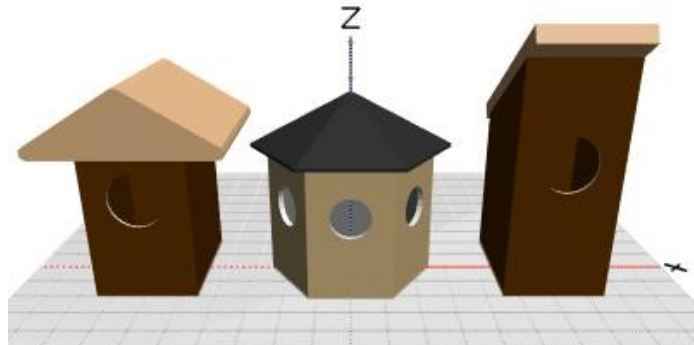




Birdhouses



Your neighbor builds her own birdhouses and is hoping to modernize her business with a machine that will do the building and printing for her. You have been hired as her engineer to help her get the company ready for business!

In this exploration you will:

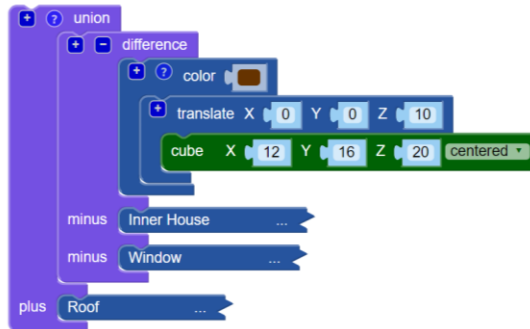
- 1) Convert birdhouse measurements
- 2) Calculate birdhouse dimensions
- 3) Program your birdhouse-making machine to build scaled houses

Check these boxes when you've completed each step:

Part I: Measurements

Your first job will be to convert some sizes for your neighbor. The program that the birdhouses are designed in uses inches, but customers typically want to know dimensions measured in feet.

Open the BlocksCAD file “Birdhouses Student File.xml”. You will see three different birdhouse blocks. Only #1 will be enabled. Right click and **Expand** this block so that you can see the block that codes for the main body of the birdhouse:



The green block has the dimensions, in inches, of this birdhouse. If x is length, y is width, and z is height, fill out the table below in both inches and feet by converting:

	Inches		Feet
Length	12	=	1.0
Width		=	
Height		=	

Collapse and **disable** the “Birdhouse #1” block (right click and select) and **expand** and **enable** the “Birdhouse #2” block.



Look again at the green cube block to determine the dimensions of this birdhouse in inches, and then convert those inches to feet:

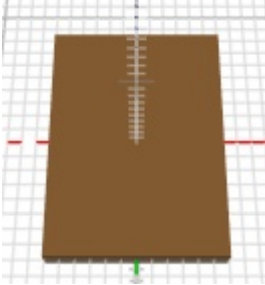
	Inches		Feet
Length		=	
Width		=	
Height		=	

Checkpoint: Confirm with your facilitator that you have accurate conversions.

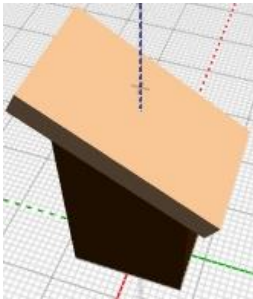
Part II: Piece Perimeters

In addition to selling full birdhouses, your neighbor also sells kits that contain the building blocks so that customers can make the birdhouses themselves at home. She needs some help calculating product descriptions for some of the pieces:

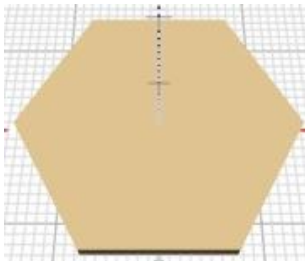
1) The base of Birdhouse #1 is 12 x 16 in. What is the perimeter of this base, in both inches and in feet?



2) The roof of Birdhouse #2 has length 15 in. and width 25 in. What is the perimeter of the roof in feet?



3) The base of Birdhouse #3 has six sides that are all 15 in. long. What shape is this base, and what is the perimeter in feet?



Checkpoint: Confirm with your facilitator that all your product descriptions are accurate.

Part III: Scaling

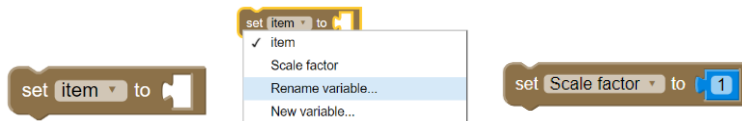
Your neighbor used to only make each bird house in one size. Now that she has a programable machine, however, she would like to easily create a birdhouse of any given size.

Grab a “**Scale**” block from the Transforms menu and pick a birdhouse to experiment on. Place the birdhouse block inside the scale block and try changing some of the numbers.



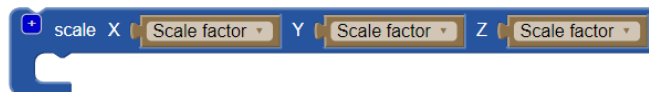
What happens when you change just one of the scale numbers? What happens when you change them all to the same new numbers?

Instead of having to grab and adjust new scale blocks every time you want to print a new printer, you can create a *variable* that makes this process faster. Grab an **item** block from the Variables menu and **rename** it from “item” to “Scale factor”. Place a number block from the Math menu into the blank space:

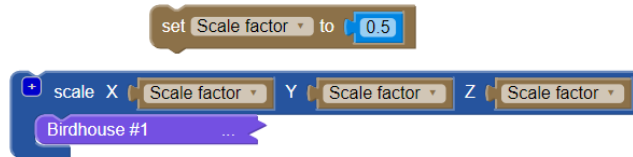


The scale factor tells your machine how to adjust the size of a birdhouse. If the scale factor is two, the birdhouse will double in size. If it's 1/2, the house will be half as big.

To use this new scale factor variable, create a scale block that has the scale factor variable in each slot. You can get the scale factor variable from the Variables menu:



You can now put this block around each birdhouse block, and whenever you set the scale factor to a different number in the brown “Set Scale factor to...” block your birdhouse will re-size accordingly.



Try making the following birdhouses using your new scaling tool:

1) Make a version of Birdhouse #1 that is two times as big as the original. The original was 20 in. tall. How tall is this bigger birdhouse *in feet*?

2) Make a version of Birdhouse #3 that is three times as big as the original. The circular opening used to be 6 in. How many *feet* wide is it now?

3) Make a version of Birdhouse #3 that is half as big as the original. The perimeter of the original hexagon base was 90 in. What is the perimeter now?