Using the TI-73:
A Guide for Teachers

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Note: Using calculators other than the TI-73 may produce results different from those described in these materials.

About the Activities

This guide consists of 12 activities designed to be teacher-directed. They are intended to help develop mathematical concepts while incorporating the TI-73 as a teaching tool.

Organization

Each activity is self-contained and includes:

♦ The mathematical strands with which the activity is most closely associated: Number Sense; Patterns, Relations, and Functions; Measurement and Geometry; or Probability and Statistics
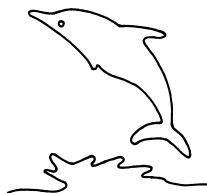
♦ The materials needed to perform the activity

♦ An overview of the mathematical purpose of the activity

♦ The detailed procedure, including step-by-step TI-73 keystrokes

Additionally, most of the activities contain:

♦ A student activity sheet as needed

♦ A teacher black-line master as needed

♦ A section to wrap-up what is being taught

♦ A section to assess what is being taught

♦ A section to extend what is being taught

Conventions Used

♦ Brackets [ ] around a key's symbol indicate that the key is a second function (printed in yellow) on the TI-73.   *Example*   2nd [QUIT]

♦ Bold type indicates a calculator display or format.   *Example*   **Done**

How To Order Materials

To place an order or request additional information about TI calculators, call our toll-free number: 1-800-TI-CARES (1-800-842-2737).

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Activity 1

The Cookie Caper

Students learn about equivalent fractions by sharing their favorite cookies.

Setup

Before you begin, you or you and your students do the following:

♦ For each student, cut a poster board circle with a diameter of 7cm (2¾ in.) to represent a cookie.

♦ Cut out the fractional circles that are provided and paste one on the back of each poster board "cookie." (Some students will have halves, some thirds, some fourths, etc.)

♦ Cut shapes of colored paper for raisins, nuts, etc., and glue them to the front of the cookies, or have students draw their favorite ingredients on the front of their cookies.

Activity

Have students perform the steps unless otherwise indicated.

1. After designing the cookies, turn them over and cut into the assigned fractional parts pre-pasted on the back.

2. On a sheet of notebook paper, make a diagram of the cookie circle and the cuts made to make the assigned fractional parts.

3. Give students a set time period to trade cookie "bites" (slices) with each other. Tell them they must trade equal-sized pieces, so they will need to know what fractional parts are equal to each other.

    Example   A ½ slice may be traded for two ¼ slices.

    At the end of the trade time, each student should still have a whole cookie, but now it is made of a variety of cookie ingredients.

4. Discuss the results with your students. Ask:
    Why did some have a whole cookie, and some did not?

    What kinds of trades could they have made to end up with a whole cookie?

5. Use the TI-73 to verify equivalent fraction trades and to count or add up fractions to see if they equal a whole cookie.

    Example 1   If a student traded ¼ for ³/₁₂, the student would enter

    1 [b/c] 4 [▶] [2nd] [TEXT] [▼] [▼] [▼] to **=**
    [ENTER] [▼] to **Done** [ENTER]
    3 [b/c] 1 2 [ENTER]
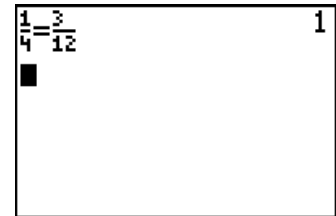
⇨ If a **1** is displayed on the right-hand side of the screen, the 2 fractions are equivalent. If a **0** is displayed, they are not equivalent fractions.

    Example 2   If a student traded for ¼, ½, and ³/₁₂, the student would enter

    1 [b/c] 4 [▶] [+] 1 [b/c] 2 [▶]
    [+] 3 [b/c] 1 2 [ENTER]
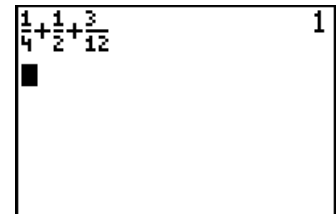
⇨ If a **1** is displayed on the right-hand side of the screen, the student knows the pieces add up to a whole cookie.

Wrap-up

♦ Have students make a list of the fractions they think are equivalent to each other.

♦ Have students enter their equivalent fractions into the TI-73 and change each to a decimal using ⌨F↔D⌨ (**fraction-to-decimal** function). Discuss why these equivalent fractions also have the same decimal value.

> *Example*   Press ⌨1⌨ ⌨b/c⌨ ⌨4⌨ ⌨F↔D⌨ ⌨ENTER⌨.
>
> The display shows **.25** as the decimal equivalent for ¼.
>
> Then enter ⌨3⌨ ⌨b/c⌨ ⌨1⌨ ⌨2⌨ ⌨F↔D⌨ ⌨ENTER⌨.
>
> The display again shows **.25** as the decimal equivalent.

```
1/4▸F↔D            .25
3/12▸F↔D           .25
```

♦ Now have students make a diagram of their final cookies next to their original diagrams. Have them label the new fractional parts and decimal amounts.

Extensions

♦ Older students: Change the decimals to percents and have a pie chart of all three amounts—fractions, decimals, and percents.

♦ All students: Cut their pieces in half, name the fractional parts, and trade again for another set time period. Investigate:
Did they make equivalent trades?

Was it easier this time, or more difficult?

