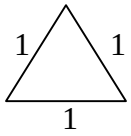
Activity Name: Building the Train

Objective:
Students will demonstrate the ability to construct a polygonal train and calculate the perimeter. Also, students will demonstrate the ability to integrate technology to determine the formula for calculating the perimeter of "n" number of polygons.

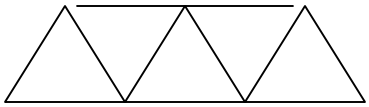
Getting Started:
How many times have you or someone you know been confused over the definition of perimeter? In its simplest form, perimeter is the sum of the measures of all sides of a polygon. However, what happens when we connect various polygons and join them in a "train" where one polygon blends into another one? This activity is designed to clear up any confusion over calculating the perimeter and help discover the perimeter formula for a polygonal train.

Activity:
Examine the following polygon and determine its perimeter. You may use pattern blocks to build the train and determine the perimeter each time a new polygon is added to the train enhances this activity.



The perimeter for this figure is 3 units. To calculate the perimeter of this triangle, simply add up the sides. Since all three sides of this triangle are congruent, this triangle in an equilateral triangle.

Can you calculate the perimeter of the following "Triangle Train" where each side of the triangle measures 1 unit? (Note: All triangles in this train are equilateral triangles.)



One way to determine the perimeter is to count up all of the sides. Once completed, the perimeter of this Triangle Train measures 7 units.

What would be the perimeter of a Triangle Train if it had "n" triangles in it? Would you be able to come up with a formula to determine the perimeter based on this information? Do you think there is some kind of pattern involved here that would make solving this problem easier?

To solve this problem, let's create a chart that shows the number of triangles in the train and its respected perimeter.

Triangles	Perimeter
1	3
2	4
3	5
4	6
n	???

By looking at this chart, can you see a constant relationship between the number of triangles and the perimeter of its train? You might be able to see that for every triangle, its perimeter is 2 more than the number of triangles in the train. Therefore, the Perimeter of a Triangle Train with "n" number of triangles would be "n + 2".

Calculator Notes:

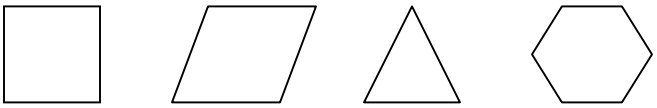
To Access the STAT Application:

- From the Main Menu, move the cursor to the STAT icon and press EXE.
- Input data into List 1 and List 2. (As a general rule when working with functions, input the independent (input) data in List 1 and the dependent (output) data in List 2.
- Press F1 to graph the data. (GRPH)
- Press F1 again to graph the data in Graph 1. (GPH1)
- Once the data points have been displayed, press F1 to calculate the data.
- Decide what kind of data is being displayed. Since the data is linear, press F2.
- Examine the data for the Linear Regression.
- If needed, press F5 to copy that formula into the GRAPH application, press EXE to paste the function into the Graph Editor window. Then, press F6 to Draw the line for the graph.

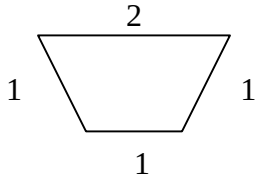
Using the Graph Solve:

- Once you have entered the function into the Graph Editor window, graph the function.
- To use the graph to a specific value, use the Graph Solve (F5) feature.
- Press F6 to scroll to the next menu.
- Press F1 to enter an X-Value and have the calculator show the Y-Value.
- Press F2 to enter a Y-Value and have the calculator show the X-Value.

Sample Problems:
Each of these figures (square, parallelogram, triangle, hexagon) is considered **regular** polygons as each side measures 1 unit.



This polygon is an isosceles trapezoid and has the following dimensions.



A **train** is a connected group of congruent polygons joined on a particular side. Using your manipulatives, (or you can draw them) construct a train of 1, 2, 3, and 4 polygons and determine the perimeter for each train. Then, develop a formula for determining the perimeter of a train consisting of "n" polygons. Next to the table write any notes to help you remember how you determined the formula for each perimeter.

For each problem, input the data into the STAT application and use the calculator to determine the formula for each train.

# Squares	Perimeter
1	
2	
3	
4	
"n"	

# Parallelograms	Perimeter
1	
2	
3	
4	
"n"	

# Trapezoids	Perimeter
1	
2	
3	
4	
"n"	

# Hexagons	Perimeter
1	
2	
3	
4	
“n”	

Answers:

# Squares	Perimeter
1	4
2	6
3	8
4	10
“n”	2n + 2

# Parallelograms	Perimeter
1	4
2	6
3	8
4	10
“n”	2n + 2

# Trapezoids	Perimeter
1	5
2	8
3	11
4	14
“n”	3n + 2

# Hexagons	Perimeter
1	6
2	10
3	14
4	18
“n”	4n + 2

Extension:
Have students use construction paper to create a train that could be used as a border around the classroom. Have the students label the perimeter under each polygon in the train as an ordered pair (# of polygons, perimeter).