

Important Concepts . . .

Preview Review



Mathematics Grade 8 TEACHER KEY
W3 - Lesson 3: Calculating Volume

Important Concepts of Grade 8 Mathematics

W1 - Lesson 1	Perfect Squares and Square Roots
W1 - Lesson 2	Working with Ratios and Rates
W1 - Lesson 3	Multiplying and Dividing Fractions
W1 - Lesson 4	Multiplying and Dividing Integers
W1 - Lesson 5	Working with Percents
W1 - Review	
W1 - Quiz	
W2 - Lesson 1	Modelling and Solving Linear Equations Using Algebra Tiles
W2 - Lesson 2	Solving Linear Equations
W2 - Lesson 3	Graphing and Analyzing Linear Relations
W2 - Lesson 4	Critiquing the Representation of Data
W2 - Lesson 5	Probability of Independent Events
W2 - Review	
W2 - Quiz	
W3 - Lesson 1	Pythagorean Theorem
W3 - Lesson 2	Calculating Surface Area
W3 - Lesson 3	Calculating Volume
W3 - Lesson 4	Drawing 3-D Objects
W3 - Lesson 5	Congruence of Polygons
W3 - Review	
W3 - Quiz	

Materials Required

Protractor
Ruler
Calculator

**No Textbook
Required**

**This is a stand-
alone course.**

Mathematics Grade 8

Version 6

Preview/Review W3 - L3

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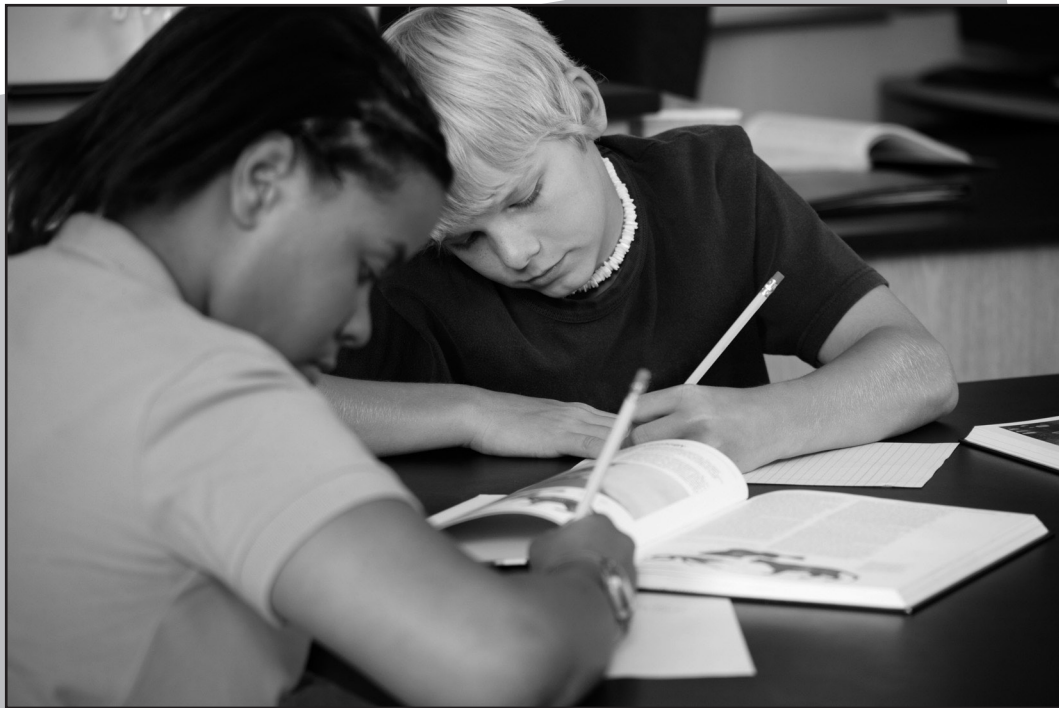
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Preview/Review Concepts for Grade Eight Mathematics

Teacher Key



W3 – Lesson 3:

Calculating Volume

OBJECTIVES

By the end of this lesson, you will be able to:

- Explain the connection between the area of the base of a given right 3-D object and the formula for the volume of the object.
- Apply a formula to solve a given problem involving the volume of right rectangular prisms, right triangular prisms, and right cylinders.

GLOSSARY

Right Prism – a three-dimensional object that can have any polygon as a base and rectangles as lateral faces. The prism is named according to its base.