Does the new fractional cookie still add up to a whole cookie on the TI-73?
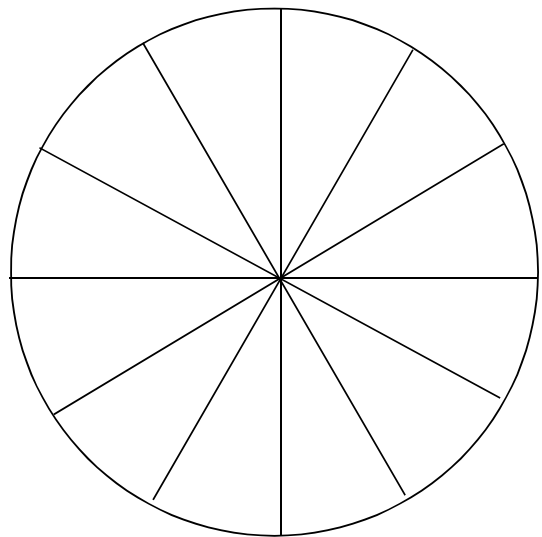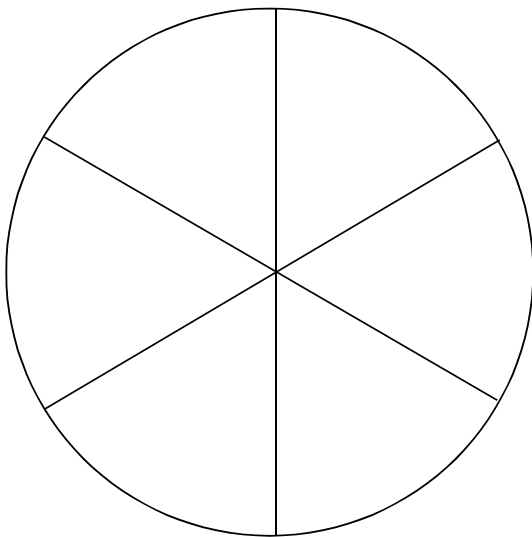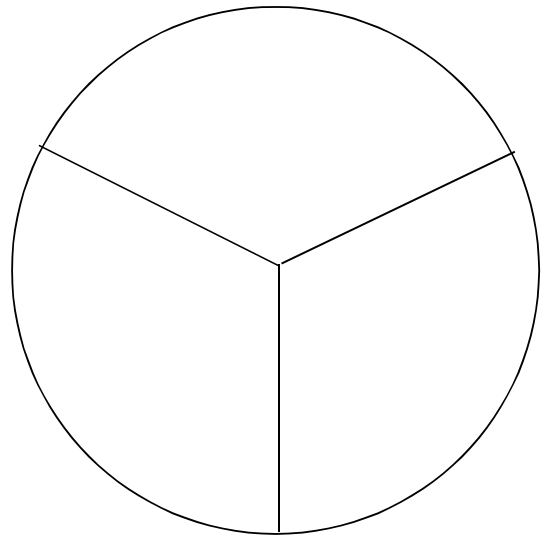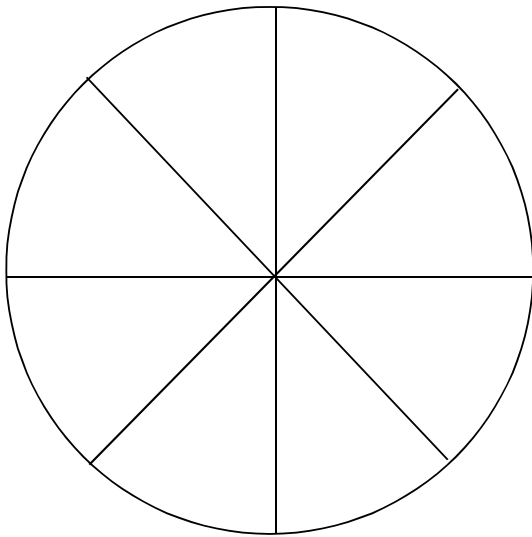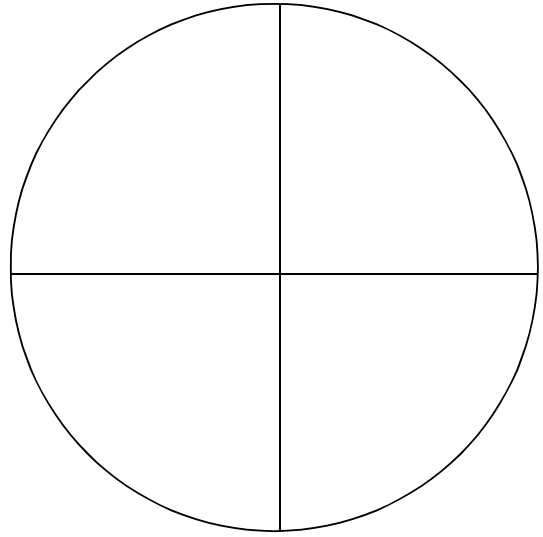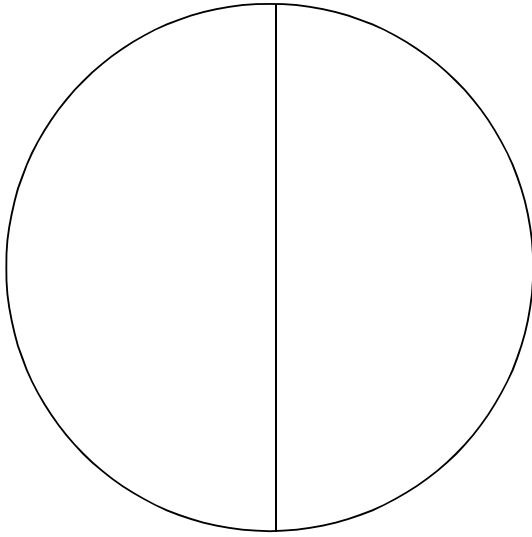
Activity 2
Dice Digits

Students use 4 numbers, any operations, and grouping symbols to write mathematical expressions that are equal to each of the numbers 1 through 9.

Materials

♦ student activity sheet (provided)

♦ transparency of activity sheet

♦ TI-73 📷

Setup

If your TI-73s have not been used for random number generation prior to this activity, you and your students need to store an integer "seed value" to **rand** in each TI-73.

With each **rand** execution, the TI-73 generates the same random-number sequence for a given seed value. The TI-73 factory-set seed value for **rand** is **0**. To generate a different random-number sequence, store any non-zero seed value to **rand**.

1. Enter the number you want for your seed value. Have students use different seed values. (In the example shown at the right, **1** is used.)

2. Now press [STO▶] [MATH] [▶] [▶] **1** [ENTER] [MATH] [▶] [▶] **1** [ENTER] [ENTER].

(For more information about seed values, refer to the "[MATH] Probability Menu" section in the Math chapter of the *TI-73 Guidebook* 📖.)

➡ If you *do not enter a seed value*, **rand** uses whatever value happens to be the current seed. If there is no seed, it uses the factory-set value of **0**.

```
1→rand          1
rand
       .7455607728
rand
       .8559005971
```

➡ If you want to restore the factory-set seed value, store **0** to **rand** or reset the defaults.

Activity—Part A

Whole Class

1. Demonstrate to your students how to roll dice on the TI-73 to get 4 numbers. Record the 4 numbers.

   a. Go to the Home screen.

      [2nd] [QUIT]

   b. Select **dice** from the **MATH PRB** menu, and paste it to the Home screen.

      [MATH] [▶] [▶] [7]

   c. Enter the number of dice you want to roll at one time.

      [4] [)] [ENTER]

      You now have 4 numbers.

   d. Record the 4 numbers on the transparency.

2. Have students use each of the 4 numbers once, along with any operations symbols (and grouping symbols, when needed), to write an expression that has a value of 1.

   Example   If your 4 numbers were **{4 3 4 5}**, an expression would be 1 = (5 - 3) - (4/4).

3. Record one of these expressions on the transparency. Ask if anyone has a different expression. Record these, also.

4. Repeat this procedure to write an expression equal to 2.

5. Continue the demonstration until students understand what to do.

   Students may use the TI-73 to find the expression or to check the value of the expression.

   Example   If the 4 numbers are **{4 3 4 5}**, and the expression is 1 = (5 - 3) - (4/4), then enter

   [(] [5] [−] [3] [)] [−]
   [(] [4] [÷] [4] [)] [ENTER].

```
MATH NUM PRB LOG
1:rand
2:randInt(
3:nPr
4:nCr
5:!
6:coin(
7:dice(
```

```
dice(4)
          {6 6 1 4}
■
```

Activity—Part B

Individual or Small Group

1. Have each student or pair of students roll dice on the TI-73 to get 4 numbers.

2. Instruct students to use all 4 numbers, any operations, and grouping symbols to write an expression for each of the numbers 1 through 9.

3. Have students check their work on the TI-73 and record each expression on the student activity sheet provided.

Wrap-up

♦ Students can exchange papers and check one another's work.

♦ Ask students: *Will it always be possible to write expressions for each counting number using the 4 numbers?* (no)

♦ Share examples of what students believe to be impossible.

Assessment Suggestions

♦ Ask students to write a journal entry summarizing the rules for order of operations. (Refer to "Equation Operating System (EOS™)" in Appendix B of the *TI-73 Guidebook* 📖.)

♦ Ask students to think of an example of 4 numbers that would make this activity difficult or impossible to complete and explain why.

Extensions

♦ Find the probability of getting an "unlucky" roll such as four 1s.

♦ Depending on the level of the students, extend the activity to include exponents, roots, factorials, etc.

♦ As a class, use the 4 digits of the current year to develop expressions that equal the numbers 1 through 100. Display students' work on a bulletin board.

Name   _____

Date   _____

Activity 2
Dice Digits

Roll dice to get 4 numbers. Record numbers below.

_____ _____ _____ _____

Expression	**Key Sequence**

1 = _____   _____

2 = _____   _____

3 = _____   _____

4 = _____   _____

5 = _____   _____

6 = _____   _____

7 = _____   _____

8 = _____   _____

9 = _____   _____

Can you find more than one expression for each number?

Activity 3

How Do You Measure Up?

Students discover the ratio between their heights and the lengths of their intestines. This activity is a good introduction to using lists to find the mean and performing operations on lists.

Setup

♦   Ask students: *How long do you think your small intestine is?*

♦   Have each student estimate the length of their intestine in meters or feet, and then cut a piece of string this length.

♦   Tape a long strip of masking tape on the floor as the horizontal axis, and then make a vertical bar graph using the students' pieces of strings.

⇨ You may want to do this part of the setup in the hall or some place with a large area of floor space.

Activity—Part A

In this part, students find the average length of their small intestines. Have students perform the steps unless otherwise indicated.

1. Measure the strings.

2. Enter the data in **L1** on the TI-73.

   a. Display the List editor.

      [LIST]

   b. If necessary, clear **L1**.

      [▲] to highlight **L1**

      [CLEAR] [ENTER]

   c. Starting at the first line in **L1**, enter the string
      lengths. (You'll get an error if **L1** is still highlighted.)
      Press [ENTER] after each list item.

3. Find the mean of **L1**.

   a. Return to the Home screen.

      [2nd] [QUIT]

   b. Access the [2nd] [STAT] **MATH** menu and select **mean**.

