

# Volume of a Prism

## Teacher Answers

7 **8** 9 10 11 12



TI-Nspire CAS



Investigation



Student



30min

## Aim

The aim of this investigation is to learn how to develop and apply the volume formula for various prisms.

## Equipment

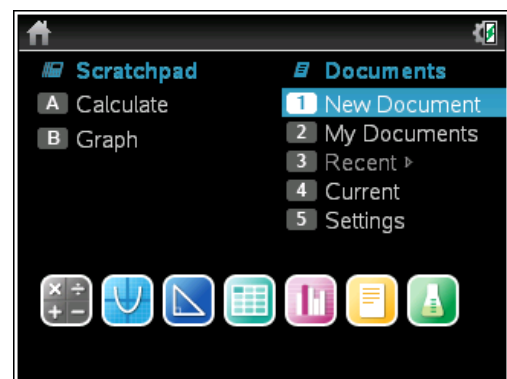
For this activity you will need:


- TI-Nspire CAS (or TI-Nspire)
- TI-Nspire file – Volume of a Prism

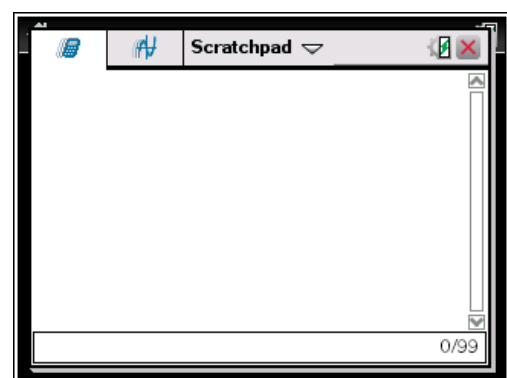
## Introduction – Setting up the calculations

This activity requires access to the “Volume of a Prism” TI-Nspire document. This document should be loaded on your device before proceeding.

Once the document is on your handheld, press **home** and select **My Documents**. Locate the “Volume of a Prism” document and press **enter** to open.

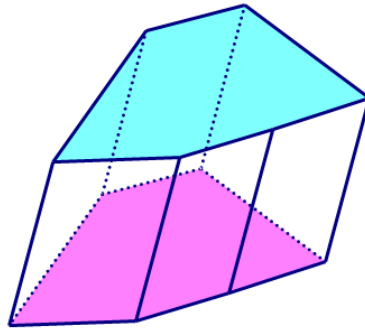


Part of in this investigation requires calculations to be performed. The Scratchpad is a place where calculations can be computed and then discarded. To access the Scratchpad press **home** and select **Scratchpad** (or press **A**). Alternatively, press the  key (this key is not available on a Clickpad).



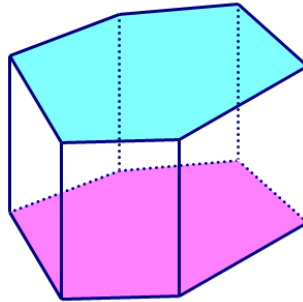
## Definition of a Prism

A **prism** is a solid with bases that are parallel, congruent polygons. The sides of a prism are parallelograms.



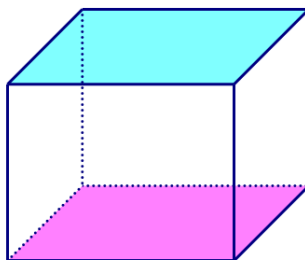
prism

A **right angle prism** is a prism where the sides are rectangles.



right angle prism

A **rectangular prism** is a prism where all the sides and ends are rectangles.



rectangular prism

## Volume of a Rectangular Prism

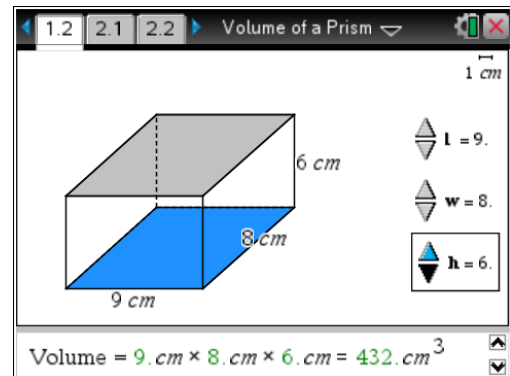
The formula for the **volume of a rectangular prism** is:

$$\begin{aligned}\text{Volume} &= \text{length} \times \text{width} \times \text{height} \\ &= l \times w \times h\end{aligned}$$

Open the **Volume of a Prism** document on your calculator and go to page 1.2.

Adjust the sliders to change the length (**l**), width (**w**) and height (**h**) of the rectangular prism.

Observe the changes to the volume.



For the following table, write down five different sets of values for the length, width and height in the first three columns. In the fourth column, write the corresponding value for the volume shown on the screen. Use the Scratchpad to calculate each volume and write your answer in the fifth column. The first entry has been completed for you.

Results for each student will vary.

Length (cm)	Width (cm)	Height (cm)	Volume (cm <sup>3</sup> )	Scratchpad (cm <sup>3</sup> )
9	8	6	432	432
6	5	4	120	120
7	5	6	210	210
9	6	4	216	216
10	8	5	40	400

Were the volumes you found from the TI-Nspire document the same as those you found using the Scratchpad? **Yes**

Use the Scratchpad to calculate the volumes of the rectangular prisms with the following dimensions (correct to one decimal place). The first result has been calculated for you.

