Hands on Reflections

Teachers Teaching with Technology™
Professional Development from Texas Instruments

ACMMG181

7   **8**   9   10   11   12

| TI-Nspire | Navigator | Student | 120 min |

Objective

Describe translations, reflections in an axis, and rotations of multiples of 90° on the Cartesian plane using coordinates. Identify line and rotational symmetries

Equipment

For this activity you will need:

- TI-Nspire
- TI-Nspire file: "Hands on Reflections" (tns)
- Printed Grid
- TI-Navigator system (Optional)

Instructions

Begin by tracing around your **right hand** using a pen and the grid paper supplied. Mark points around your hand (along the trace), these points will ultimately form a 'dot to dot' picture. More dots generate a better image, and more work.

Starting at the base of the thumb and working towards the base of your pointer finger, place approximately 7 dots along this section of your trace. The dots do not have to be equally spaced, but should represent any bumps or key points around your thumb. Write down the coordinates of these points on the grid, adjacent to each point.

Do not plot any more points until these ones have been tested on the calculator.

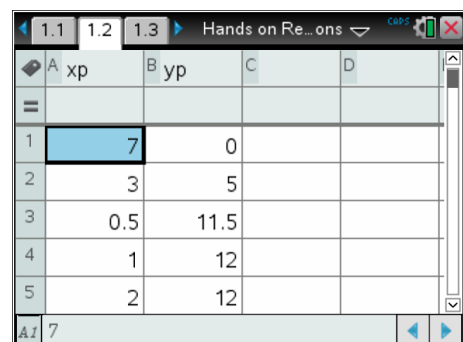Open the TI-Nspire file:

"Hands on Reflections"

Navigate to page 1.2.

Entering data:

xp = x coordinate

yp = y coordinate.

To begin with, enter only the first 5 to 7 coordinate pairs.

A xp	B yp	C	D
7	0		
3	5		
0.5	11.5		
1	12		
2	12		

Author: P. Fox

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Navigate to page 1.3 and check the progress of your dot to dot image. This page has already been set up to draw the plot.

If the image appears correctly, continue plotting, recording and entering points whilst periodically checking the graph. (image)

If your hand is not displaying correctly, check with a classmate or your teacher to help resolve the problem *before* continuing.

During the plotting process save the file occasionally by pressing:

Ctrl + S = Save

When you have finished plotting points the graph or image should look similar to the one shown here.

It is time to draw the left hand. No new points need to be collected; instead the originals will be 'transformed'.

In the Spreadsheet application enter two new list names:

LHX   (Left Hand X)

LHY   (Left Hand Y)

In the formula bar (shown opposite) use the **VAR** key to access the current variable list. Select XP and then modify these values using an appropriate mathematical operation that will cause the x points to be reflected in the y axis.

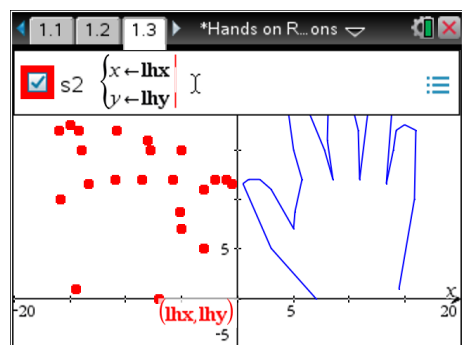Populate the LHY list using an appropriate formula and list.

Navigate to graph application on page 1.3.

Press the **TAB** key to access the graph list or press Ctrl + G.

S2 represents the second scatterplot. Use this plot to graph LHX and LHY. Initially these points will be disconnected as shown.

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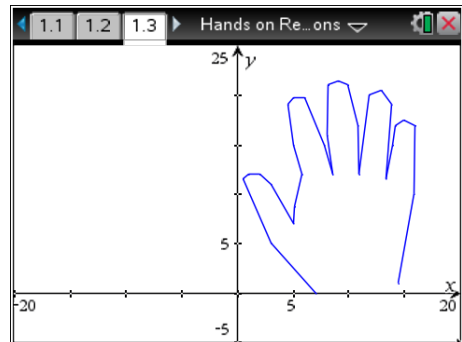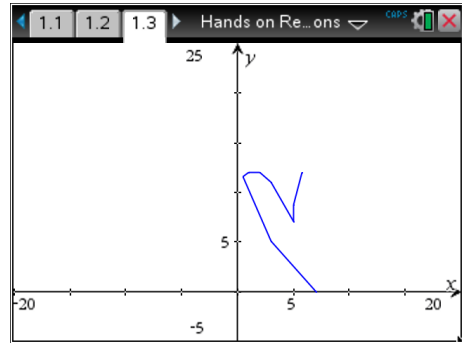
While the cursor on or in the second scatter plot press **Ctrl** + **Menu** (equivalent to a right mouse click on a computer) and select **attributes**.

There are 13 different options for the way the points are displayed. Option 7 is the best for blending points on a connected scatter plot.

Use the right arrow key to move across to option 7.

