



## “Ice Cream Machine”



\$10

Summer is coming, and you have just acquired a rare ice cream cone printer! Before you can make big bucks, though, you’ll have to program your machine to create and price different types of ice cream cones to make your life easier when you are out selling your desserts!

You’ll approach this project in three stages:

1. Making the Ice Cream
  - Customers can choose between three different sizes and up to three scoops of each size. You’ll have to program your machine to stack the scoops appropriately.
2. Making the Cone
  - You’ll need a cone that is proportional in height to the size of the ice cream scoops and fits the bottom one snugly.
3. Calculating the Price
  - Different sizes cost different amounts, so you’ll have to write a formula that can quickly calculate how much a particular type of cone costs.

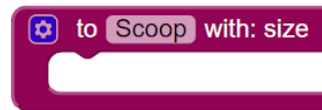
Use the written hints along the way and the help of your teacher to get your machine up and running!

## Part I: Making the Ice Cream

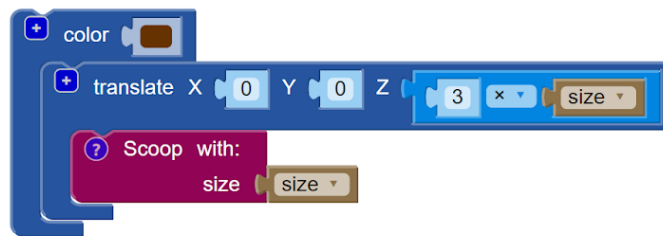
You'll first want to create a variable that can be set to the size of ice cream scoops that your customer desires. The scoop sizes tell what the radius of the spherical scoop should be.

Small → 3 units      Medium → 4 units      Large → 5 units

Now use a module block to provide instructions for how to build a scoop using your variable to set the radius of the sphere.



Create a block for each of the three possible scoops a customer can order. You'll need to use your "size" variable, the "Scoop" module you made, and some translations to stack the scoops correctly. You'll want to leave room for the cone - whose size will depend on the radius of your ice cream scoop - so your first scoop block could look like this:

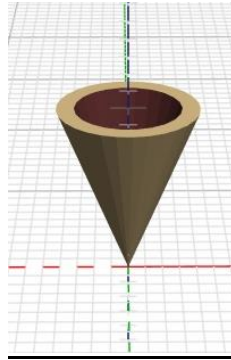


Hint: The height of scoops two and three will also need to depend on the size of the scoops so that the scoops stack nicely together.

(Note: If you want to have only one or two scoops, disable the blocks for scoops two or three. Make sure to label your work with comments!)

**Checkpoint:** You'll know you're ready to move on to Part II when you can stack three scoops of any given size together nicely and leave room for the cone below.

## Part II: Making the Cone



Your cone should have both an appropriate height and an appropriate radius for the size of the scoops that it will hold.

Hint: Use a difference block and be sure to incorporate your “size” variable into the cone’s dimensions.

**Checkpoint: You’ll know you’re ready to move on the Part III when you can set the size variable and render a cone with three scoops that all fit in the cone and together nicely.**

## Part III: Calculating Cost

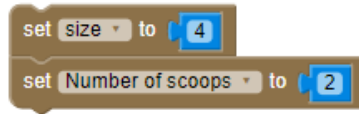
Now that your ice cream machine can print cones and scoops, you want it to calculate and print how much each customer’s combination will cost. The price of the ice cream cone depends on how many and what size scoops are ordered.

Imagine that the ice cream costs  $\$0.40/\text{units}^3$ . This means that for every cubic unit of volume a customer buys, they should pay  $\$0.40$ . Let’s imagine a customer buys just one scoop of ice cream with a scoop size (radius) of 5 units.

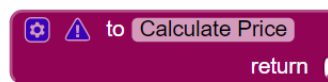
What is the volume of this sphere of ice cream?

Multiply this volume by  $\$0.40/\text{units}^3$  and you’ll have the cost for this purchase!

We now want to write a formula in BlocksCAD that will get it to do this calculation for us for different scoop sizes and numbers. First create a variable for “Number of scoops” so that you now have:



Grab a function block from the Modules menu and call it “Calculate Price”:



This block tells BlocksCAD to do a specific calculation and give us back (“return”) the answer. The calculation we are asking it to do is to calculate the price of the ice cream.

Use math blocks with external inputs (right click the block and select external inputs) to create a function that looks like the one below. Examine the setup of the function and fill in the blanks with the following seven blocks (found in the Math or Variables menus) based on what you know about how to calculate the volume and then price of an ice cream scoop:

