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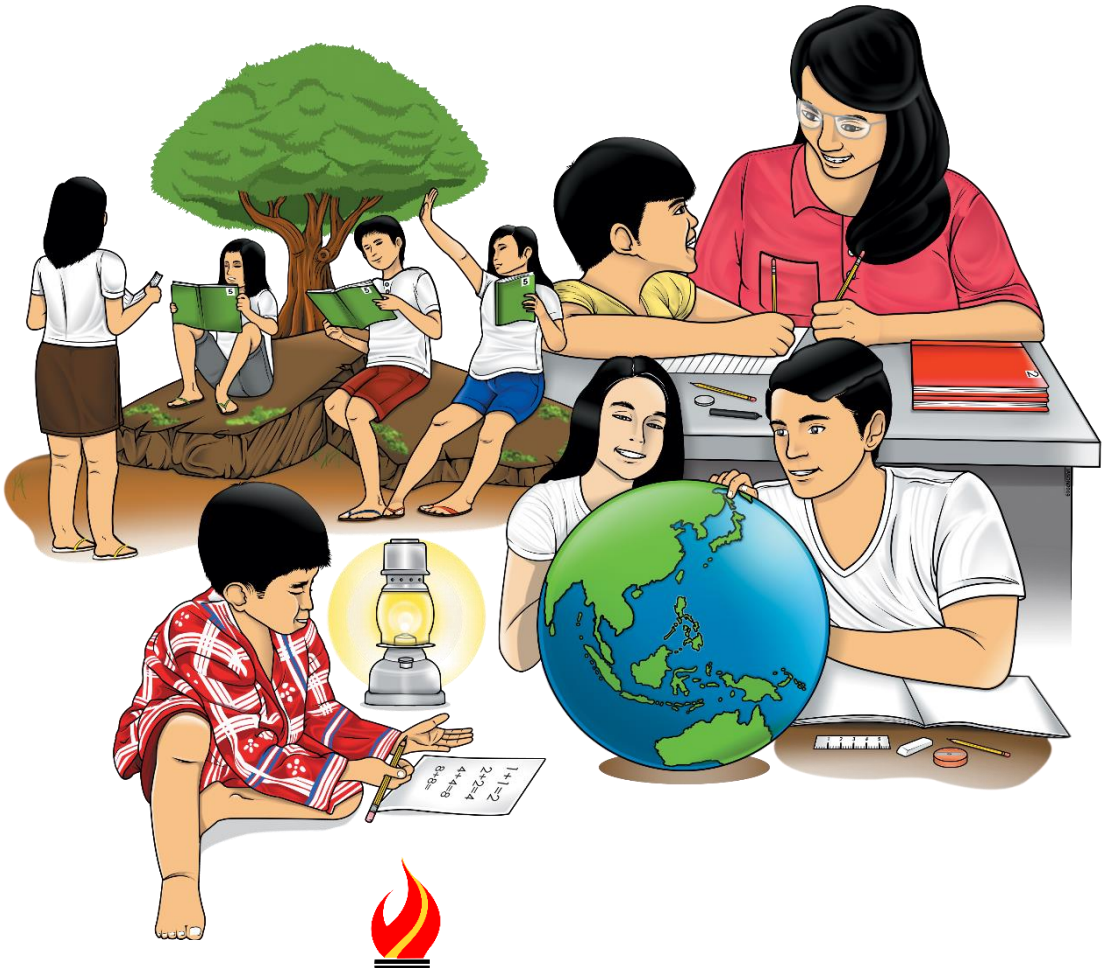
Mathematics

Quarter 4 – Module 5:
Problems Involving the Volume of a Rectangular Prism



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Mathematics

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Problems Involving the Volume of a Rectangular Prism

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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

Good day to you! From the previous module, you learned how to find the volume of a rectangular prism.

This time you will learn how to solve problems involving the volume of a rectangular prism in real life. Have fun!

After going through this module, you are expected to be able to solve routine and non-routine problems involving the volume of a rectangular prism.

What I Know

A. Solve each problem by answering the following questions. Choose the letter of the correct answer.

Elvira wants to fill a rectangular container with chocolate. What is the volume of the rectangular container if it is 70 cm long, 40 cm wide and 10 cm tall?

