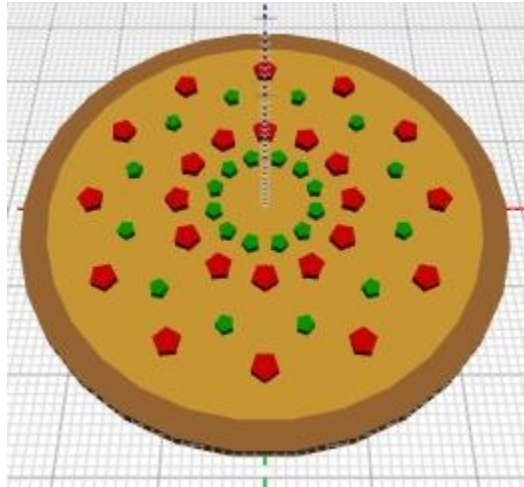




## “Pizza Printer”



You’ve decided to open a high -tech pizza shop in town to show off your newest invention: The Pizza Printer! This futuristic culinary creation combines the baker and the oven into one machine that can make, top, and cook a pizza based on your instructions. It has the potential to revolutionize a favorite dinner, but your machine needs some instructions first before business can start booming.

In this exploration, you will:

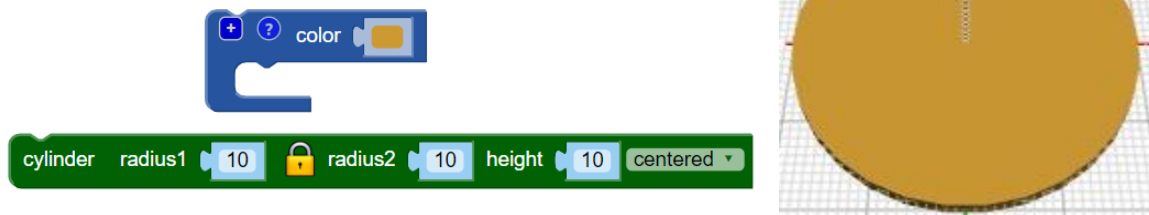
- 1) Teach your machine to make a pizza by writing it a “recipe”
- 2) Make sure that your machine can make pizzas of any size
- 3) Solve some pizza problems that may arise once you start business
- 4) Teach your machine to add different types of toppings to your pizza

## Part I: A Recipe for Pizza

The first step in writing down any recipe is to make the meal yourself!

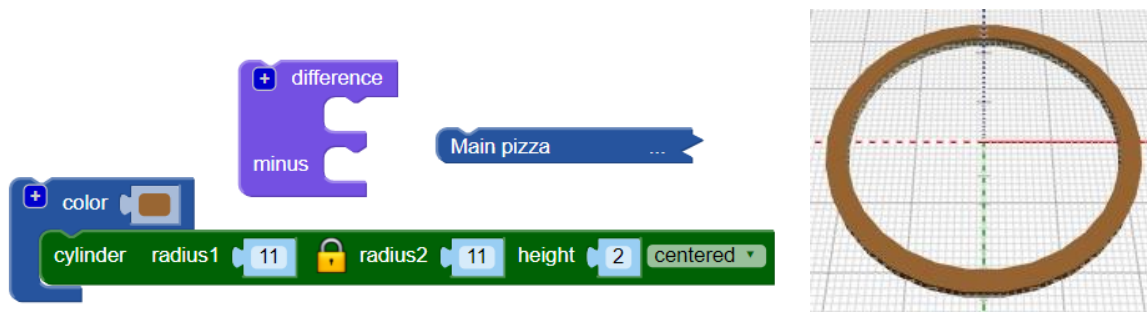
Start by making the inside of the pizza to be 20 cm in radius. The shape you're aiming for and the blocks you'll need to work with are shown below:

Note: Assume that one unit on the BlocksCAD axes are equal to 1 cm.



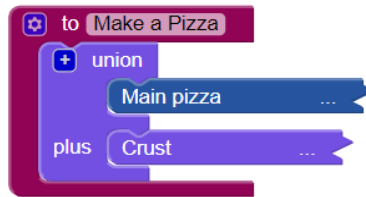
Use a comment to name this block "Main Pizza".

Now add a crust that is 3 cm thick. The crust alone without the inside of the pizza can be made using the blocks below. The "Main pizza" block is a copy of what you just made.



Add a comment to call these blocks "Crust". Use a union block to bring together "Main Pizza" and "Crust".

In programming, a module like the one below (from the Modules menu) acts as a “recipe”. Take the union block that contains your pizza and crust and put it inside of this module:



Try rendering your code. What happens? That’s because you’ve only provided a recipe, but haven’t actually asked your machine to execute that recipe yet. If you go back to the Modules menu, you’ll notice a block called “Make a Pizza”. Drag this block out into your workspace and then render again. Voila, you’ve got a pizza!