      [2nd] [STAT] [▶] [▶] [3]

   c. Calculate the mean of **L1**.

      [2nd] [STAT] [1] [)] [ENTER]

4. Inform students that the average small intestine is 6m
   (20 ft.) long. Ask:
   Was the mean you found close to 6m (20 ft.)?

   Who had the closest estimate?

   Which estimate was off the farthest?

   What are some objects that are 6m (20 ft.) long?

   *If all the strings were connected together, how long do
   you think they would be?*

   ➭ Find some objects 6m (20
   ft.) long that students are
   familiar with in your local
   area.

5. Find the sum.

   a. Return to the Home screen.

      [2nd] [QUIT]

   b. Access the [2nd] [STAT] **MATH** menu and select **sum**.

      [2nd] [STAT] [▶] [▶] [7]

   c. Calculate the sum.

      [2nd] [STAT] [1] [)] [ENTER]

Activity—Part B

In this part, students discover the ratio of the average height of a student to the average length of an intestine. Have students perform the steps unless otherwise indicated.

1. Measure height in centimeters or inches.

2. Enter the data in **L2**.

   a. Display the List editor.

      [LIST]

   b. If necessary, clear **L2**.

      [▲] to highlight **L2**
      [CLEAR] [ENTER]

   c. Enter the heights in **L2**. Press [ENTER] after each list item.

3. Find the average height on the Home screen using the **mean** function.

   a. Return to the Home screen.

      [2nd] [QUIT]

   b. Access the **MATH** menu and select **mean**.

      [2nd] [STAT] [▶] [▶] [3]

   c. Calculate the mean.

      [2nd] [STAT] [2] [)] [ENTER]

4. Compare the average height to intestine length as a ratio.

Wrap-up

Ask students: *How many average students would it take to make the length of an average intestine?*

Assessment Suggestions

The average length of the small intestine of an ostrich is 1372cm (45 ft.). Three ostriches have heights of 314cm (10 ft. 3 in.), 308cm (10 ft. 1 in.), and 299cm (9 ft. 8 in). Have students find the ratio of the ostriches' average height to average intestine length.

Extensions

Investigate the length of the intestine for different animals. Compare the ratio of the height to intestine length to the ratio you discovered above.

Herbivores length of intestines =	4 times body length or 12 times length of torso.
Carnivores length of intestines =	body length or 6 times length of torso.

How many average students would it take to make the length of a weasel's intestine?

How many teachers would it take to make the length of the intestine?

Activity 4

Stadium Walls

Students investigate real-life situations and find patterns by making concrete representations and making T-charts. Students then describe and generalize these patterns verbally, symbolically, and graphically.

Setup

Present the following problem to students.

An engineer designs the skeleton for the walls of a new stadium from equal lengths of steel beams that are placed in a rectangular pattern as shown below. The engineer knows that one wall has to have a length of 57. How many steel beams are needed for this wall?

□ length 1
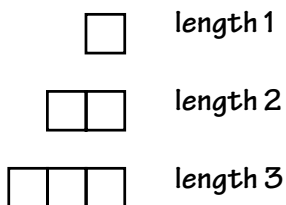
□□ length 2

□□□ length 3

(This view is from the front.)

The length of each wall is measured by the number of beams along the bottom of the wall.

Activity

Have students perform the steps unless otherwise indicated.

1. Model the wall using toothpicks to represent the beams to a length of 6.

2. As each length of the wall is modeled, record the total number of beams in a T-chart.

   Example

length(X)	number of beams(Y)
1	4
2	7
3	10
4	13
5	16
6	19
7	22

3. Investigate the pattern in the tables and concrete models and predict how many beams are needed for a wall length of 7 and a length of 10.

4. Record answers in the table and share in small groups how these values were determined.

5. With students working in small groups, ask them to write a sentence to describe the patterns they see in the table.

   Ask: *Do these patterns make sense in terms of the concrete model?*

6. Now have students determine how many beams are needed for a length of 57.

   Discuss how they found their solutions.
   (Some students may find the solution by recognizing that each number in the right-hand column is obtained by adding 3 to the previous term, starting with 4.)

7. Show students how the TI-73 may be used to find the solution in the same manner. You can do this in one of two ways, with the CONST key or with the ENTER key.

   a. Using the CONST key:

      (1) Access the **Set Constant** screen.

         2nd [SET] (above the CONST key)

      (2) At **C1**, enter the constant.
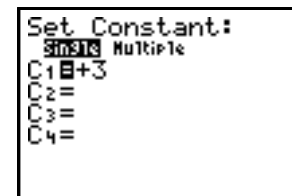
         + 3

      (3) Return to the Home screen.

         2nd [QUIT]
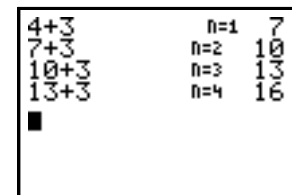
      (4) At the Home screen, begin your sequence with 4.

         4 CONST CONST CONST and so on
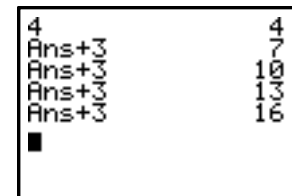
   b. Using the ENTER key:

      At the Home screen, begin your sequence.

      ENTER + 3 ENTER ENTER ENTER and so on

      (You might discuss the inefficiency of this method for large numbers.)

