Volume of a Prism
Teacher Notes

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.

National Curriculum Statement: Develop the formulas for volumes of rectangular and triangular prisms and prisms in general. Use formulas to solve problems involving volume (ACMMG198)

Equipment
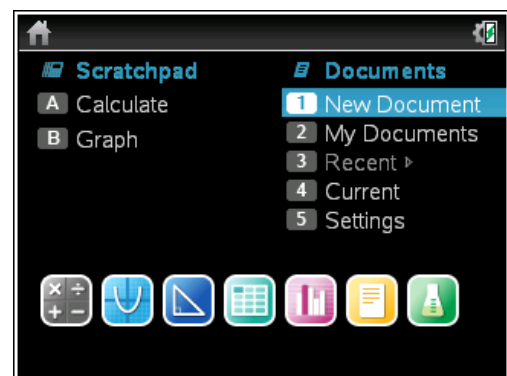
For this activity you will need:

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

Introduction – Setting up the calculations

During this activity, students will need to use the TI-Nspire file: "Volume of a Prism". This file can be distributed using TI-Navigator, the TI-Nspire docking station or the teacher/student software. To distribute the file using the Teacher software, use the **Tools** menu and select the **Transfer Tool.** Locate the TI-Nspire file on your computer and then start the transfer. Once the file is transferred to the first handheld, unplug the handheld and continue plugging in each student's handheld device. Once all the students have the file, stop the transfer. Note that students can also transfer files from one handheld device to another from within the **My Documents** folder. Note also that multi-port USB connectors can be used to transfer files to several computers at the one time.

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.

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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).
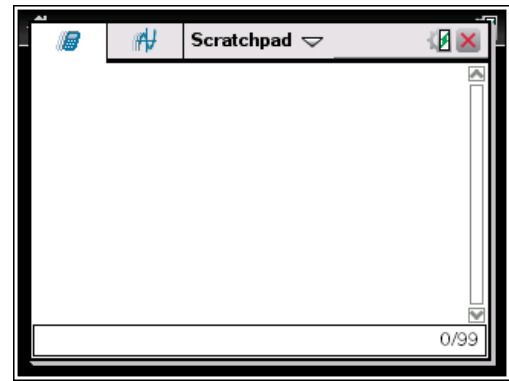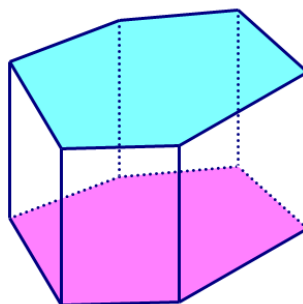
Definition of a Prism

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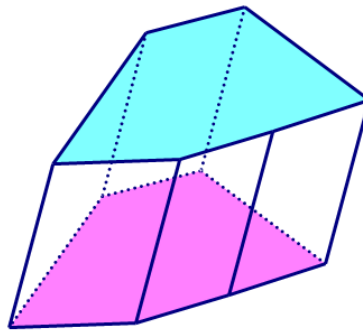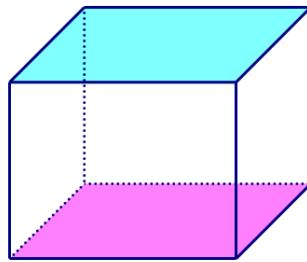
prism

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:

Volume = length × width × height
= l × w × h

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.

The document will open with the cursor in the upper window. If the cursor is in the lower window and you are using a Clickpad, press **ctrl + tab** to move the cursor to the upper window.
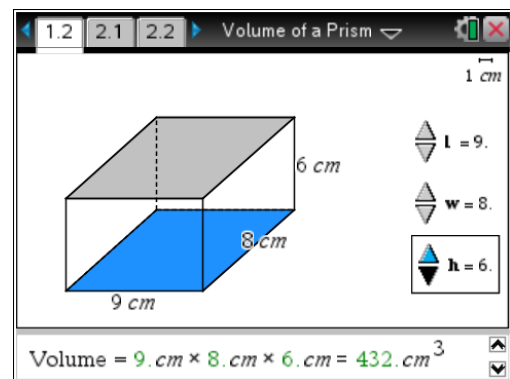
For the following table, write down five different sets of values for the length, width and height in the first three columns. In the fourth column, write the corresponding value for the volume shown on the screen. Use the Scratchpad to calculate each volume and write your answer in the fifth column. The first entry has been completed for you.