1. What is asked in the problem?
   a. The height of the container
   b. The volume of each chocolate bar
   c. The volume of the rectangular container
   d. The number of chocolate bars needed to fill the container

2. What are the given facts in the problem?
   a. Length = 70 cm
      Width = 40 cm
      Height = 10 cm
   c. Length = 40 cm
      Width = 70 cm
      Height = 10 cm
   b. Length = 10 cm
      Width = 40 cm
      Height = 70 cm
   d. Length = 70 m
      Width = 40 m
      Height = 10 m

3. What is the formula to be used?
   a. Volume = Length *x* Width ÷ Height
   b. Volume = Length + Width *x* Height
   c. Volume = Length *x* Width *x* Height
   d. Volume = Length *x* Width - Height

4. What is the number sentence?
   a. Volume = 70 m *x* 40 m *x* 10 m
   b. Volume = 70 cm *x* 40 cm *x* 10 cm
   c. Volume = 70 cm *x* 40 cm + 10 cm
   d. Volume = 70 cm + 40 cm ÷ 10 cm

5. What is the final answer?
   a. The volume of the rectangular container is 2 800 cm^3.
   b. The volume of each chocolate bar is 28 000 m^3.
   c. The volume of the rectangular container is 28 000 cm^3.
   d. The rectangular container needs 28 000 chocolate bars.

A glass block 10 cm long, 6 cm wide and 3 cm high is placed inside a 2 cm-thick box. Find the volume of the box.

6. What are you going to find out in the problem?
   a. The volume of the box
   b. The dimensions of the box
   c. The volume of the glass block
   d. None of the above

7. What could be an appropriate strategy to solve the problem?
   a. Draw an illustration.
   b. Follow the 4-step Plan.
   c. Guess and Check
   d. Make a pattern.

8. Which solution is correct?
   a. V = (10 cm x 6 cm x 3 cm) + 2 cm
      V = 180 cm^3 + 2 cm
      V = 182 cm^3

   b. V = (10 cm x 6 cm x 3 cm) x 2 cm
      V = 180 cm^3 x 2 cm
      V = 360 cm^3

   c. V = (10 cm + 4 cm) x (6 cm + 4 cm) x (3 cm + 4cm)
      V = 14 cm x 10 cm x 7 cm
      V = 980 cm^3

   d. V = (10 cm + 6 cm + 3 cm) x 2 cm
      V = 19 cm x 2 cm
      V = 38 cm^3

A. Read and solve.

9. A rectangular box has a length of 45 cm, a width of 25 cm and a height of 10 cm. Find the volume of the box.

10. A wooden plank is 360 cm long, 40 cm wide and 2 cm thick. Find the volume of the plank if its length is reduced by 240 cm.

To check, go to the ***Answer Key***. If you got a score of 8 – 10, VERY GOOD! The lesson will be easy for you. If you got a score of 7 or below, study carefully the discussion and examples in this module.

What's In

You can find the volume of a rectangular prism by using the formula **V = *L* x *W* x *H***, *where L= length, W= width, and H= height.*

Find the volume of the following objects below.

1.

30 cm

12 cm

20 cm

2.

40 cm

22 cm

10 cm

Go to the ***Answer Key***. If you got 2, Excellent!
If you have any mistakes, it's OK, try to review your solutions.

What's New

Do you bring snacks and lunch to school? Where do you put them? Are your snacks and lunch healthy?

Read the problem below.

Chris helps his mother prepare his lunch for school. He puts them in a lunch box which is 20 cm long, 15 cm wide, and 10 cm tall. What is the volume of the lunch box?

What Is It

The problem is an example of a routine problem. You encounter many situations of this kind in your daily life.

To solve the problem, use the 4-step Plan

A. UNDERSTAND

1. Know **what is asked** in the problem.
   The volume of the lunch box
2. Know the given facts.
   Length (L) = 20 cm Width(W) = 15 cm Height(H) = 10 cm

B. PLAN

1. Determine the **operation** or f**ormula** to be used.
   Multiplication: V = L x W x H

C. SOLVE

Solve using the formula.

V = L x W x H

V = 20 cm x 15 cm x 10 cm

V = 3 000 cm^3

Substitute 20 cm for L, 15 cm for W, and 10 cm for H then multiply.

20 x 15 = 300

300 x 10 = 3 000

Don't forget to write the unit **cm^3**.

