

## Activity 3

### Drawing on Your Knowledge

#### Math Concepts

- ◆ Geometry

#### Science Concepts

- ◆ Data collection
- ◆ Life science
- ◆ Environmental science
- ◆ Physical science

#### Materials

- ◆ TI-73 calculator
- ◆ Some paper (maybe graph) to make a rough sketch of what you want to draw (optional)
- ◆ TI-GRAPH LINK™ software with cable, and a computer with printer (optional)

#### *In this activity, you will:*

- ◆ Explore geometric relationships, such as parallel and perpendicular lines
- ◆ Use coordinates to construct objects of relatively the same size
- ◆ Look at symmetric relationship of parts of an object as they relate to your constructions
- ◆ Investigate your depth of understanding of the parts of two-dimensional figures when related to the real subject of interest
- ◆ In the area of life science, explore the relationship of the parts to the whole of the organism sketched or the structure of a the item drawn (cell, beehive, tree, plant, flower, and so forth)
- ◆ In the area of earth science, explore the nature of different clouds, or geometric formations, rocks types or the components of a solar system
- ◆ In the area of physical science, explore the nature of simple machines, atomic structures the structure of chemical compounds, and the layout of different circuits
- ◆ Discover the nature of observation and the function of parts to make the whole

#### *Introduction*

What you know about a topic can often be revealed by your description of it. If asked to describe in words what a bridge is, the response might tell us what the person knew about the object in terms of function and use, but

maybe not much about the design of a bridge. An individual's drawing of a bridge might reveal another level of that person's understanding of the object. In science, you can often learn more about what one knows about a subject from their drawings than from their words, especially if they have not developed the vocabulary of the field of study.

In this investigation, you will mix your prior knowledge of a subject with your spatial perceptions to lay a foundation for understanding and learning more about the subject.

### The Problem

The goal of this investigation is to use the **DRAW** option of the TI-73 to construct an image of an item from memory (and prior knowledge). Use the drawing tools so that your object will have the most detail possible. In addition, you should use the **TEXT** option at least once in the process. Once the item has been constructed, save it as a **Pic**. You may then transfer the drawing to the computer using the TI-GRAPH LINK™ and print it.

### Activity

1. Set the TI-73 to its default mode.
  - a. Press **[2nd]** **[MEM]** and select option **7:Reset** from the **MEMORY** menu.
  - b. Select option **2:Defaults** from the **RESET** menu.
  - c. Select option **2:Reset** from the **RESET DEFAULTS** menu. This will place all options to the default and turn off any graphs or plots.

```
MEMORY
1:About
2:Check RAM...
3:Check APPs...
4:Delete...
5:Clear Home
6:ClrAllLists
7:Reset...
```

```
RESET
1:All Memory...
2:Defaults...
```

```
RESET DEFAULTS
1:No
2:Reset
```

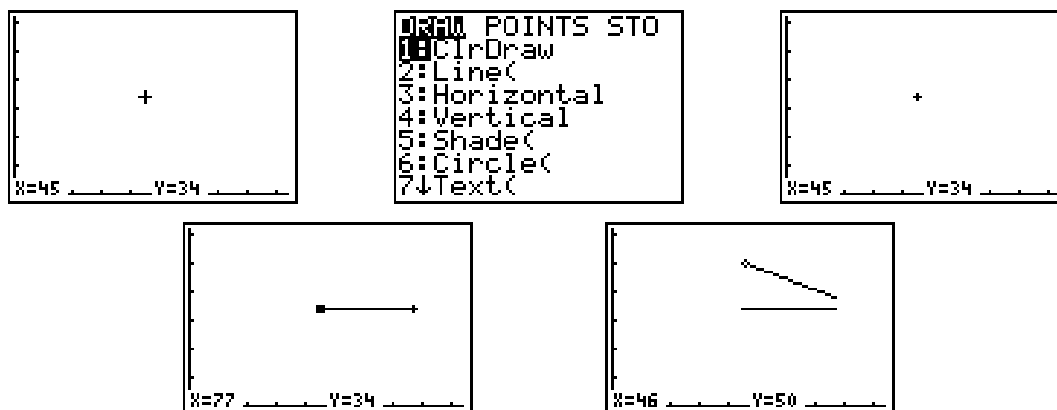
```
█
Defaults set
```

```
Normal Sci
Float 0123456789
Degree Radian
R/b/c b/c
Autosimp Mansimp
```