Results for each student will vary.

Length (cm)	Width (cm)	Height (cm)	Volume (cm^3)	Scratchpad (cm^3)
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

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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^3)
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:

**Volume = area of base × height**

= A × h

(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.

The page will open with the cursor in the upper window. If the cursor is in the lower window and you are using a Clickpad, press **ctrl + tab** to move the cursor to the upper window.

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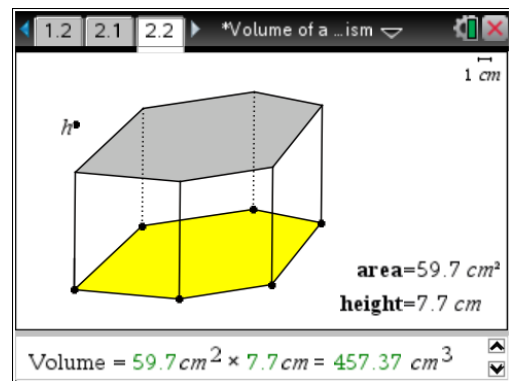
For the following table, write down five different sets of values for the area and height in the first two columns. In the third column, write the corresponding value for the volume shown on the screen. Use the Scratchpad to calculate each volume and write your answer in the fourth column. The first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

Results for each student will vary.

Area (cm^2)	Height (cm)	Volume (cm^3)	Scratchpad (cm^3)
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.
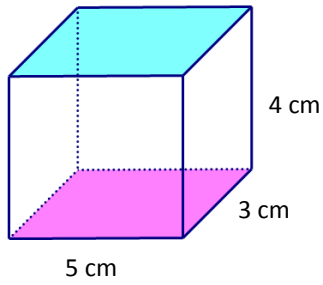
Which column gives a more accurate result for the volume? State your reasons.

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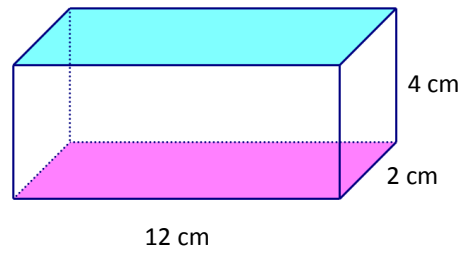
Use the Scratchpad to calculate the volumes of the following right angle prisms and put your results in the table below (correct to one decimal place). The first result has been calculated for you.

Area (cm^2)	Height (cm)	Volume (cm^3)
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

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Find the volumes of the following prisms:

4 cm

3 cm

5 cm

Volume = 5 cm × 3 cm × 4 cm = 60 cm^3

4 cm

2 cm

12 cm

Volume = 12 cm × 2 cm × 4 cm = 96 cm^3

5 cm
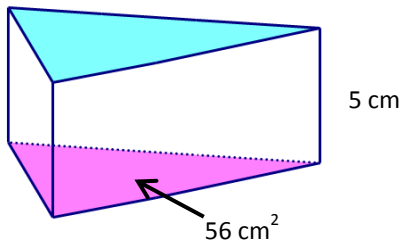
56 cm^2

Volume = 56 cm^2 ×5 cm = 280 cm^3

8 cm
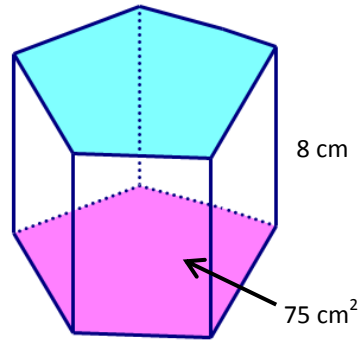
75 cm^2

Volume = 75 cm^2 ×8 cm = 600 cm^3

9 cm

60 cm^2

Volume = 60 cm^2 × 9 cm = 540 cm^3