➡ **n** = *number of counts*

8. Using the TI-73, lead students to alternative methods by reading the T-chart as a relationship between X and Y.

   a. Tell students to look at the numbers in their T-chart and describe the rule that relates the number of lengths to the total number of beams. For example, *As the number of lengths change, what happens to the number of beams?* Have students share rules in small groups, and then with the whole class.

   b. Write the rules on the board or chart paper so all can see. Students may suggest the following rules (or something similar):

      • The total number of beams is equal to 3 times the number of lengths plus 1.

      • The total number of beams is equal to 4 plus 3 times 1 less than the number of lengths in the bottom.

      • The total number of beams is equal to 2 times the number of lengths plus the number of lengths plus 1.

9. Ask students to describe their rules symbolically (mathematically) using L to represent the number of lengths and B the total number of beams.

   Record the equations so the whole class can see them. They are related to the rules stated earlier.

   • The total number of beams is equal to 3 times the number of lengths plus 1.

     B is 3 times L plus 1.
        $B = 3L + 1$

   • The total number of beams is equal to 4 plus 3 times 1 less than the number of lengths in the bottom.

     B is 4 plus 3 times L minus 1.
        $B = 4 + 3(L-1)$

   • The total number of beams is equal to 2 times the number of lengths plus the number of lengths plus 1.

     B is 2 times L plus L plus 1.
        $B = 2L + L + 1$

10. Ask:

    What remains the same or constant? (1)

    What changes or varies? (*L*-number of lengths varies)

    What will the graph of the line represented by these equations look like?

11. The TI-73 uses *X* and *Y* when graphing, so change the equation *B = 3L + 1* to *Y = 3X + 1* using the Y= editor.

    a. On each line where there is an entry, clear the Y= editor.

       [Y=] [CLEAR]

    b. Now enter the equation.

       [3] [*x*] [+] [1]

12. View the window.

    [WINDOW]

13. Discuss the possible values for *X* and *Y*. Ask questions such as:

    What does X represent? (length)

    Do you need negative values for Xmin? (no)

    What would you suggest for Xmin? (Look at T-chart data.)

    What do you suggest for Xmax?

    What does Y represent? (number of beams)

    Do you need negative values for Ymin?

    What do you suggest for Ymin? (Look at T-chart data.)

    What do you suggest for Ymax? Should it be smaller or larger than Xmax?

    At the right is an example of an appropriate window.

```
WINDOW
 Xmin=0
 Xmax=100
 ⌂X=1.063829787…
 Xscl=10
 Ymin=0
 Ymax=310
 Yscl=20
```

14. Turn off **STAT PLOTS**, and then display the graph.

    2nd [PLOT] 4 ENTER GRAPH
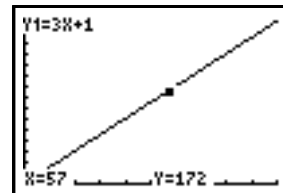
15. Ask:
    What do you notice about the graph on the screen?

    What is the value of Y when X is 57? How can you find out? (Press TRACE to see the values on the graph. If you are not tracing whole number values for X, estimate the value of Y by rounding the decimal.)

    What will Y equal when X is 57? (To find the whole number value, press 5 7 ENTER.)

    Is this the same value you found earlier when you added 3 to each previous term? When you used the CONST *key? When you used the* ENTER *key?*

➥ Have students sketch the graph on graph paper for further discussions later (slope, intercepts, how does it describe the situation in the problem?, etc.).

16. Since the X values in the table of values for the equation depend on some initial settings in the **TABLE SETUP,** do the following.

    a. Access the **TABLE SETUP** screen.

        2nd [TBLSET] (above the WINDOW key)

    b. Make sure the screen looks like the one shown at the right (**TblStart=0, ΔTbl=1, Indpnt: Auto, Depend: Auto**).

17. Use the TI-73 to show a table of values for the equation.

    2nd [TABLE] (above the GRAPH key)

18. Compare the table on the TI-73 with the T-chart in the first part of the activity. Ask:
    What value does the table give for X = 57?

    How does this compare to the value you computed earlier for X = 57?

    What do the X values in the table represent? (the length of the wall)

    What do the numbers in the **Y₁** *column represent?* (the number of beams)

19. Enter the second equation *Y = 4 + 3(X - 1)* in **Y₂**, and then graph it.

    Y= ▾ to **Y₂** 4 + 3 (x − 1) GRAPH

    Ask: *Do you see 2 lines? Why not?*

20. Change the graph style of **Y2**.

    Y= ▼ to **Y2** ◄ so the cursor is blinking on top of the little diagonal line on the far left
    ENTER

    Notice that the diagonal line has changed to a darker line.

21. To see the second line graph over the first, press GRAPH.

    Ask: *What is true about the graph of the second equation compared to the first?* (same line)

22. Explain that another way to determine that the two equations are graphing the same line is from the graph screen.

23. Access the graph screen and turn on **Trace**.

    GRAPH TRACE

    Notice that **Y1=3X+1** is the equation at the top of the screen.
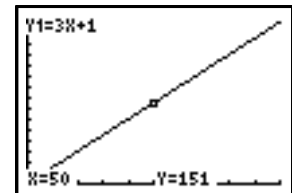
24. Press ▲.

    Notice that now **Y2=4+3(X-1)** is the equation at the top of the screen.

    Press ▲ again a few times.

    Point out to students that as they move from graph to graph, the *Y* values stay the same, proving that the equations graph the same line.
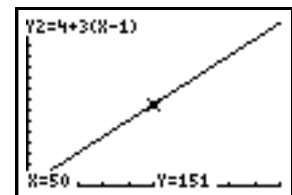
25. Look at the table of values for this equation.

