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Algebra
Unit 3 Line Master 8a

Using Subprograms to Organize Your Code

Part 1: Application that Calculates the Area of a Rectangle

Let's revisit the application that determined the area of a rectangle and reorganize the code by creating subprograms.

A ***subprogram*** contains a small set of instructions to complete a task and is referenced and called to action by the main program.
In Scratch, when we make a new block, we have made a subprogram.

Use the link to the application you used to determine areas of rectangles in Master 7:

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

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.

This pseudocode shows how we will reorganize the application into 3 subprograms and a main program that calls them up.

Obtain Input Subprogram

```
subprogram obtainInput
    output "Enter the length of the rectangle in
      centimetres:"
    length = user input
    output "Enter the width of the rectangle in
      centimetres:"
    width = user input
```

Calculate Area Subprogram

```
subprogram calculateArea
    area = length * width
```

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Output Info Subprogram

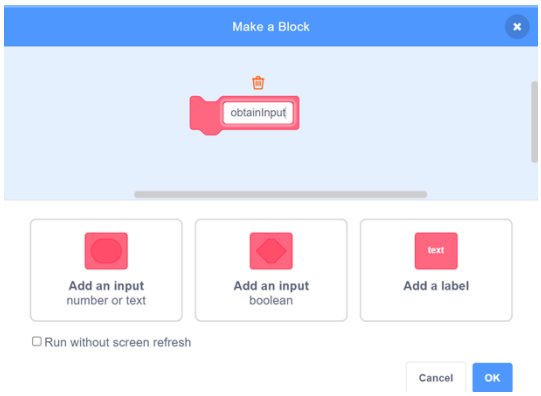
```
subprogram outputInfo
    output "The area is  ", area, " square centimetres."
```

Main Program

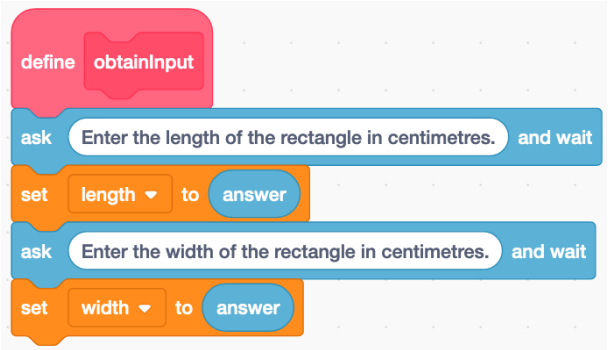
```
output "I'll calculate the area of your rectangle."
run obtainInput subprogram
run calculateArea subprogram
run outputInfo subprogram
```

1. Start by creating a subprogram containing the code that requests information about length and width from the user.

   - To create a subprogram, select **My Blocks**, **Make a Block**. Name the first subprogram **obtainInput** and click **OK**.



   - Pull apart the blocks from the original program. Drag the relevant **ask** and **set** blocks so they appear beneath the **obtainInput** subprogram as shown here.



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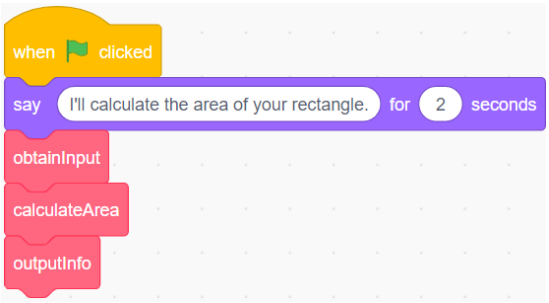
2. Create a second subprogram called **calculateArea**.
   Drag the **set area** calculation code to appear beneath it.

3. Create a third subprogram called **outputInfo**.
   Drag the **say** block that states the calculated area to appear beneath it.

4. Now you can adjust your main program to "call" the subprograms into action, as shown below.



- You have broken down the main program into smaller, more manageable steps. This means there is less code in the main program. It also helps to clarify what is happening in each part.
- If you need to debug or correct errors in the application, you can focus on one of the subprograms rather than having to look at all of the code at once.
- Try the application with dimensions you used in Part 1 of Master 7 to confirm it outputs the correct areas.

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Using Subprograms to Organize Your Code (cont'd)

Part 2: Application that Calculates the Area of a Circle

Now that you know how to create subprograms, you can incorporate subprograms into the application you used to calculate the area of a circle in Master 7. Use this link to the application without subprograms:

https://scratch.mit.edu/projects/805564875/editor/

Create subprograms for each part of the application.
Follow the pseudocode provided below. Be sure to name your subprograms based on the names used in the pseudocode.
Check your revised program using diameters from Part 2 of Master 7.

Obtain Input Subprogram

```
subprogram obtainInput
    output "Enter the diameter of the circle in
      centimetres:"
    diameter = user input
```

Calculate Radius Subprogram

```
subprogram calculateRadius
    radius = diameter/2
```

Calculate Area Subprogram

```
subprogram calculateArea
    area = pi * radius * radius
```

Output Info Subprogram

```
subprogram outputInfo
    output "The area is  ", area, " square centimetres."
```

Main Program

```
pi = 3.14
output "I'll calculate the area of your circle."
run obtainInput subprogram
run calculateRadius subprogram
run calculateArea subprogram
run outputInfo subprogram
```