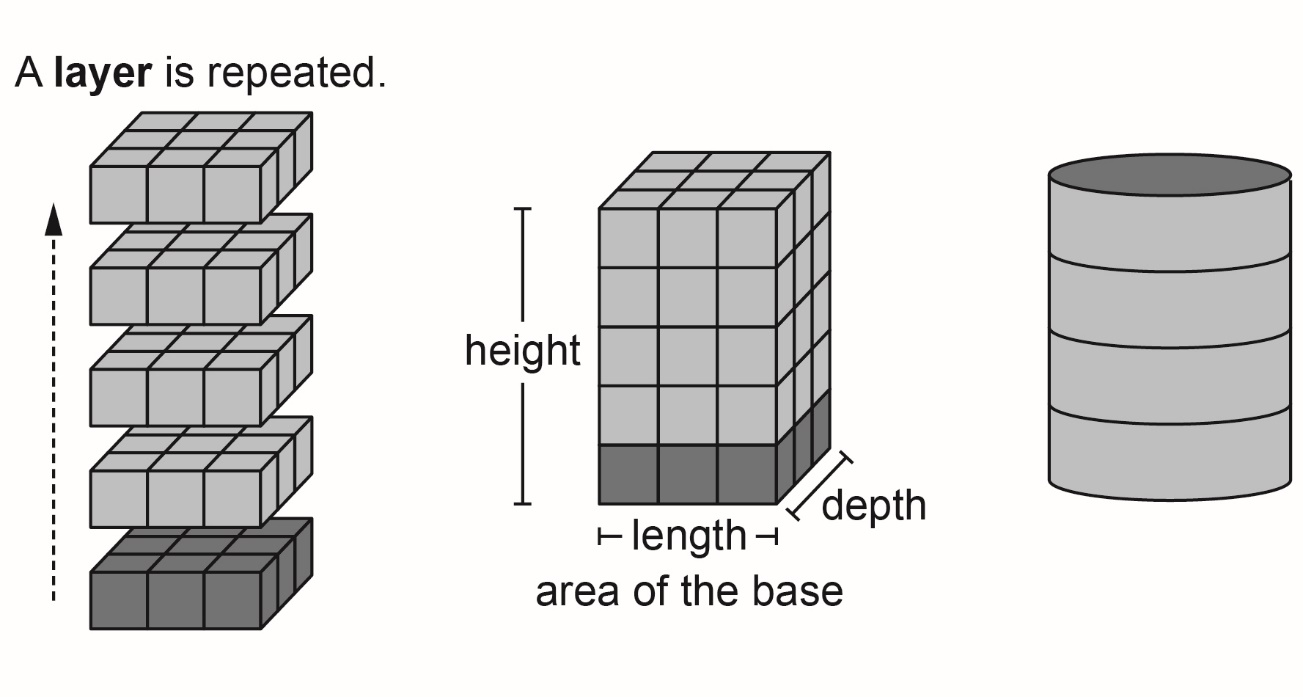
Writing Code to Calculate the   
 Volumes of Prisms and Cylinders

**Algebra**

**Unit 3 Line Master 9a**

So far, you’ve written code for applications that calculate the   
area of rectangles and circles.   
These are two-dimensional shapes, which is why the areas are measured in square units, such as *square centimetres* (cm2).

When you start to work with 3-D objects, such as prisms and cylinders, you can visualize creating an object by stacking copies of the base in layers that are each 1 unit tall until you reach the height.

****

From the diagrams, you can see that the volume of each object   
is equal to the area of the base multiplied by the height.

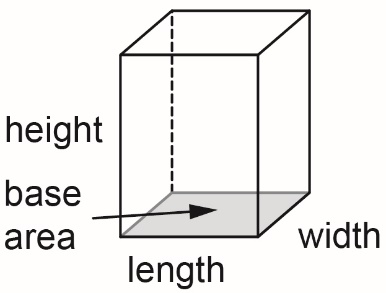
volume = base area height

Because you are multiplying three dimensions (the base length, base width, and height), volumes are measured in cubic units, such as *cubic centimetres* (cm3).

Writing Code to Calculate the   
 Volumes of Prisms and Cylinders (cont’d)

**Algebra**

**Unit 3 Line Master 9b**

**Part 1: Calculating the Volume of a Rectangular Prism**   
When the base of a prism is a rectangle,   
we call it a *rectangular prism*.

In code, the formula for the area of a   
rectangular prism is:

**volume = baseArea \* height**

Here’s a link to the application you created in Scratch that uses subprograms to calculate the area of a rectangle.

<https://scratch.mit.edu/projects/805451173/editor/>

You will modify the application by adding a volume calculation.   
Go to the link and alter the code, based on the pseudocode provided on the following page.

The dimensions of the rectangle that the user enters now represent the dimensions of the base of a rectangular prism. You will need to add blocks to the **obtainInput** subprogram to ask the user to enter a height as well.