D. CHECK AND LOOK BACK

Check your answer.

State the final answer.

You can also use a calculator to check.

The volume of the lunch box is 3 000 cm^3

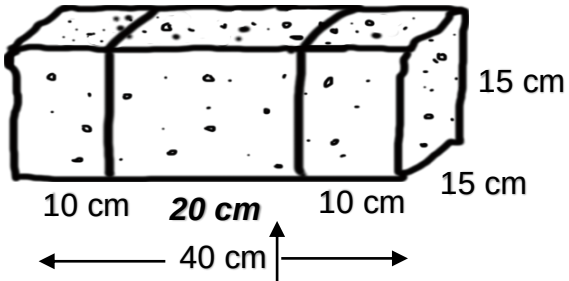
This is solving routine problems. How about solving non-routine problems? Let me show you an example.

Study this problem.

A loaf of banana bread 40 cm x 15 cm x 15 cm is cut into three slices, each in the shape of a rectangular prism. The end slices are each 10 cm x 15 cm x 15 cm. What is the volume of the middle slice?

An illustration would help solve this problem.

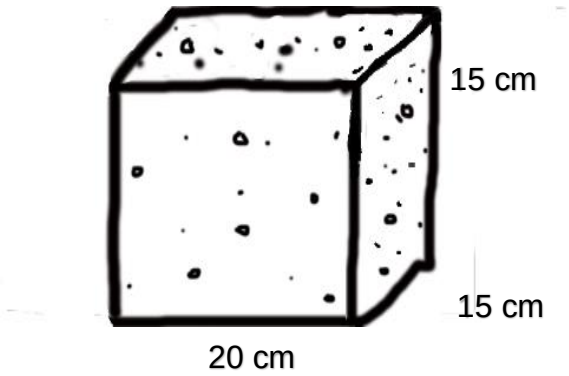
Find the dimensions of the middle slice.



Non-routine problem solving develops your reasoning power. You may use any of these strategies: Listing, Creating a Table, Guess and Check, Drawing, Making Diagrams, Finding Patterns, etc.

The length of the middle slice is 20 cm since (40 – (10+10)) = 20.
The width and height are just the same.
40 – (10 + 10) = 20

Thus, the middle slice has these dimensions:



Solving for the volume of the middle slice,

V = L x W x H
= 20 cm x 15 cm x 15 cm
= 4 500 cm^3

So, the volume of the middle slice is 4 500 cm^3

You just learned how to solve non-routine problems.
You are now ready for the activities. LET'S GO!

What's More

Activity 1

A rectangular swimming pool 8 m long, 5 m wide and 2 m deep is to be filled with water. How much water is needed to completely fill the swimming pool?

Fill in the blanks.

1. What is asked?

   The volume of water needed _____.

2. What are the given facts?

   L = 8 m, W = 5 m, _____

3. What is the operation or formula to be used?

   V = __ x W x ___

4. Show your solutions.

   V = 8 m x 5 m x 2 m
   V = _____ m^3

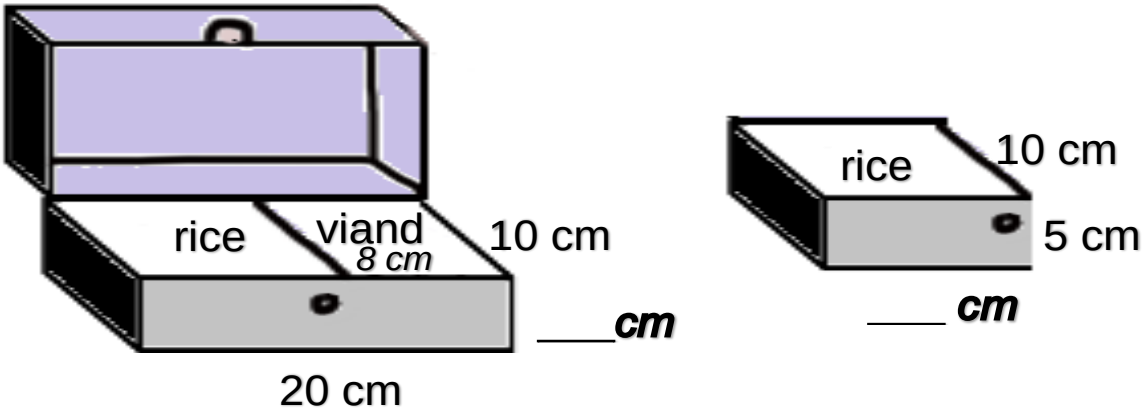
5. What is the final answer?