Volume – the amount of space an object occupies.

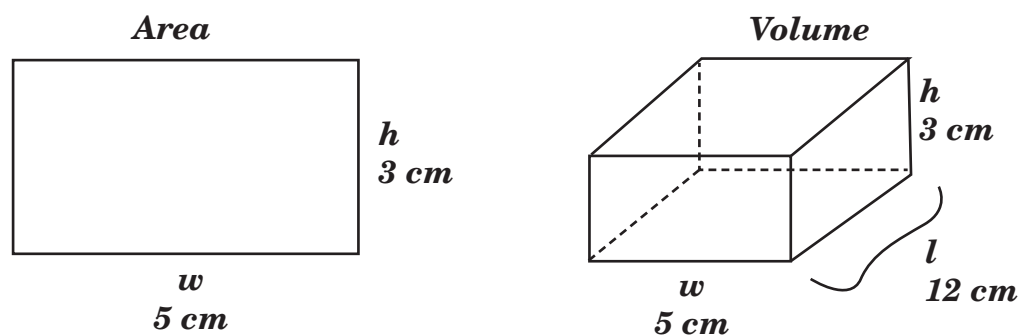
W3 – Lesson 3: Calculating Volume

Materials required:

- Paper, Pencil, Calculator

Calculating Volume of a Right Rectangular Prism

Volume is the amount of space a 3-D object occupies.



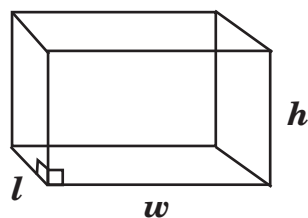
To calculate the volume of any right prism, calculate the area of its base and multiply by its length or height.

The general volume formula used to calculate the volume of any right prism is

$$V = A_{\text{Base}} \times h.$$

Volume is a cubic measure because volume is a three-dimensional measure. This means that three measures are needed to calculate the volume of a right prism:
length \times width \times height.

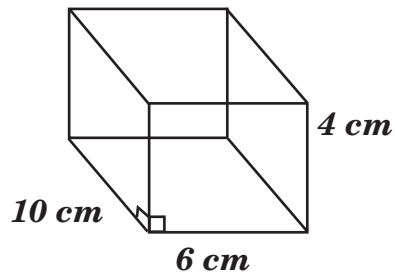
The base of a right rectangular prism is in the shape of a rectangle. The formula that is used to calculate the area of a rectangle is $A = lw$. To calculate the volume of a right rectangular prism, substitute this formula into the general volume formula to get:



$$\begin{aligned} V &= A_{\text{base}} \times h \\ V &= A_{\text{rectangular prism}} \times h \\ V &= (lw) \times h \\ V &= lwh \end{aligned}$$

Example 1

Calculate the volume of the given right rectangular prism.

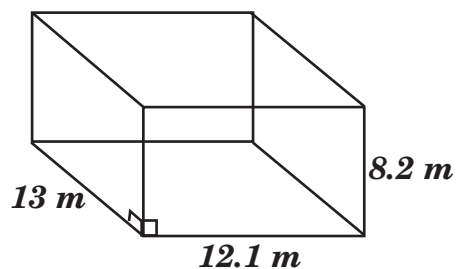


Use the volume formula, substitute in the known values, and evaluate.

$$\begin{aligned} V &= lwh \\ &= (10)(6)(4) \\ &= 204 \text{ cm}^3 \end{aligned}$$

Practice Questions

Calculate the volume of the following right rectangular prism.

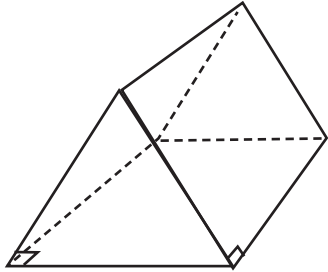


Use the volume formula, substitute in the known values, and evaluate.

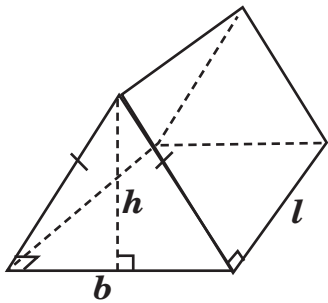
$$\begin{aligned} V &= lwh \\ &= (13)(12.1)(8.2) \\ &= 1289.86 \text{ m}^3 \end{aligned}$$

Calculating Volume of a Right Triangular Prism

A right triangular prism is a prism that has triangular bases that are perpendicular to the rectangular sides of the prism.