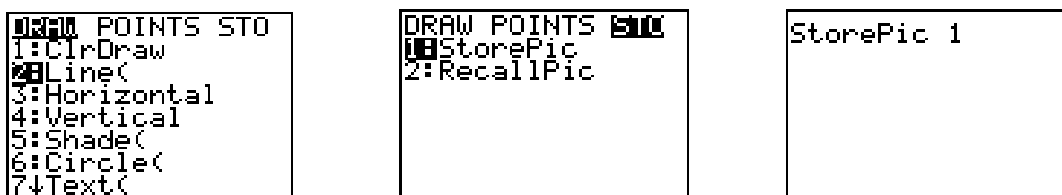
2. To start drawing in the interactive mode, you need to set the Window to an appropriate area. In this case, you will use the first quadrant. Press **[WINDOW]** and set up the values as shown below.

```
WINDOW
Xmin=0
Xmax=94
eX=1
Xscl=10
Ymin=0
Ymax=62
Yscl=10
```

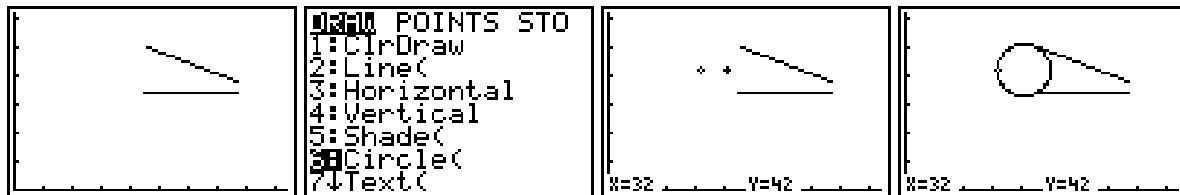
3. Before you draw the item, explore the different drawing options on the TI-73.
  - a. To draw lines, from the Graph screen (press **GRAPH** if you are not there), select the line tool by pressing **DRAW** and select option **2:Line(** from the **DRAW** menu. This places you back in the graph area ready to draw.
  - b. Move the cursor to the starting location and press **ENTER** when ready.
  - c. Move your cursor to the end point of the desired line and press **ENTER** again to end the draw.
  - d. To make a connected line, press **ENTER** again and continue.
  - e. To make a disconnected line, move to a new starting point, and press **ENTER**.
  - f. If you make a mistake you will be able to undo the line by using the **Pt-Off(** option from the **POINTS** menu found by pressing **DRAW** **▸**. Select the desired option, move in the graph window to the particular point, and press **ENTER**.



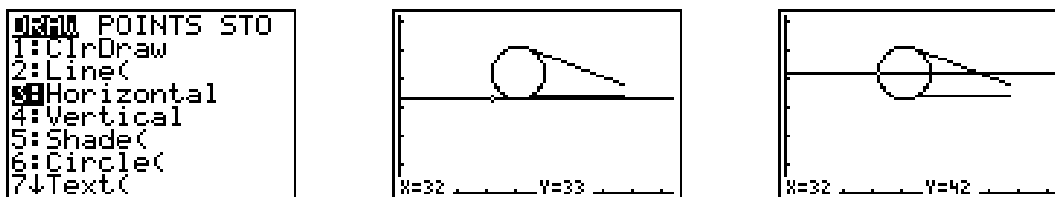
4. The **ClrDraw** option will allow you to start from scratch, but if you get to a point where you have more than you want to redo, you can save the image as a **Pic**.
  - a. To do this, move to the Home screen by pressing **2nd** **[QUIT]**.
  - b. At the Home screen, press **DRAW** **◀** and select **1:StorePic**.
  - c. Key in the number for the picture (1, 2, or 3) and press **ENTER**. Note that this action will erase your previous picture with the same name (number).



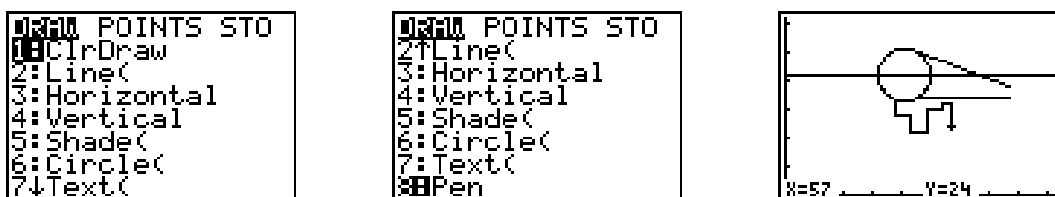
5. Circles may be constructed if, from the Graph Screen, you select the tool for drawing circles by pressing **[DRAW]** and select option **6:Circle(** from the **DRAW** menu. This will move you to the graph screen and allow you to construct the circle.
  - a. Move the cursor to the center of the circle to be constructed and press **[ENTER]**.
  - b. Move to the edge of the proposed circle (this distance will be the radius of the circle) and press **[ENTER]**. This will make your circle.
  - c. Continue with the placement of the required circles.