Notice in the pseudocode, the variable called **area** in the rectangle application is renamed **baseArea**.

To rename a variable, right click on the variable name under **Variables** and select **Rename variable** and enter the new name.

Graphical user interface, text, application, chat or text message

Description automatically generated

Writing Code to Calculate the   
 Volumes of Prisms and Cylinders (cont’d)

**Algebra**

**Unit 3 Line Master 9c**

**Pseudocode: Calculating the Volume of a Rectangular Prism**

*Obtain Input Subprogram*

|  |
| --- |
| subprogram obtainInput  output “Enter the base length of the prism in centimetres:”  **length** = user input  output “Enter the base width of the prism in centimetres:”  **width** = user input  output “Enter the height of the prism in centimetres:”  **height** = user input |

*Calculate Base Area Subprogram*

|  |
| --- |
| subprogram calculateArea  **baseArea** = **length** \* **width** |

*Calculate Volume Subprogram*

|  |
| --- |
| subprogram calculateVolume  volume = baseArea \* height |

*Output Info Subprogram*

|  |
| --- |
| subprogram outputInfo  output “The base area is “, **baseArea**, “ square centimetres.”  output “The volume is “, **volume**, “ cubic centimetres.” |

*Main Program*

|  |
| --- |
| output “I'll calculate the volume of your rectangular prism.”  run obtainInput subprogram  run calculateArea subprogram  run calculateVolume subprogram  run outputInfo subprogram |

Writing Code to Calculate the   
 Volumes of Prisms and Cylinders (cont’d)

**Algebra**

**Unit 3 Line Master 9d**

Your main program should look like this when completed:  
Table

Description automatically generated

1. Try out your application by using it to determine the volume

of a rectangular prism with each set of dimensions.

The first one can be calculated mentally and serves as a way

to check whether your code is correct.

a) length: 10 cm, width: 10 cm, height: 10 cm

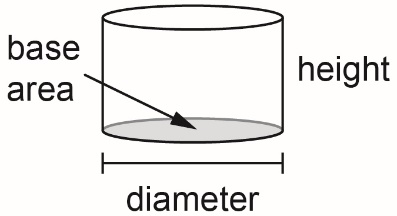
b) length: 25 cm, width: 17 cm, height: 8 cm

c) length: 125 cm, width: 64 cm, height: 32 cm

Writing Code to Calculate the   
 Volumes of Prisms and Cylinders (cont’d)

**Algebra**

**Unit 3 Line Master 9e**

**Part 2: Calculating the Volume of a Cylinder**

Here is an image of the completed Scratch   
code for an application to calculate the volume   
of a cylinder:

Graphical user interface

Description automatically generated

1. Pseudocode for this application is provided here and on the   
 next page but some parts are missing.   
 Fill in the blanks to complete the missing parts.

*Obtain Input Subprogram*

|  |
| --- |
| subprogram obtainInput  output “What is the diameter of the base circle in  centimetres?”  **diameter** = user input  output “What is the height of the cylinder in  centimetres?”  **height** = user input |

*Calculate Radius Subprogram*

|  |
| --- |
| subprogram calculateRadius  **radius = diameter/2** |

Writing Code to Calculate the   
 Volumes of Prisms and Cylinders (cont’d)

**Algebra**

**Unit 3 Line Master 9f**

*Calculate Base Area Subprogram*

|  |
| --- |
| subprogram calculateArea  **baseArea** = **pi** \* **radius** \* **radius** |

*Calculate Volume Subprogram*

|  |
| --- |
| subprogram calculateVolume  **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** |

*Output Info Subprogram*

|  |
| --- |
| subprogram outputInfo  output “The area is “, **baseArea**, “ square centimetres.”  output “\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_” |

*Main Program*

|  |
| --- |
| pi = 3.14  output “I'll calculate the volume of your cylinder.”  run \_\_\_\_\_\_\_\_\_\_\_\_\_ subprogram  run \_\_\_\_\_\_\_\_\_\_\_\_\_ subprogram  run \_\_\_\_\_\_\_\_\_\_\_\_\_ subprogram  run \_\_\_\_\_\_\_\_\_\_\_\_\_ subprogram  run \_\_\_\_\_\_\_\_\_\_\_\_\_ subprogram |

2. Here is a link to the completed application for calculating   
 the volume of a cylinder in Scratch.

<https://scratch.mit.edu/projects/805563755/editor/>

Use the application to determine the volume of a cylinder   
 with each set of dimensions.

a) diameter: 20 cm, height: 10 cm

b) diameter: 34 cm, height: 50 cm

c) diameter: 120 cm, height: 88 cm

Writing Code to Calculate the   
 Volumes of Prisms and Cylinders (cont’d)

**Algebra**

**Unit 3 Line Master 9g**

**Additional Challenge**

Write code for an application to calculate the volume of   
a triangular prism.   
You might find it helpful to begin by writing pseudocode.   
As you plan your code, think about what information you   
need to determine the area of the base triangle.