The base of a right triangular prism is in the shape of a triangle. The formula that is used to calculate the area of a triangle is $A = \frac{bh}{2}$. To calculate the volume of a right triangular prism, substitute this formula into the general volume formula to get:



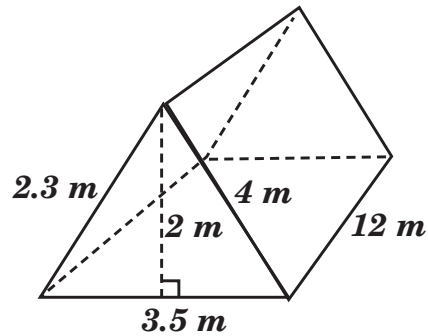
$$V = A_{\text{base}} \times h$$

$$V = A_{\text{triangle}} \times l$$

$$V = \left(\frac{bh}{2} \right) \times l$$

Example 1

Calculate the volume of the given right triangular prism.

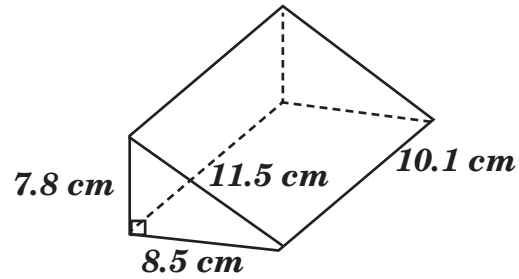


Use the volume formula, substitute in the known values, and evaluate.

$$\begin{aligned} V &= \left(\frac{bh}{2} \right) \times l \\ &= \left(\frac{(3.5)(2)}{2} \right) \times (12) \\ &= 3.5 \times 12 \\ &= 42\text{m}^3 \end{aligned}$$

Practice Questions

Calculate the volume of the following right triangular prism.



Use the volume formula, substitute in the known values, and evaluate.

$$\begin{aligned} V &= \left(\frac{bh}{2} \right) \times l \\ &= \left(\frac{(8.5)(7.8)}{2} \right) \times (10.1) \\ &= 33.15 \times 10.1 \\ &= 334.82 m^3 \end{aligned}$$

Calculating Volume of a Right Cylinder

A right cylinder is a prism that has circular bases that are perpendicular to the curved rectangular side of the prism.



The base of a right cylinder is in the shape of a circle. The formula that is used to calculate the area of a circle is $A = \pi r^2$. To calculate the volume of a right cylinder, substitute this formula into the general volume formula to get:

$$V = A_{\text{base}} \times h$$

$$V = A_{\text{circle}} \times h$$

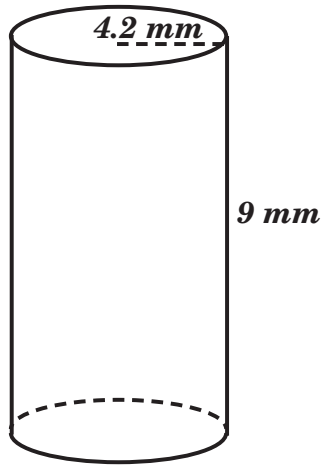
$$V = \pi r^2 \times h$$

$$V = \pi r^2 h$$

When calculating the volume of a right cylinder, use $\pi = 3.14$.

Example 1

Calculate the volume of the given right cylinder. Use $\pi = 3.14$.

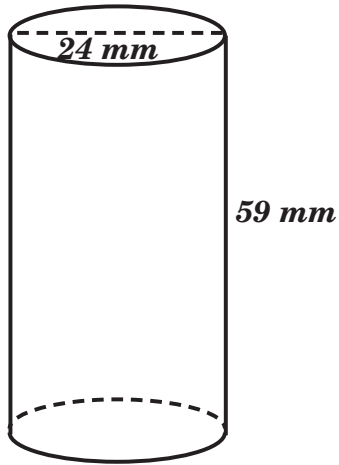


Use the volume formula, substitute in the known values, and evaluate.

$$\begin{aligned} V &= \pi r^2 h \\ &= (3.14)(4.2)^2(9) \\ &= 498.51 \text{ mm}^3 \end{aligned}$$

Practice Question

Calculate the volume of the following right cylinder.