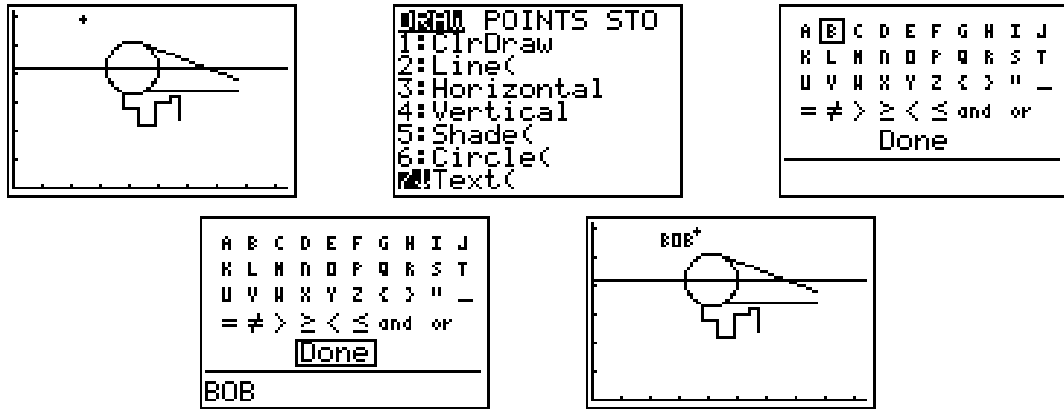
6. In some cases you may need to draw a horizontal or vertical line.
  - a. To do this, from the Graph screen, press **[DRAW]** and select option **3:Horizontal**, or option **4:Vertical** from the **DRAW** menu. This will cause you to move back to the Graph screen with what appears to be a line already drawn. This is just an image of what the line will look like when you press **[ENTER]**.
  - b. To place the line, move to the desired location and press **[ENTER]**.



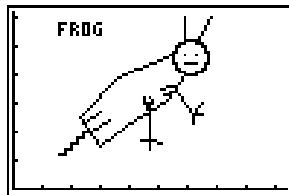
7. To access the **Pen** tool from the Graph screen, press **[DRAW]** and select option **8:Pen** from the **DRAW** menu. You will need to scroll down or up to actually see this option.
  - a. When the **Pen** is selected, you will automatically return to the graph.
  - b. Move the cursor to the starting location of your line.
  - c. This option differs from the Line drawing in that as you make turns, the Pen will reflect the corners and continue to draw, stopping only when you press **[ENTER]**.



8. To add text to your drawing, from the Graph screen, press **[DRAW]** and select option **7:Text(** from the **DRAW** menu. This will place you back in the graph ready to place text. Be careful, almost every key you press now will place text on your drawing.
  - a. Move your cursor to the upper left hand corner of the location where you wish the first letter to be placed.
  - b. To get the letter or letters needed, press **[2nd] [TEXT]** and move the cursor around the text screen, pressing **[ENTER]** when each character is located.
  - c. When finished, select **Done** and press **[ENTER]**. This will return you to the graph with the word or letters placed. Be careful about positioning the cursor to start the word.
  - d. In addition, you may add words and numbers from the keyboard and the Catalog as long as you are in the Text drawing option. You will need to leave the graph (press **[CLEAR]**) before you enter any commands that you wish to execute, since they will appear as text on your drawing if you are still in the Text mode.



How do you like the frog?





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## Teacher Notes

### ***Math Strands: Geometry***

Geometric relationships such as parallel and perpendicular lines as well as use of coordinates to construct objects of relatively the same size. Symmetric relationship of parts of an object as they relate to the students' constructions. Levels of understanding of the parts of two-dimensional figures.

### ***Science Strands: Data Collection; Life, Environmental, and Physical Sciences***

In Life science, the relationship of the parts to the whole of the organism sketched or the structure of a cell, beehive, tree, plant, flower, and so forth. In Earth Science the nature of different clouds, or geometric formations, rocks types or the components of a solar system. In Physical Science, the nature of simple machines, atomic structures the structure of chemical compounds, and the layout of different circuits. In addition, observation and the function of parts to make the whole are addressed.