    2nd [TABLE]

    Ask: *What do you notice about the values in **Y2**?*

26. Repeat the procedure for the third equation by entering it in **Y3** and viewing the table of values.

Wrap-up

♦ Ask: *Based on your observation of the graphs of the equations, what conclusions would you draw about the equations you graphed?* Have students report findings. This could lead to a discussion of equivalent expressions and simplifying expressions.

♦ Have students substitute $X = 57$ in the equations to find a value for Y. This will also show the equivalency of the equations.

Assessment Suggestions

Have students repeat the above activity for the following situation.

The architect designs the roof trusses with another design. It is made from equal lengths of steel beams arranged in the form of equilateral triangles, as in the diagram below.

1 length
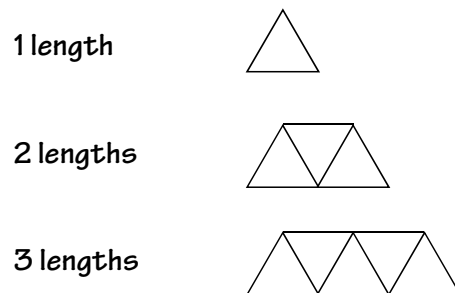
2 lengths

3 lengths

Note that one more length is always in the bottom of the trusses than on the top.

Extensions

♦   Assign the following problem and have students
    answer the questions.

*A group of students from a jazz choir want to attend
an international competition. They need to raise
money to help pay for the expenses. Each student
decided to investigate a scheme and present their
findings at the next meeting of the group.*

*One student decided to sell granola bars. The
predicted profit for every bar sold is $0.65. How
much could this scheme realistically make for the
trip?*

♦   Have students present their solutions orally with
    handouts that include a written plan along with tables
    and graphs to support their cases.

Activity 5

The Twin's Towers

Students develop the concept of a variable while solving problems using the ENTER key and the 2nd [ANS] key.

Setup

Discuss the following situation with your class.

My twin brother and sister are building towers with blocks. They built them in the following ways.

⇨ Build the towers with blocks as you discuss this activity or have the students build them with you.
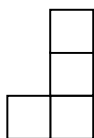
1-level tower   **2-level tower**   **3-level tower**
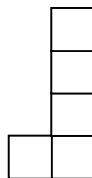
The twins want to know how many blocks they will need for a tower 27 levels high. Can you help them find this?

No. of levels	1	2	3	4	5 27
No. of blocks	3	4	5	6	7 29

Activity—Part A

1. Ask students: *Look at the row for the number of blocks. What pattern do you see?* (The first number is 3 and then increases by 1.)

2. Demonstrate along with your class how to put the pattern into the TI-73.

   a. Explain that this whole scenario starts with a 1-level tower that needs 3 blocks. So the first entry is 3.

      3 ENTER

   b. Ask students: *How many blocks do you need for a 2-level tower?* (Remember, you are working on how to get from the original 3 blocks to the 4 blocks in the 2-level tower.)

   c. Press + 1.

      Ask the class to tell you what **Ans** *means.* (Explain that just pressing + indicates to the TI-73 that it needs two things to add, so it grabs the answer (in this case, **3**) that you had in the line above and calls it **Ans**.)
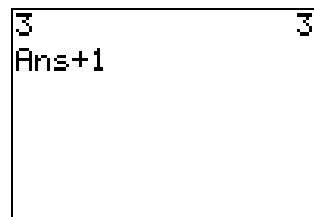
   d. Press ENTER.

      Explain that the number of blocks in the 1-level tower is the first entry and output on the screen (**3**). The number of blocks in the 2-level tower is the next output (**4**).
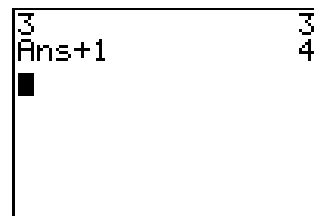
   e. Press ENTER again.

      Ask the class to explain what happened. (Because you did not enter a new command, the TI-73 did the previous command again; but this time, **Ans** stood for the most current answer, which was **4**.)
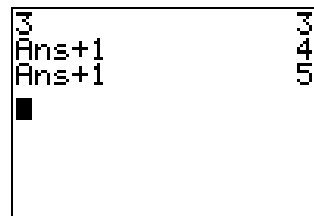
   f. Ask students: *How would you use the* ENTER *key (this technique) to find out how many blocks you would need for a 10-level tower?*

Have students count aloud as you press ENTER 7 more times.

3. Now have students generate this sequence on their
   TI-73s.

   ⬚3 ⬚ENTER ⬚+ ⬚1 ⬚ENTER

4. Working in groups of two, have students use their
   TI-73s to answer the following questions.
   How many blocks do you need for a 27-level tower?
   (29)

   How many blocks do you need for a 53-level tower?
   (55)

   A ___-level tower has 27 blocks? (25)

   A ___-level tower has 53 blocks? (51)

Activity—Part B

1. *Now the twins build the following towers.* Have
   students build them, too.
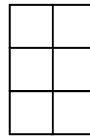
   1-story tower   **2-story tower**   **3-story tower**

2. Ask students how they would enter this scenario into
   the TI-73.

   ⬚2 ⬚ENTER ⬚+ ⬚2 ⬚ENTER

3. Have students answer the following questions.
   How many blocks do you need for an 8-story tower?

   A ____-story tower has 28 blocks.

   How many blocks do you need for a 53-story tower?

   A ____-story tower has 27 blocks.

Up to this point, students have been counting the number
of times they press ⬚ENTER . To make it easier to see which
term of the sequence they are on, they can create a
counter that will keep track for them.

