ALGEBRA I ACTIVITY 7:
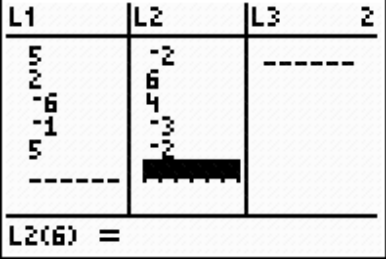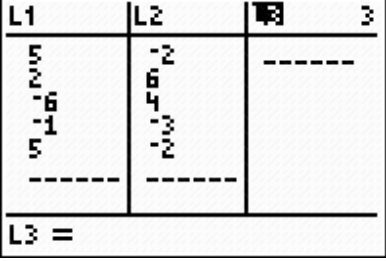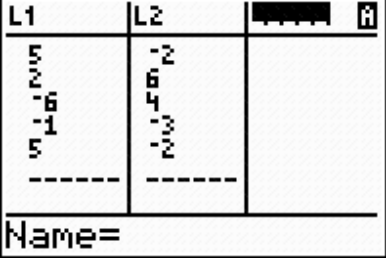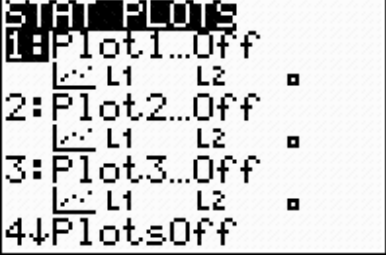# TRANSFORMATIONS IN THE COORDINATE PLANE
TIalgebra.com

ACTIVITY OVERVIEW:
In this activity we will
- Create a polygon using coordinate pairs in lists by setting up a connected scatter plot
- Use operations on lists to translate, reflect, and dilate the polygon

Press STAT ENTER. Type in coordinates to form a polygon. In the example shown, five points are entered to form a four-sided polygon. The first and last points are the same so that the calculator will know to connect the points back to the first vertex.

Press ▶ ▲ to the top of **L3**. Press DEL to remove **L3**.

Repeat to remove **L4**, **L5**, and **L6**. The screen will appear as shown here. The untitled list will be next to **L2**. The calculator will already be in Alpha mode, ready for the list to be named. Later this list will be named and used.

Press 2nd Y= to prepare to set up a plot. Press ENTER or 1 to access **Plot 1**.

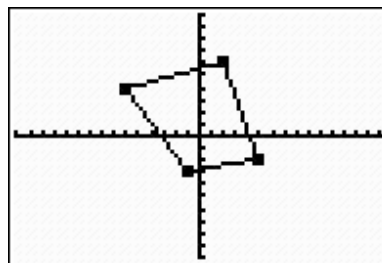|	
Press [ENTER] to turn the plot **On**. Press [▼][▶][ENTER] to turn on the "connected scatter plot" option. Use the defaults for the remaining choices.	Plot1 Plot2 Plot3 **On** Off Type: ⌐ ▨ ⅃ʰₗ ⊞⋯ ⊞⊞ ⌐ Xlist:L₁ Ylist:L₂ Mark: ■ + .
Press [ZOOM][5] to graph in a square window.	**ZOOM** MEMORY 1:ZBox 2:Zoom In 3:Zoom Out 4:ZDecimal 5:ZSquare 6:ZStandard 7↓ZTrig
What action would move the polygon 3 units to the right? Return to the lists by pressing [STAT][ENTER]. You will name the next list **TR3**. At the top of the untitled list, press [4][×] to access the letters "T" and "R." Press [ALPHA] to turn off the Alpha mode and press [3] to complete the list name. Press [ENTER].	L1 L2 **TR3** 3 5 -2 ------ 2 6 -6 4 -1 -3 5 -2 ------ ------ TR3 =
To translate the polygon 3 units to the right, add 3 to the *x*-coordinates. While the cursor is at the top of **TR3**, press [2nd][1][+][3]. This will command the calculator to access **L1** and add three to its members.	L1 L2 **TR3** 3 5 -2 ------ 2 6 -6 4 -1 -3 5 -2 ------ ------ TR3 =L₁+3
Press [ENTER].	L1 L2 TR3 3 5 -2 **8** 2 6 5 -6 4 -3 -1 -3 2 5 -2 8 ------ ------ ------ TR3(1) =8