### ***Classroom Management and Safety***

Students will do well on this as a team since a combination of ideas will appear in the final drawing. With more mature students, or with simpler concepts, working alone will suffice. The access to the TI-GRAPH LINK™ may be limited, but it is important to collect the images before they get erased. Printing these images, as well as saving them to disk, will provide better opportunities for class discussion (post the images on the wall or on the class web page) and for the students to place in their portfolios, in particular as part of a collection showing growth.

### ***Getting Ready***

1. Having an actual copy of the object that is to be drawn will be useful after the fact, but displaying it (any more than just briefly to nudge the child's memory) will dampen the effect of the experience. The "before" and "after" views of the item will be the source of much discussion of the topic. Misconceptions and pre-knowledge are key issues in this investigation.
2. An individual's misconceptions about a topic as well as their understandings can be used to direct the discussion of the topic to be studied. This information can be obtained from her drawing of the item of interest.

### *Activity*

1. A common mistake will be that the students are not in the interactive drawing mode. That is, they are not in the graph screen when they select the drawing tool. If they select the drawing tool from other environments, they will be placed in the Home screen with a command line awaiting a set of coordinates to complete the drawing option selected.
2. Students may need to explore a bit before starting on the drawing. The need to “erase” some parts or to start over can be frustrating. Using the **Pt-On(** and **Pt-Off(** options may help. In addition, the use of **ClrDraw** and saving the drawing as **PICS** will help along the way, to avoid starting from scratch.
3. If the students use the **Pt-Off(** option to correct a mistake in the drawing, they will need to re-select the drawing tool they were using from the Graph Screen.
4. When in the Text mode, anything touched could appear as a word on the drawing. Leave this mode by moving to the Home screen.
5. To recall a **Pic**, go to the **STO** menu (press **DRAW** **▾**) and select option **2:RecallPic**. Key in the **Pic** number desired and press **ENTER**. You will get an error if there are no images stored in that location. Check which numbers are occupied, or go to the **MEMORY** menu and explore there.

### *Computer Issues*

- ◆ As your students save the images as Tagged Image Format (.tiff) files, they should use a naming convention consistent with the 8 character DOS rules on an IBM. They can use first name and last initial, or other methods, but they need to avoid duplicates and spacing in the names of the files.
- ◆ If the students copy the images to the clipboard (50%, 100% or at other sizes) and then paste them in a word processor, their ability to comment about the drawing (name, date, and other thoughts) will be enhanced.
- ◆ Saving the image for the web page requires conversion to .gif, or .jpeg (.jpg) file types. This can be done with various types of software, but must be done to use on the web.

For more sophisticated drawing or for the instructor to make samples, one might use **IVIEW**. Go to “8xIVIEW for Windows 3.1 and Windows 95” at <http://www.ti.com/calc/docs/arch.htm> for more information and the software.



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### *Ideas for things to Draw*

- ◆ Life Science:
  - Rose, daisy, mum
  - Tree, bush, plant, cotton, apple, soybean
  - Cell, beehive, lung, heart
  - Animal, mouse, dog, frog, butterfly, bee, fly, worm
- ◆ Physical Science:
  - Simple machines, pulley
  - Chemical compounds, atoms
  - Circuits parallel, series
- ◆ Earth and Space Science:
  - Clouds
  - Geological forms, buttes, canyons, rocks, minerals
  - Stars, planets, solar systems, galaxies, comets
  - Water cycles, transpiration
  - Rivers, streams, springs
- ◆ Mathematics:
  - Triangles, equilateral, scalene, isosceles, obtuse
  - Quadrilaterals, squares, rhombus, rectangle
  - Areas and perimeters
  - Lines, parallel, and perpendicular
  - Polygons, regular and otherwise

### *Extensions*

- ◆ Have a student draw the image again by using a set of commands from the Home screen or in a program, using the coordinates needed.
- ◆ Have the students make a new drawing after the lesson on the topic and compare graphs (show growth, before and after).
- ◆ Have a student write a program that is a “slide show” of the saved **Pics**. Make sure that unique names are used to avoid erasing any child’s drawing.
- ◆ Have a student write a program that will draw their selected object!
- ◆ Draw an image with a given area or perimeter.
- ◆ Maximize or minimize area or perimeter with drawing. Have a contest.

