

Using Code to Calculate the Areas of Rectangles and Circles

Part 1: Area of a Rectangle

Let's take a look at a Scratch application that determines the area of a rectangle based on dimensions input by the user.

Click on this link to access the application:

<https://scratch.mit.edu/projects/805357000/editor/>

Here's the code that you will see:

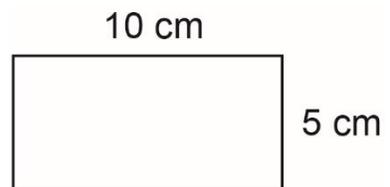
```

when clicked
say "I'll calculate the area of your rectangle." for 2 seconds
ask "Enter the length of the rectangle in centimetres." and wait
set length to answer
ask "Enter the width of the rectangle in centimetres." and wait
set width to answer
set area to length * width
say "The area is " + area + " square centimetres." for 3 seconds
  
```

If you have a Scratch login, save the project in your Scratch account by selecting **Remix** at the top of the screen. A login is not required to work with the code, but you will not be able to save your changes without it.

1. Without using the application, calculate the area of a rectangle with length 10 cm and width 5 cm.

How did you determine the answer?



Using Code to Calculate the Areas of Rectangles and Circles (cont'd)

2. Click on the green flag above the stage to execute the application. When the program asks for input, enter 10 for the length and 5 for the width. Click on the checkmark symbol or press return to enter each dimension.

Your output should look like the one below.

Does the calculated area agree with your answer to Question 1?



3. Use the program to determine the area of rectangles with these dimensions.
- a) length 15 cm, width 7.5 cm
 - b) length 24 cm, width 9 cm
 - c) length 105 cm, width 57 cm
4. List all the possible pairs of whole number dimensions for a rectangle with an area of 36 cm^2 .
Input some of your answers in the program to verify they are correct.

Using Code to Calculate the Areas of Rectangles and Circles (cont'd)

Next, let's look at the pseudocode for this program.

Pseudocode is an informal way of describing a computer program—it is somewhere between everyday language and programming code. Computer programmers, or coders, often use pseudocode when planning their programs.

Pseudocode for *Calculating Area of a Rectangle* Program

```
output "I will calculate the area of your rectangle."  
output "Enter the length of the rectangle in  
centimetres:"  
length = user input  
output "Enter the width of the rectangle in centimetres:"  
width = user input  
area = length * width  
output "The area is ", area, " square centimetres."
```

5. How would you change this pseudocode so that the instructions for the user asks for metres rather than centimetres?
Alter the Scratch code to reflect this change now.

Part 2: Area of a Circle

Let's write similar code to calculate the area of a circle.

Here's the pseudocode for calculating the area of a circle.

```
pi = 3.14  
output "I will calculate the area of your circle."  
output "Enter the diameter of the circle in centimetres:"  
diameter = user input  
radius = diameter/2  
area = pi * radius * radius  
output "The area is ", area, " square centimetres."
```

Using Code to Calculate the Areas of Rectangles and Circles (cont'd)

If you have prior experience coding in Scratch, you may go ahead and create the Scratch application now.

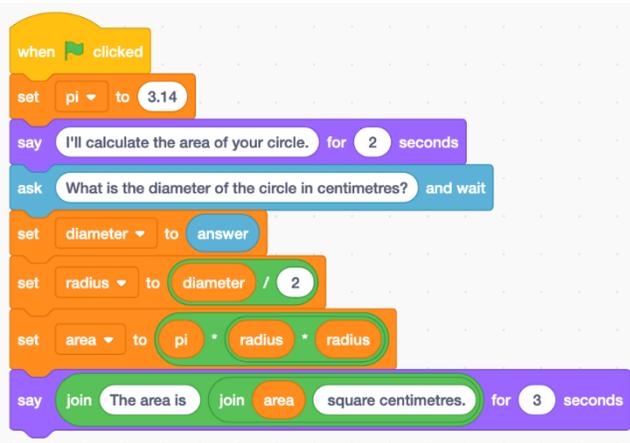
Otherwise, take a look at the code below.

You can use the link below to open an application that contains only a stage backdrop and sprite.

If you prefer, you can open a new Scratch file of your own and select a backdrop and sprite of your choice from the area just below the stage.

<https://scratch.mit.edu/projects/805563622/editor/>

Recreate the code shown below. If you are uncertain where to find or how to use any of the blocks, take a look at the coding tips.



Coding Tips

Variables

- To create variables, go to **Variables, Make a variable.**
- The four variables needed for this application are **diameter**, **radius**, **area**, and **pi**.
- Use a **set** block to set the **pi** variable to 3.14.



Using Code to Calculate the Areas of Rectangles and Circles (cont'd)

Say and join blocks

- The **say** block is found under **Looks**.
- For the first say block, you just need to enter the speech bubble text.
- When you come to create the second **say** block at the end of the program, you will use two **join** blocks inside each other. These can be found under **Operators**.

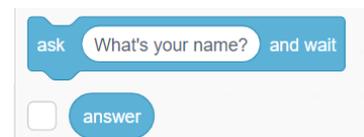
Join blocks allow you to say more than one thing inside of a speech bubble, which is useful when you'd like to output the value of a variable, such as **area**, a long with some text.

Complete the **say** block as shown.



Ask and Wait Blocks

- The **ask and wait block** can be found under **Sensing**.
- You will need both the **ask and wait** block, as well as the **answer** block found beneath it.
- Enter the prompt that you want to appear in the speech bubble.
- Use a **set** block to set the **diameter** to the answer.



Operators

- To determine the radius, retrieve a **division operator** from under **Operators**.
- Snap this into the **set** block found under **Variables**, with the **radius** variable selected in the pulldown menu.



Using Code to Calculate the Areas of Rectangles and Circles (cont'd)

- Drag the **diameter** variable into the first oval and enter the number **2** as shown.



- To calculate the area, you will need two **multiplication operators**. Place one inside of the other.



- Snap this into the **set** block found under **Variables**, with the **area** variable selected in the pulldown menu.
- Drag and insert the **pi** and **radius** variables as shown.



If you're stuck, here is a link to the completed application.

<https://scratch.mit.edu/projects/765438443/editor/>

1. a) Use the formula $A = \pi r^2$ to determine the area of a circle with diameter 20 cm. Remember that the radius is half the diameter.
b) Now use your Scratch application to determine the area of a circle with diameter 20 cm.
c) Do your answers to parts a and b match? If they don't check your calculation and your code to look for errors.
The area should be 314 cm².
2. Once you are satisfied that your code is correct, use it to determine the area of a circle with each given diameter. Round each answer to the nearest square centimetre when necessary.
a) 12 cm b) 64 cm c) 120 cm
3. What is the benefit of having an application that can calculate areas of rectangles or circles?