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.

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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
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**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.



 Writing Code to Calculate the
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**Algebra**

**Unit 3 Line Master 9c**

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

*Obtain Input Subprogram*

|  |
| --- |
| subprogram obtainInputoutput “Enter the base length of the prism in centimetres:” **length** = user inputoutput “Enter the base width of the prism in centimetres:”**width** = user inputoutput “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 outputInfooutput “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 subprogramrun calculateArea subprogramrun calculateVolume subprogramrun outputInfo subprogram |

 Writing Code to Calculate the
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**Algebra**

**Unit 3 Line Master 9d**

Your main program should look like this when completed:


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:



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 obtainInputoutput “What is the diameter of the base circle in centimetres?” **diameter** = user inputoutput “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 outputInfooutput “The area is “, **baseArea**, “ square centimetres.”output “\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_” |

 *Main Program*

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

