.

1. Sphere = ______________
2. Cone = ______________
3. Pyramid = ______________
4. Cylinder = ______________

B. Directions: Name the 4 steps in solving word problems.

Step 1:

Step 2:

Step 3:

Step 4:

What I Can Do

A. 904.32cm^3	B. 1 728cm^3	C. 399.12cm^3	D. 140cm^3	E. 549.5cm^3

1. Mark has a chocolate box whose sides are 12 centimeters each. Find its volume.
2. A cylindrical glass container with a radius of 5 cm and a height of 7cm. What is the volume of a cylindrical glass container?
3. Calculate the volume of a conic-shaped birthday hat with a base radius of 6 cm and a height of 9cm.
4. Calculate the volume of a tent with a rectangular base of 6 meters wide, 7 meters long, and 10 meters high. What is the volume of the tent?
5. A soccer ball has a radius of 6 centimeters. Find its volume.

Assessment

A. Directions: Read and solve each problem, then choose only the letter of the correct answer.

1. Daniel wants to put water in a cylindrical metal tank, 12 meters high and a base radius of 8 meters. How many cubic meters of water is needed for the tank?
   A. 2 411.52m^3 B. 1 607.68m^3 C. 301.44m^3 D. 200.96m^3

2. Arnaldo is setting up his tent. His tent is in the shape of a pyramid with a rectangular base of 4 meters wide, 8 meters long, and 10 meters high. What is the volume of the tent?
   A. 106.67 m^3 B. 125.67 m^3 C. 174.67 m^3 D. 129 m^3

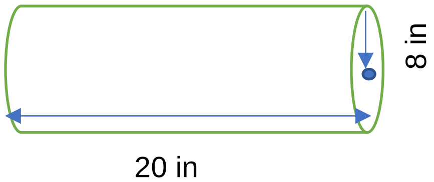
3. Kathryn plays a jackstone, which has a 2-inch radius. What is its volume?
   A. 15.26 $inches^3$ B. 25.32 $inches^3$ C. 33.49 $inches^3$ D.50.24 $inches^3$

4. Aniza bought ice cream at an ice cream parlor. The ice cream is served in a cone with a base radius of 4.3 centimeters and 5.4 centimeters high. What is its volume?
   A. 126.34cm^3 B. 65.5 cm^3 C. 96.4 cm^3 D. 104.5 cm^3

5. Carl and Mike bought a coffee drink and was served in a cylindrical coffee mug with a base radius of 4 inches and a height of 7 inches. How much coffee drink can fill in a coffee mug?
   A. 788.4 inches^3 B. 351.68 inches^3 C. 80.30 inches^3 D. 235.54 inches^3

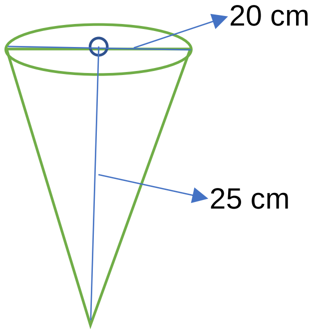
B. Find the volume of the following figures and choose the correct answer.

1. Find the Volume of the cylinder.



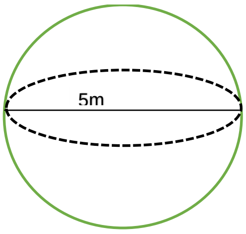
A. 502.4 in^3
B. 1 004.8 in^3
C. 1 280 in^3
D. 4 019.2 in^3

2. Find the volume of the cone.



A. 523.33 in^3
B. 1 570 in^3
C. 2 616.67 in^3
D. 4 166.67 in^3

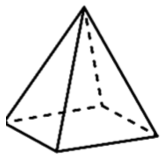
3. Find the volume of this sphere.



A. 20.9 m^3
B. 62.8 m^3
C. 63.5 m^3
D. 65.4 m^3

4. Find the volume of the pyramid.

$l = 5m, \ w = 3m, \ h = 6m$



A. 90 m^3
B. 30 m^3
C. 18 m^3
D. 15 m^3

Answer Key

What I Know:

1. B 2. C 3. B 4. C 5. A

What's In:

1. True 2. False 3. True 4. True 5. False

What's New:

Answer: Figure A occupies the greatest space since it has the greatest volume.