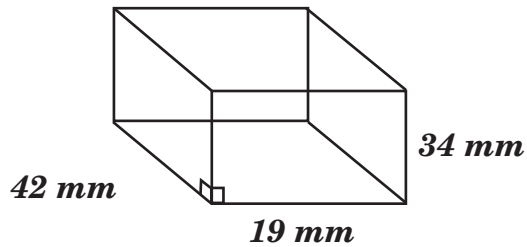
Use the volume formula, substitute in the known values, and evaluate.

$$\begin{aligned} V &= \pi r^2 h \\ &= (3.14)(12)^2(59) \\ &= 26\,677.44 \text{ mm}^3 \end{aligned}$$

Lesson 3: Assignment

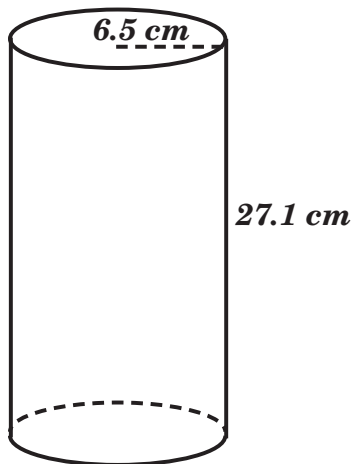
Calculate the volume of each of the following right prisms. Round the answers to the nearest hundredth of a unit.

1.



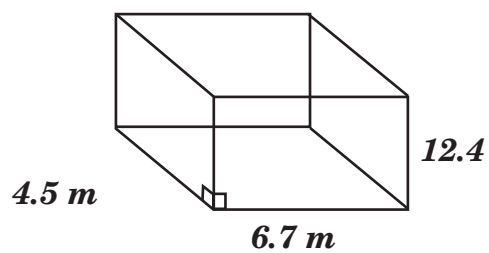
$$\begin{aligned} V &= lwh \\ &= (42)(19)(34) \\ &= 27132 \text{ mm}^3 \end{aligned}$$

2.



$$\begin{aligned} V &= \pi r^2 h \\ &= (3.14)(6.5)^2(27.1) \\ &= 3595.22 \text{ cm}^3 \end{aligned}$$

3.

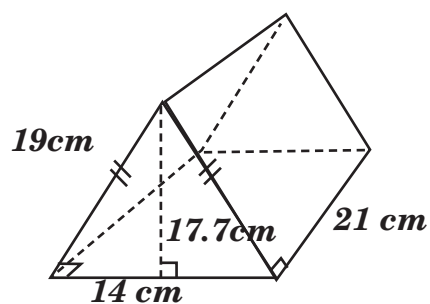


$$V = lwh$$

$$= (4.5)(6.7)(12.4)$$

$$= 373.86m^3$$

4.



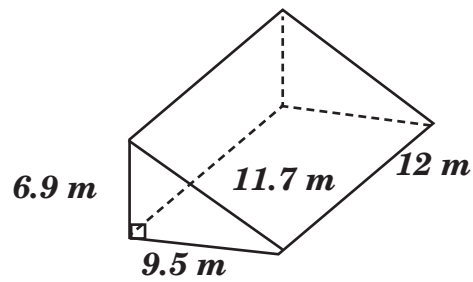
$$V = \left(\frac{bh}{2} \right) \times l$$

$$= \left(\frac{(14)(17.7)}{2} \right) \times (21)$$

$$= 123.9 \times 21$$

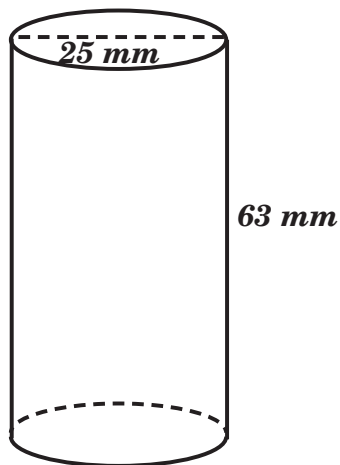
$$= 2601.9cm^3$$

5.



$$\begin{aligned}
 V &= \left(\frac{bh}{2} \right) \times l \\
 &= \left(\frac{(9.5)(6.9)}{2} \right) \times (12) \\
 &= 32.78 \times 12 \\
 &= 393.3 \text{ m}^3
 \end{aligned}$$

6.



$$\begin{aligned}
 V &= \pi r^2 h \\
 &= (3.14)(25)^2(63) \\
 &= 928.94 \text{ m}^3
 \end{aligned}$$