   _____ ***is needed to completely fill the swimming pool.***

Activity 2

Solve the problem. Complete the illustration and solutions by filling in the blanks.

A lunch box 20 cm long, 10 cm wide and 5 cm tall is divided into two parts: one part for viand and one part for rice. If the part for viand is 8 cm x 10 cm x 5 cm, what is the volume of the part for rice?



Solutions:

Length = 12 cm
Width = 10 cm
Height = _____

$V_{\text{part for rice}}$ = L x W x H
V = 12 cm x 10 cm x 5 cm
V = 600 ____

The total length of the lunch box is 20 cm. By taking away 8 cm (the length of the compartment for the viand), we get the length of the part for the rice, which is 12 cm.

Answer: The volume of the part for _____.

Illustration/Solutions:

Activity 3

Read and understand each problem. Write the equation and the final answer on your answer sheet. The first one is done for you.

1. Victor made a rectangular prism out of used cardboards for his project. If the prism is 6 cm long, 25 cm tall, and 5 cm wide, find the volume of the rectangular prism.
   Equation: **V = 6 cm x 5 cm x 25 cm**
   Final answer: **The volume of the rectangular prism is 750 cm^3.**

2. How much water would fill up a concrete fish pond which is 5 m long, 4 m wide and 2 m deep?
   Equation: _____
   Final Answer: _____

3. If a dictionary measures 20 cm long, 27 cm wide and 6 cm thick, what is its volume?
   Equation: _____
   Final Answer: _____

4. A rectangular pan measuring 31 cm x 25 cm x 6 cm is half-filled with chiffon cake mixture. How much chiffon cake mixture is in the pan?
   Equation: _____
   Final Answer: _____

Go to the ***Answer Key***. If you got most of the answers, WOW! That's great! If not, go back and review the lesson before proceeding.

What I Have Learned

How do you solve routine and non-routine word problems involving the volume of a rectangular prism?

To solve routine problems involving the volume of a rectangular prism, you may follow these steps:

UNDERSTAND

- Know what is asked.
- Know the given facts.

PLAN

- Determine the operation or formula to use.

SOLVE

- Substitute the correct values in the formula.

CHECK AND LOOK BACK

- Write the correct answer.

Non-routine problems can be solved using different strategies such as drawing a picture, guess and check, making a pattern, using number line, and/or making a table.

What I Can Do

A. Solve each problem. Answer the following questions.

1. Mother and I prepared a fruit salad for a weekend family gathering. If the fruit salad completely filled a rectangular container that was 40 cm long, 25 cm wide and 10 cm high, how much fruit salad was there?

    a. What is asked? _____
    b. What are given? _____
    c. What is the formula to be used? _____
    d. What is the solution? _____
    e. State the final answer. _____

2. Steven helps his father in making a wooden cabinet with three identical drawers. Each drawer is 50 cm long, 30 cm wide and 15 cm high. What is the total volume of the three drawers?

    a. What is asked? _____
    b. What is the solution? _____
    c. State the final answer. _____

B. Read and solve each problem.
Show your solutions/illustrations.

1. Jennifer bakes a three-layered rectangular cake. The first layer measures 50 cm long, 25 cm wide and 5 cm high. The second is 10 cm shorter than the first. The third is 10 cm shorter than the second. Each layer has the same width and height. What is the volume of the third layer of the cake?

2. The edge of a Rubik's cube is 5 cm long. What is the total volume of three of these Rubik's cubes placed side by side?

Go to the ***Answer Key***. Check your answers before you proceed to the next activity.

Assessment

Read, analyze, then solve each problem. Answer each question.

A. A bowl of mango jelly was poured into a 14 cm x 8 cm x 3 cm rectangular container. If the mango jelly completely filled the container, how much mango jelly was there?

1. What is asked in the problem? _____
2. Show your solutions. _____
3. State the final answer. _____

B. Ana is cleaning a box which is 6 dm long, 4 dm wide and 15 dm tall. What is the volume of the box?

4. What is asked in the problem? _____
5. What are given? _____
6. State the final answer. _____

C. Wenalyn baked a cassava cake which measures 18 cm x 10 cm x 4 cm. She wants to share the cake with her two classmates so she cuts it into three parts all of the same sizes. How much cassava cake will each of her classmates receive?