What's More:

1. $V = \pi \times r^2 \times h$
   $= 3.14 \times 9m \times 9m \times 10\ m$
   $= 2\ 543.4m^3$

2. $V = \frac{1}{3} \times (l \times w \times h)$
   $V = \frac{1}{3} \times (8m \times 5m \times 10m)$
   $V = 133.33m^3$

3. $V = \frac{1}{3}(\pi r^2 \times h)$
   $= \frac{1}{3} \times (3.14 \times 7\ cm \times 7\ cm \times 9cm)$
   $V = 461.58\ cm^3$

What I Have Learned:

A.
1. Sphere: $V = \frac{4}{3}\pi r^3$
2. Cone: $V = \frac{1}{3}(\pi r^2 h)$
3. Pyramid: $V = \frac{1}{3}(l \times w \times h)$
4. Cylinder: $V = \pi r^2 h$

B.
1. Understand 2. Plan 3. Solve 4. Check

Assessment:

A. 1. A 2. A 3. C 4. D 5. B

B 1. D 2. C 3. D 4. B

What I Can Do:

1. B 2. E 3. C 4. D 5. A

References:

Jaime R. Burgos, Marjoseph H. Perez, and Donnel P.Placer, Century 21st Mathletes Textbook, ed. Mercurio T. Elenzano and Chin Uy Vibal Group, Inc. Quezon City, Quezon City Philippines:2016, 35-40, 70-78.

I AM A FILIPINO
by Carlos P. Romulo

I am a Filipino – inheritor of a glorious past, hostage to the uncertain future. As such, I must prove equal to a two-fold task – the task of meeting my responsibility to the past, and the task of performing my obligation to the future.

I am sprung from a hardy race – child many generations removed of ancient Malayan pioneers. Across the centuries, the memory comes rushing back to me: of brown-skinned men putting out to sea in ships that were as frail as their hearts were stout. Over the sea I see them come, borne upon the billowing wave and the whistling wind, carried upon the mighty swell of hope – hope in the free abundance of the new land that was to be their home and their children's forever.

This is the land they sought and found. Every inch of shore that their eyes first set upon, every hill and mountain that beckoned to them with a green and purple invitation, every mile of rolling plain that their view encompassed, every river and lake that promised a plentiful living and the fruitfulness of commerce, is a hollowed spot to me.

By the strength of their hearts and hands, by every right of law, human and divine, this land and all the appurtenances thereof – the black and fertile soil, the seas and lakes and rivers teeming with fish, the forests with their inexhaustible wealth in wild and timber, the mountains with their bowels swollen with minerals – the whole of this rich and happy land has been for centuries without number, the land of my fathers. This land I received in trust from them, and in trust will pass it to my children, and so on until the world is no more.

I am a Filipino. In my blood runs the immortal seed of heroes – seed that flowered down the centuries in deeds of courage and defiance. In my veins yet pulses the same hot blood that sent Lapulapu to battle against the alien foe, that drove Diego Silang and Dagohoy into rebellion against the foreign oppressor.

That seed is immortal. It is the self-same seed that flowered in the heart of Jose Rizal that morning in Bagumbayan when a volley of shots put an end to all that was mortal of him and made his spirit deathless forever; the same that flowered in the hearts of Bonifacio in Balintawak, of Gregorio del Pilar at Tirad Pass, of Antonio Luna at Calumpit, that bloomed in flowers of frustration in the sad heart of Emilio Aguinaldo at Palanan, and yet burst forth royally again in the proud heart of Manuel L. Quezon when he stood at last on the threshold of ancient Malacanang Palace, in the symbolic act of possession and racial vindication. The seed I bear within me is an immortal seed.

It is the mark of my manhood, the symbol of my dignity as a human being. Like the seeds that were once buried in the tomb of Tutankhamen many thousands of years ago, it shall grow and flower and bear fruit again. It is the insigne of my race, and my generation is but a stage in the unending search of my people for freedom and happiness.

I am a Filipino, child of the marriage of the East and the West. The East, with its languor and mysticism, its passivity and endurance, was my mother, and my sire was the West that came thundering across the seas with the Cross and Sword and the Machine. I am of the East, an eager participant in its struggles for liberation from the imperialist yoke. But I know also that the East must awake from its centuried sleep, shake off the lethargy that has bound its limbs, and start moving where destiny awaits.

For I, too, am of the West, and the vigorous peoples of the West have destroyed forever the peace and quiet that once were ours. I can no longer live, a being apart from those whose world now trembles to the roar of bomb and cannon shot. For no man and no nation is an island, but a part of the main, and there is no longer any East and West – only individuals and nations making those momentous choices that are the hinges upon which history revolves. At the vanguard of progress in this part of the world I stand – a forlorn figure in the eyes of some, but not one defeated and lost. For through the thick, interlacing branches of habit and custom above me I have seen the light of the sun, and I know that it is good. I have seen the light of justice and equality and freedom, my heart has been lifted by the vision of democracy, and I shall not rest until my land and my people shall have been blessed by these, beyond the power of any man or nation to subvert or destroy.

I am a Filipino, and this is my inheritance. What pledge shall I give that I may prove worthy of my inheritance? I shall give the pledge that has come ringing down the corridors of the centuries, and it shall be compounded of the joyous cries of my Malayan forebears when first they saw the contours of this land loom before their eyes, of the battle cries that have resounded in every field of combat from Mactan to Tirad Pass, of the voices of my people when they sing:

"I am a Filipino born to freedom, and I shall not rest until freedom shall have been added unto my inheritance—for myself and my children and my children's children—forever."