4. Have students set up the counter for the second scenario.

   2nd [TEXT] ⌄ ⌄, and then ▸ until **{** ENTER
   1 , 2 ▸ to **}** ENTER
   ⌄ ⌄ to **Done** ENTER ENTER
   2nd [TEXT] ⌄ ⌄, and then ▸ until **{** ENTER
   ⌄ ⌄ to **Done** ENTER
   2nd [ANS] (above the (-) key)
   (1) + 1 ,
   2nd [ANS] (2) + 2
   2nd [TEXT] ⌄ ⌄, and then ▸ until **}** ENTER
   ⌄ ⌄ to **Done** ENTER ENTER

➡ **{ }** *indicates a list of numbers.*

```
{1,2}
            {1 2}
{Ans(1)+1,Ans(2)
+2}
            {2 4}
```

➡ **Ans(1)** *means the answer in the first position of the list and* **Ans(2)** *means the answer in the second position of the list.*

Ans(1) +1 *will count up by ones to let you know which term you are on, while* **Ans(2)+2** *is the familiar pattern you use to find the number of blocks each tower will have.*

Activity—Part C

1. *Now the twins move to bigger things.* Try this next pattern with the counter.

1-story tower   **2-story tower**   **3-story tower**
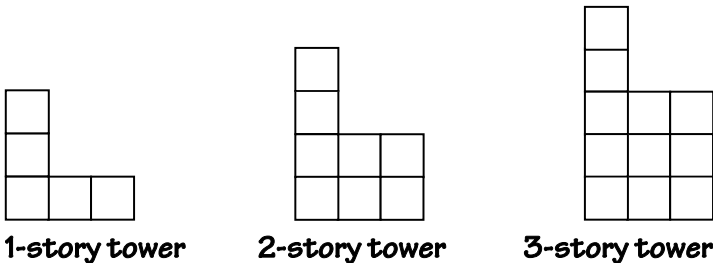
2. Have students set up the counter.

   2nd [TEXT] ⌄ ⌄, and then ▸ until **{** ENTER
   1 , 5 ▸ to **}** ENTER
   ⌄ ⌄ to **Done** ENTER ENTER
   2nd [TEXT] ⌄ ⌄, and then ▸ until **{** ENTER
   ⌄ ⌄ to **Done** ENTER
   2nd [ANS] (above the (-) key)
   (1) + 1 ,
   2nd [ANS] (2) + 3
   2nd [TEXT] ⌄ ⌄, and then ▸ until **}** ENTER
   ⌄ ⌄ to **Done** ENTER ENTER

```
{1,5}
            {1 5}
{Ans(1)+1,Ans(2)
+3}
            {2 8}
■
```

3. Explain to students that the process they have been
    using to find successive terms in a sequence of
    numbers is called *recursion*. Recursion means that
    each term is built from the term before it. This
    recursive process allows students to solve more
    complicated, real-life problems.

Wrap-up

Discuss the power of **Ans** with your students. You could
have solved all of the situations examined by making lists
of each sequence, term after term. With the power of
technology, terms can be generated much faster and
difficult real-world problems can be solved.

Assessment Suggestions
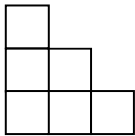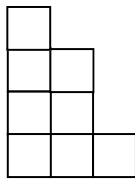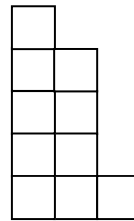
1 story   2 story   3 story

<u>or</u>
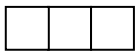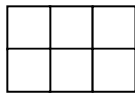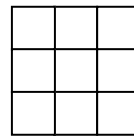
1 story   2 story   3 story

♦ Have students write the recursive pattern they would
   use to generate how many blocks they need for each
   tower.

♦ Ask students:
   *How many blocks do the following need: 1 story, 8
   stories, 150 stories, 99 stories?*

   *If you use the following number of blocks, what story
   are you on: 56, 110, 221?*

♦ Give students a situation like in the last question. Then give them the screen shot shown at the right. Ask students to discuss what the screen means.

```
5              5
Ans+2          7
■
```

♦ In groups, have students come up with their own situations that can be solved recursively. Have them write the situations in story form, and then trade with another group.

♦ Give students the screen shot at the right. Ask them to create at least one situation that would fit this pattern.

```
{1,3}
            {1 3}
{Ans(1)+1,Ans(2)
+2}
            {2 5}
■
```
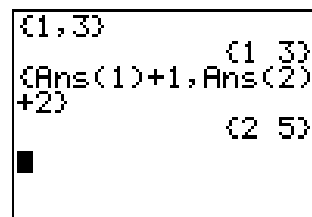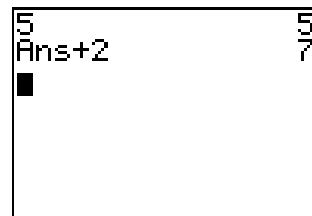
Extensions

Use the following patterns to work with fractions and decimals.

1.

2.
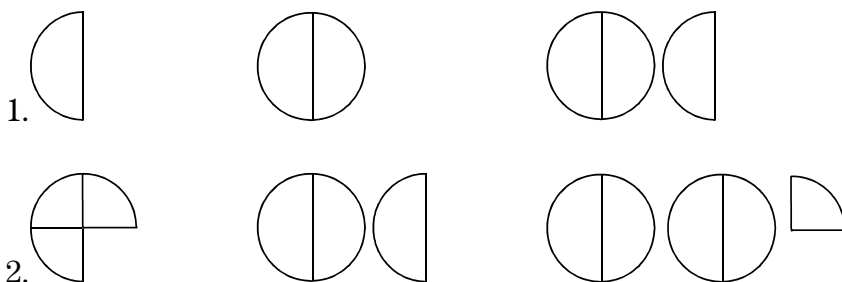
Doubling

An old legend recounts the story of the ruler who offered the subject any payment the subject requested. The subject replied that the following would suffice: 1 grain of wheat on the first square of the chessboard, 2 on the next, 4 on the next, and so on, doubling the amount of wheat on each successive square.