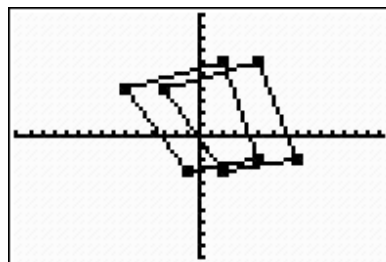|	
Set up **Plot 2** to graph the polygon shifted 3 units to the right. Press 2nd Y= 2. Turn the plot **On** and select "connected scatter plot." While on top of **Xlist**, press 2nd STAT to access the names of all the lists.	Plot1 **Plot2** Plot3 **On** Off Type: ⌐ ◢ ⊿ ⊡⊡ ⊡⊡ ⌐ Xlist: ∏1 Ylist: L2 Mark: ▫ + ·
Select **TR3** by pressing the number next to it or by going down to it and pressing ENTER.	**NAMES** OPS MATH 1: L1 2: L2 3: L3 4: L4 5: L5 6: L6 7▶ TR3
This will identify **TR3** as the **Xlist**. The *y*-coordinates will not change, so **L2** will remain the **Ylist**.	Plot1 **Plot2** Plot3 **On** Off Type: ⌐ ◢ ⊿ ⊡⊡ ⊡⊡ ⌐ Xlist: TR3▮ Ylist: L2 Mark: ▫ + ·
Press GRAPH.	
Create other lists using operations on the original *x*- and *y*-coordinates. To name a new list press STAT ENTER. First arrow up to the top of **TR3**. Then right arrow to reveal a new unnamed list.	L2 | TR3 | ▬▬▬ ▯ -2 | 8 6 | 5 4 | -3 -3 | 2 -2 | 8 ------ | ------ Name=
Follow the steps outlined previously to name the list **TD5**, meaning translate down 5 units.	L2 | TR3 | **TD5** 4 -2 | 8 | ------ 6 | 5 4 | -3 -3 | 2 -2 | 8 ------ | ------ TD5 =

| Command the calculator to subtract 5 from each member of **L2**. | L2: -2, 6, 4, -3, -2   TR3: 8, 5, -3, 2, 8   TD5: ------
 TD5 =L₂-5█ |

| Press ENTER. | L2: -2, 6, 4, -3, -2   TR3: 8, 5, -3, 2, 8   TD5: -7, 1, -1, -8, -7
 TD5(6)= |

| Set up **Plot 2** as shown. | Plot1 **Plot2** Plot3
 On Off
 Type: [graph icons]
 Xlist:L₁
 Ylist:TD5█
 Mark: ▫ + · |

| Press GRAPH. | [graph showing transformed figure] |

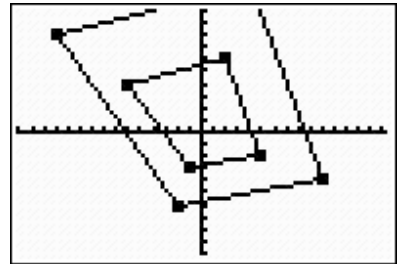| Another transformation is a dilation. Double both the original x- and y-coordinates to stretch the graph to double its length and width. | L2: -2, 6, 4, -3, -2   DBLX: 10, 4, -12, -2, 10   DBLY: ------
 DBLY=2*L₂█ |
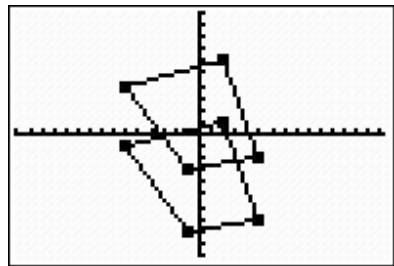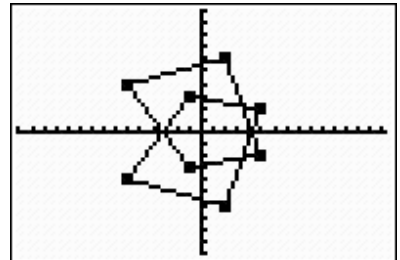
Reconfigure **Plot 2**.	Plot1 **Plot2** Plot3 **On** Off Type: ⌐⌐ ▨ ⊞ ⊞⊶ ⊞⊶ ⌐ Xlist:DBLX Ylist:DBLY■ Mark: ■ + ·
View the graph. Adjust the window as desired.	
Experiment with other rules, such as (x, 2*y), (x-3, y-3), (0.5x, 0.5y). How would you reflect the polygon across the x-axis? Across the y-axis? Across the line $y=x$? Which reflection is shown here?	
To recover **L3**, **L4**, **L5**, and **L6**, press STAT 5 to select the **Set Up Editor** command.	**EDIT** CALC TESTS 1:Edit… 2:SortA(3:SortD(4:ClrList 5**8**SetUpEditor
Press ENTER to execute the command. This will restore the lists.	SetUpEditor Done ■