Length (cm)	Width (cm)	Height (cm)	Volume (cm <sup>3</sup> )
9.2	6.5	3.6	215.3
7.5	3.4	4.5	114.8
12.6	8.7	2.5	274.1
45	36.5	20.3	33342.8
65	36.8	22.6	54059.2

## Volume of a Right Angle Prism

The formula for the **volume of a prism** is:

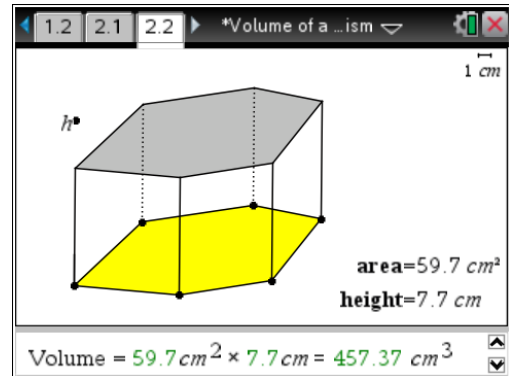
$$\begin{aligned}\text{Volume} &= \text{area of base} \times \text{height} \\ &= A \times h\end{aligned}$$

(for a right angle prism, the side length equals the height)

On your calculator and go to page 2.2.

Adjust the area of the base (**h**) by grabbing and moving the vertices of the polygon. Adjust the height (**h**) by grabbing and moving point **h**.

Observe the changes to the volume.



For the following table, write down five different sets of values for the area and height in the first two columns. In the third column, write the corresponding value for the volume shown on the screen. Use the Scratchpad to calculate each volume and write your answer in the fourth column. The first entry has been completed for you.

Results for each student will vary.

Area (cm <sup>2</sup> )	Height (cm)	Volume (cm <sup>3</sup> )	Scratchpad (cm <sup>3</sup> )
59.7	7.7	457.37	459.69
37.8	5.2	197.61	196.56
55.6	9.5	525.59	528.2
95	6.7	640.72	636.5
88.2	8.2	727.72	728.16

Explain why the results for the volume from the TI-Nspire document are not the same as those from the Scratchpad.

In the TI-Nspire document, the values for the area and height are rounded to one decimal place. However, the volumes are calculated using the original unrounded values. On the Scratchpad, the volumes are calculated using the rounded values.

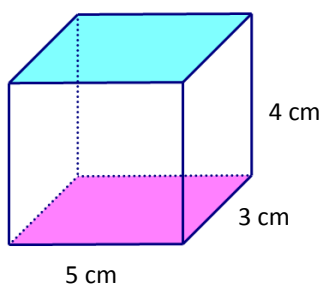
Which column gives a more accurate result for the volume? State your reasons.

The volumes shown in the TI-Nspire document are more accurate for the original unrounded values. The volumes found using the Scratchpad are more accurate for the rounded values.

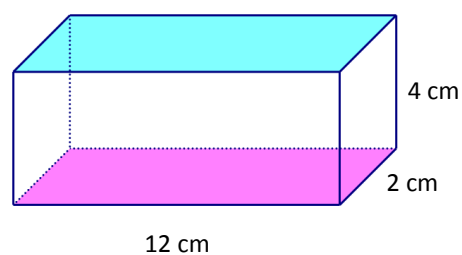
Use the Scratchpad to calculate the volumes of the following right angle prisms and put your results in the table below (correct to one decimal place). The first result has been calculated for you.

Area (cm <sup>2</sup> )	Height (cm)	Volume (cm <sup>3</sup> )
62	3.6	223.2
45	6.5	292.5
72	8.6	619.2
125.7	15.2	1910.6
153	26.8	4100.4

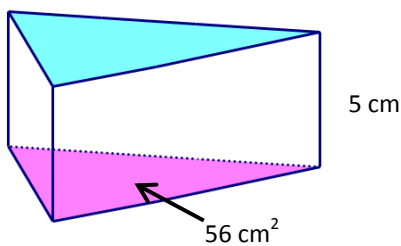
Find the volumes of the following prisms:



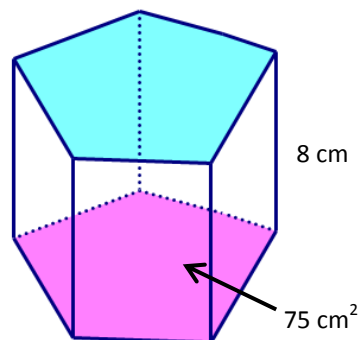
$$\text{Volume} = 5 \text{ cm} \times 3 \text{ cm} \times 4 \text{ cm} = 60 \text{ cm}^3$$



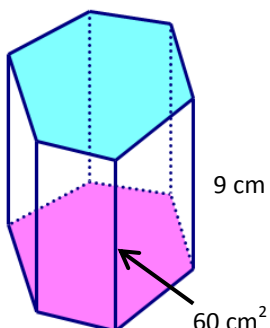
$$\text{Volume} = 12 \text{ cm} \times 2 \text{ cm} \times 4 \text{ cm} = 96 \text{ cm}^3$$



$$\text{Volume} = 56 \text{ cm}^2 \times 5 \text{ cm} = 280 \text{ cm}^3$$



$$\text{Volume} = 75 \text{ cm}^2 \times 8 \text{ cm} = 600 \text{ cm}^3$$



$$\text{Volume} = 60 \text{ cm}^2 \times 9 \text{ cm} = 540 \text{ cm}^3$$