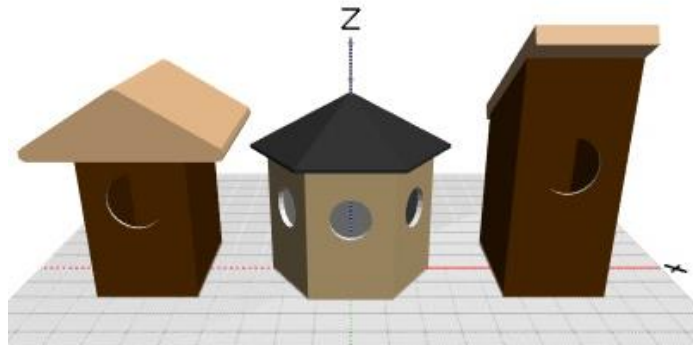




Birdhouses



Grade 4 Math Alignment

Domain: Measurement & Data

Cluster: Solve problems involving measurement and conversion of measurement

Standard: 4.MD.1 Know relative sizes of measurement units within one system of units. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit

Standard: 4.MD.3 Apply the area and perimeter formulas for rectangles in real world and mathematical problems

Level 1B CSTA Alignment

Concept: Variables

Standard: 1B-AP-09 Create programs that use variables to store and modify data

Description

Students will play the role of consultant and engineer for a neighbor's birdhouse business. They will help to **convert measurements** from inches to feet and will **calculate perimeters** of particular pieces of the birdhouses. Students will also store **scale factors** as **variables** in order to quickly adjust the size of each birdhouse.

Learning Objectives

- Students will practice converting measurements in inches to feet
- Students will calculate perimeters in different units of measurement
- Students will be introduced to the geometric concept of dilations by using the BlocksCAD scale block
- Students will practice expanding and examining code to gather information about the design it creates
- Students will create and set a variable to make their code quickly adjustable

Videos

- Working with Code: <https://www.youtube.com/watch?v=YBRaaPGuO2E>
- The Scale Block: <https://www.youtube.com/watch?v=96-8qFerCc8>
- Variables: <https://www.youtube.com/watch?v=l3OeE52zIns>

Review/Prior Knowledge

Students should be familiar with using division to convert smaller units of measurement into bigger units in the same system. They should have some experience using the terms length, width, and height, and will need to be familiar with the concept of perimeter.

Resources

- Student Worksheet: Birdhouses → Student guide for activity
- Birdhouses Student File.xml → BlocksCAD file for students to start with

Teacher Notes

General Introduction: Some basic unit conversions from inches to feet, perhaps by measuring and reporting the lengths of objects around the room, will help to remind students how to relate the two units. Measuring the perimeter of a rectangle, like a book or a desk, in the classroom will also help students prepare to think about perimeters.

BlocksCAD Introduction/Refresher: Students do not need any prior BlocksCAD experience for this lesson. Before they start working, students should be reminded about how to keep an organized workspace: Right-clicking on blocks will let them disable (keep blocks in workspace but not have object show up in render worksheet), delete, collapse, or add comments to their blocks. When students open their

Birdhouses Student File.xml (Assign from your Classroom page or send them the .xml and do New Project → Project → Load Blocks from your computer) they will see three different birdhouse blocks which they will enable throughout the lesson when prompted by their handout. Their student handout will walk them through the process of creating and using a variable, so they do not need any prior experience with that BlocksCAD menu. Encourage students to use the check boxes next to each instruction so that they can keep track of what they have completed.

Exploration: In **Part I** students will expand and examine the code for birdhouses #1 and #2 to determine some dimensions in inches. They will then convert those dimensions to feet to complete the following tables:

Birdhouse #1

	Inches	=	Feet
Length	12	=	1.0
Width	16	=	1.33
Height	20	=	1.66

Birdhouse #2

	Inches	=	Feet
Length	12	=	1.0
Width	18	=	1.5
Height	28	=	2.33

In **Part II** students will answer three questions about perimeters of specific pieces of the birdhouses:

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

$$\text{Perimeter} = 12 + 12 + 16 + 16 = 56 \text{ in.} = 4.66 \text{ ft.}$$

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

$$\text{Perimeter} = 15 + 15 + 25 + 25 = 80 \text{ in.} = 6.83 \text{ ft.}$$

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?

$$\text{Hexagon perimeter} = 15 \times 6 = 90 \text{ in.} = 7.5 \text{ ft.}$$

If you would like to move everybody together to Part III, have students also calculate the areas of the rectangles in #1 and #2

In **Part III** students will be guided through using the scale block. Challenge them to clearly describe how changing the numerical values in the scale block fields affects the birdhouse (ie. "It stretches along the x-axis" rather than just "It gets bigger").

The handout walks students through creating and using a variable for "Scale factor" so that they can quickly create scaled versions of any of the birdhouses.

Reflection Questions and Activities

- 1) What other variables could be incorporated into the design of a birdhouse so that it was even more customizable?
- 2) Other BlocksCAD activities in the perimeter progression: 4th grade Class Table (AR) and Halloween Hats (AR)
- 3) Other BlocksCAD activities in the variables progression: Dinner Robot, Pie Pieces, and Sugar Cubes