7. Show your solutions or illustration.

8. What is the final answer? _____

D. A ream of bond paper is 28 cm long, 22 cm wide and 4 cm thick. It contains 500 sheets. If 250 sheets were removed from the ream of bond paper, what is the volume of the remaining sheets?

9. Write the equation. _____
10. What is the final answer? _____

Please check your answers in the ANSWER KEY.

Additional Activities

Solve the following problems.

1. How much water is needed to completely fill a fish pond that is 10 m long, 8 m wide and 1 m deep?

2. Nenita found a 60 cm x 30 cm x 12 cm rectangular plastic container in her backyard. How much garden soil would she need if she wanted to fill it to the brim?

3. Find the volume of a container van that is 8 m long, 4 m wide and 3 m high.

4. Aling Choling sells bangus in the market. She stores them in an ice box. What is the volume of the ice box if it is 10 dm long, 8 dm wide and 7 dm deep?

5. An android tablet measures 20 cm long, 15 cm wide and 2 cm thick. It is placed inside a rectangular box that is 1 cm thick on all sides. What is the volume of the box?

To check, go to the ***Answer Key***. Congratulations for reaching this part of the module. You can always review the previous pages of this module if you need to.

Answer Key

What I Know

1. c
2. a
3. c
4. b
5. c
6. c
7. a
8. c
9. 11 250 cm^3
10. 9 600 cm^3 *(The length is decreased by 240 cm.)*

What's In

1. 7 200 cm^3
2. 8 800 cm^3

What's More

Activity 1:

1. The volume of water needed to completely fill the swimming pool.
2. L = 8 m W = 5 m H = 2 m
3. V = **L** x W x **H**
4. **V = 80 m^3**
5. **80 m^3 of water** is needed to complete fill the swimming pool.

Activity 2:

2.

V = 15 cm x 5 cm x 5 cm OR
V = (5 cm x 5 cm x 5 cm) x 3
V = 375 cm^3
Answer: The total volume of the three Rubik's cube placed side by side is 375 cm^3.

Activity 3:

2.Equation: V = 5 m x 4 m x 2 m
Final Answer: 40 m^3 of water can fill the concrete fish pond.
3.Equation: V = 20 cm x 27 cm x 6 cm
Final Answer: The dictionary is 3 240 cm^3.
4.Equation: V = 31 cm x 25 cm x 3 cm
(half- filled)
Final Answer: The pan was filled with 2 325 cm^3 chiffon cake mixture.

What I Can Do

A. 1. a. The volume of fruit salad.
b. L = 40 cm
W = 25 cm
H = 10 cm
c. V = L x W x H
d. V = L x W x H
V = 40 cm x 25 cm x 10 cm
V = 10 000 cm^3
e. There was 10 000 cm^3 of fruit salad in the container
2. a. The total volume of the three drawers.
b. V = (50 cm x 30 cm x 15 cm) x 3
V = 22 500 cm^3 x 3
V = 67 500 cm^3
c. The total volume of the three drawers is 67 500 cm^3.

B. 1.

V = 30 cm x 25 cm x 5 cm V = 3 750 cm^3
Answer: The volume of the third layer of the cake is 3 750 cm^3.

Assessment

1. The volume of the mango jelly.
2. V = L x W x H
V = 14 cm x 8 cm x 3 cm
V = 336 cm^3
3. There was 336 cm^3 mango jelly.
4. The volume of the box.
5. L = 6 dm W = 4 dm
H = 15 dm
6. The volume of the box is 360 dm^3.
7.

V = L x W x H
V = 6 cm x 10 cm x 4 cm
V = 240 cm^3
8. Each of her classmate will receive 240 cm^3 cassava cake.
9. V = 28 cm x 22 cm x 2 cm *(250 is $\frac{1}{2}$ of 500, $\frac{1}{2}$ of 4 cm is 2cm)*
10. The volume of the remaining sheets is 1232 cm^3.

Additional Activities

1. 80 m^3
2. 21 600 cm^3
3. 96 m^3
4. 560 dm^3
5. 1 496 m^3 (2 cm will be added to each dimension)

References

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