Use the down arrow to move to option 2 and then move across to make the points connected; press **Enter** to verify the changes.
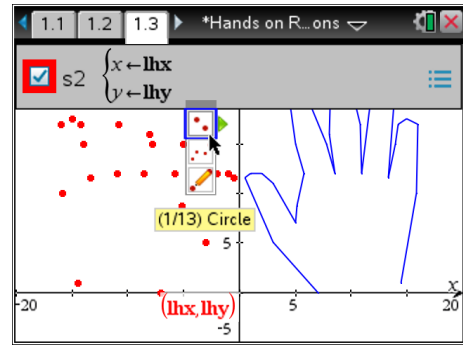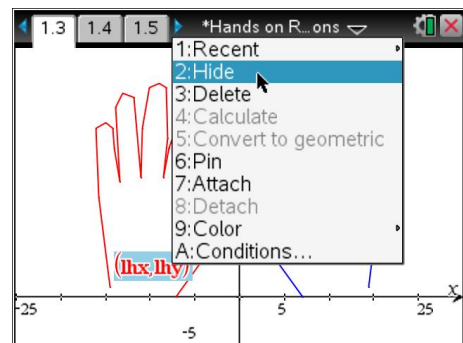
Question: 1.

Explain how the original points were modified to produce an image of the left hand.

As more graphs are added, graph labels may start to clutter. The labels can be hidden using a variety of methods, one way is to use a right click (Ctrl + Menu) while the mouse is hovering over the graph label, then select **Hide**.

Two more images have been added to the page, shown opposite. The window settings were changed using the **menu** option **Window/Zoom** followed by **Zoom Out**.

The mouse changes to a magnifying glass (with a minus sign) prompting for the 'centre'. Place the magnifying glass at the origin and press **Enter** to zoom out.

Return to the Spreadsheet application, add two more lists:

XPRH4   (**X P**oints for the **R**ight **H**and in quadrant **4**)

YPRH4   (**Y P**oints for the **R**ight **H**and in quadrant **4**)
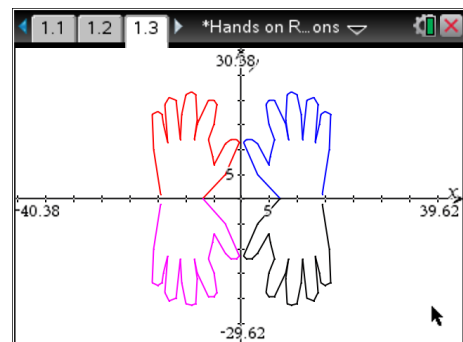
Use appropriate formulas to transform the lists then introduce additional scatterplots as before.

Question: 2.

Explain how the original points were modified to produce a reflection of the right hand in the x axis.

Return to the Spreadsheet application, add two more lists:

XPLH3   (**X P**oints for the **L**eft **H**and in quadrant **3**)

YPLH3   (**Y P**oints for the **L**eft **H**and in quadrant **3**)

Question: 3.

Explain how the image in the third quadrant (bottom left) was produced.

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A Graph application has been included on page 1.4. Add new lists to page 1.2 with appropriate names and formulas to produce the images shown below.

Note that list names cannot contain any spaces or special characters such as mathematical symbols.
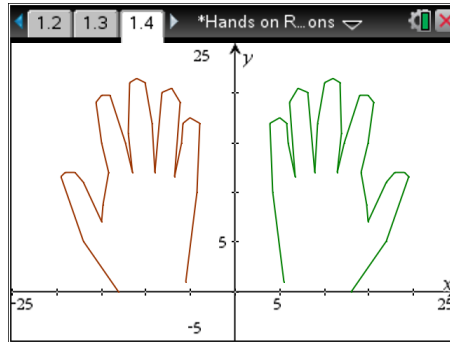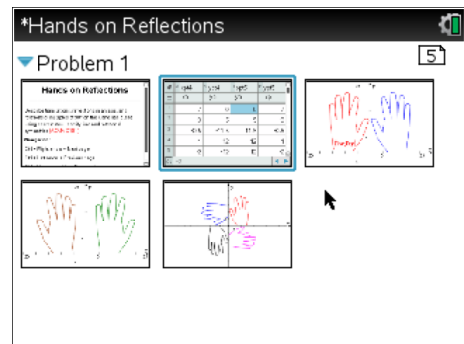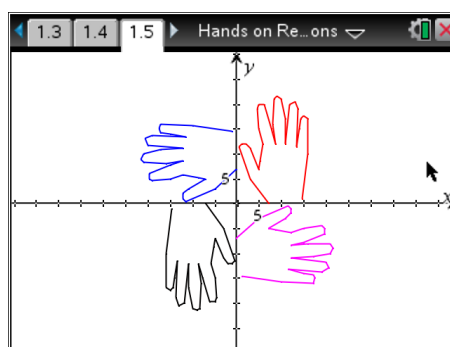

Question: 4.

Explain how you achieved each of the images above.

A quick way to navigate between pages in a large document is to use Ctrl + Up (arrow), navigate to the required page in the document and press **Enter**.

Another Graph application has been included on page 1.5. Add new lists to page 1.2 with appropriate names and formulas to produce the images shown below.

Question: 5.

Explain how you achieved each of the images above.

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