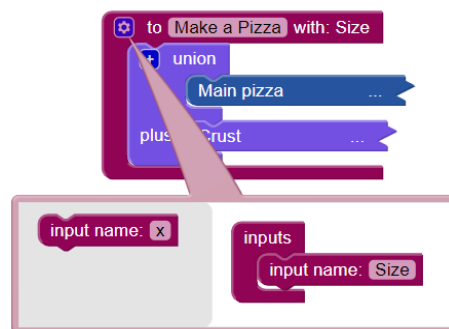
**Checkpoint:** Show your teacher the recipe for a basic pizza before moving on to Part II.

## Part II: An Adaptable Machine

You’ve now given your machine a recipe to make one specific pizza that has a radius, or size, of 20 cm.

You may, however, want your Pizza Printer to be able to make pizzas that are bigger or smaller than this. Instead of writing a whole new recipe, you can just make the one you already have *adaptable*.

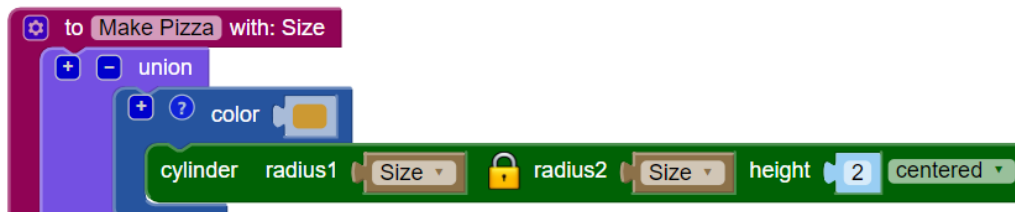
On the top left corner of your “Make a Pizza” recipe module block there is a gear. Click that gear and drag an input block to the inputs on the right. Name this input size.



Now when you drag out your actual “Make a pizza” block, there will be a place where you can set the variable “Size” to be a specific number. Try setting “Size” to different numbers using the number block from the Math menu. What happens?

Even though you’ve asked your machine to make a pizza of a different size, the only recipe it has written down is for a 20 cm radius pizza with 3 cm crust! To actually get your recipe to change based on the size you want, you’ll need to incorporate the “Size” variable (you can get this from the Variables menu) into your recipe wherever you want something to depend on the size you specify.

For example, you’d want the block that makes your main pizza to incorporate the “Size” block:



Try to adjust the crust block so that it fits around a pizza with radius set to “Size”.

Hint: How much bigger do you want the crust to be than the main pizza? Use a math block to code this into your recipe.

**Checkpoint:** Show your teacher that your Pizza Printer can make a pizza with a main pizza that has a radius of 10 cm and a crust that is 3 cm thick.

### Part III: Pizza Calculations

Test both your Pizza Printer and your readiness to handle the needs of customers by solving the following pizza problems:

Note: Radius and diameter refer to just the main pizza and not the crust, unless specified. Assume that the crust is always 3 cm.

- 1) A customer orders a pizza that is 10 cm in radius. What is the diameter of the entire pizza, including the crust? Render this pizza with your printer and ensure that your answer looks accurate based on the BlocksCAD axis scales.

What length of crust is on this pizza?

Hint: What property of a circle does the crust represent, and how do you calculate this?

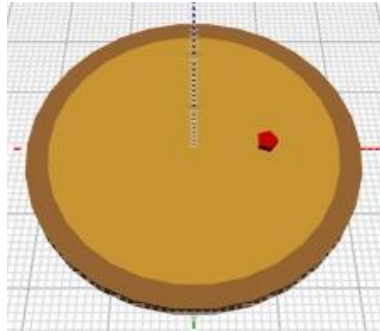
- 2) One customer orders two pizzas that each have a radius of 15 cm. Another customer orders a pizza with a radius of 25 cm. Who ordered more pizza total (excluding crust)?

- 3) A customer loves crust and wants to order a pizza that has at least 80 cm of crust. What is the smallest whole number radius that will satisfy this desire?

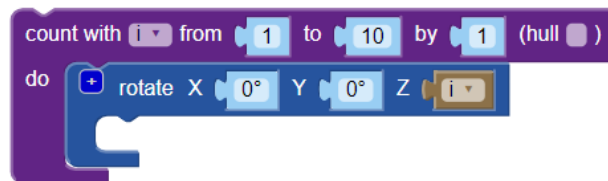
## Part IV: Adding Toppings

Your Pizza Printer can quickly make you a pizza of any size, so now it is time to program it to add some toppings! Let's start with pepperoni.

Start with a 20 cm radius ("Size") pizza. Try to place a single piece of pepperoni 10 cm from the center of the pizza and along the x-axis:



Use a loop so that there is a circle of pepperoni, spaced  $30^\circ$  apart, that are all 10 cm from the center. Try using the following blocks:



Once you successfully add a ring of pepperoni, try the following challenges and then create your own ways to increase the sophistication of your Pizza Printer:

- Add a ring of vegetables
- Use a second loop (iterated loops) to create multiple rings of a specific topping
- Create a pizza that has two halves that have different types of toppings