Ask students: *How many grains of wheat will you need just to fill the squares of the first row?* (8 squares)

How many grains for half of the board? (32 squares)

How many grains to pay the subject in full? (64 squares)

{ `0` `,` `1` **}** `ENTER`, and then **{** `2nd` `[ANS]` `(` `1` `)` `+` `1` `,` `2` `×` `2nd` `[ANS]` `(` `2` `)` **}**

Activity 5
The Twin's Towers
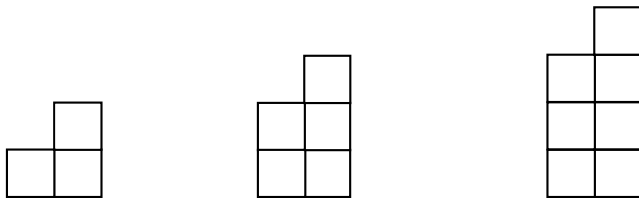
1. Build the above pictures with blocks or cutouts.

2. How many blocks total will you need to build a 6-story building?

   a. Build it and write the number here: ➡ _____

   b. Now develop a pattern for entering it into the TI-73. Write your pattern here: ➡ _____

   c. Now check your pattern by entering it into the TI-73 and pressing ENTER 5 times.

      Did you get the right number of blocks? ➡ _____

3. Using your TI-73 pattern, how many blocks will you need to build a 13-story building? ➡ _____

4. How many stories will you have if you use 53 blocks? ➡ _____

5. How many stories will you have if you use 54 blocks? ➡ _____

➡ This pattern requires an odd number of blocks, so you will not have a complete building if you use 54 blocks.

Name   _____
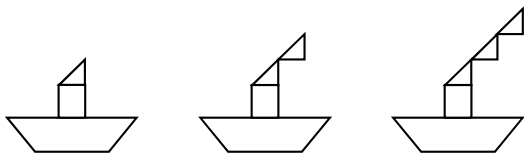
1. Build the above pictures with pattern blocks
    or cutouts.

2. How many blocks total will you need to
    build a boat with 5 puffs of smoke?

    a. Build it and write the number here: ⟹ _____

    b. Now develop a pattern for entering it
        into the TI-73. Write your pattern here: ⟹ _____

    c. Now check your pattern by entering it
        into the TI-73 and pressing ENTER 4
        times.

        Did you get the right number of blocks?   ⟹ _____

3. Using your TI-73 pattern, how many blocks
    will you need to build a boat with 17 puffs of ⟹ _____
    smoke?

4. How many puffs of smoke will you have if
    you use 37 blocks?   ⟹ _____

Activity 6

Major Martian Headache

Students learn about patterning and writing simple rules as they explore a hypothetical situation about Martians.

Setup

- ♦ Divide the class into groups and distribute 5 large marshmallows to each student.

- ♦ Provide each group with a tray of toothpicks and a dish of small marshmallows.

- ♦ Tell students:

  There has been a recent discovery on the surface of Mars. The Rover uncovered a tablet with Martian inscriptions on it. After much decoding, scientists have decided the tablet describes the physical appearance of a Martian. Martians did apparently have two antennas each. The tablet goes on to tell that as the climate changed to much colder weather, the Martians needed antenna muffs for each of their two antennas.

- ♦ Ask students: *If each Martian has two antennas, how many antenna muffs will be needed for the entire community of Martians?*

Activity

Have students perform the steps unless otherwise indicated.

1. Make each large marshmallow into a Martian head by poking 2 toothpicks on it and adding 2 small marshmallows to the tops of the toothpicks for antennas.

2. Starting with one Martian head, make a T-chart to show how many heads and how many antennas. An example of the start of a T-chart follows.

# Martian Heads	# Antennas
1	2
2	4
.	.
.	.
5	

3. See if the students can see a pattern in their own 5 Martian heads. Ask: *What if we were to count antennas in the entire classroom? Is there a fast way to count them up?*

    Students can use the CONST key to try their fast rule.

    Example   If students decided the rule was to add 2 antennas each time, then they would enter

    2nd [SET] (above the CONST key)
    + 2 2nd [QUIT]
    1 CONST 2 CONST (and continue putting in the number of Martian heads and pressing CONST until they get to 5)

    See if this matches their T-charts. Students will probably discover that for every marshmallow Martian head, there are 2 times as many antennas.

```
1+2          n=1     3
2+2          n=1     4
3+2          n=1     5
4+2          n=1     6
5+2          n=1     7
```

4. Guide students to see that the rule for making antenna muffs is *heads ∗ 2 = number of antenna muffs*. Show students how this also can be written as *X ∗ 2 = Y*.

⇨ *The TI-73 displays the multiplication symbol as an asterisk ∗.*

5. Ask students: *If there are 67 Martians in a community, how many antenna muffs would be needed?*

6. On the TI-73, enter *X ∗ 2 = Y* into the Y= editor.

    [Y=] [x] [×] [2]

7. Explore for any given Martian community size by first setting up a table of values.

    a. Access the **TABLE SETUP** screen.

        [2nd] [TBLSET] (above the [WINDOW] key)

    b. Make sure the screen looks like the one shown at the right (**TblStart=0, ΔTbl=1, Indpnt: Auto, Depend: Auto**).

```
TABLE SETUP
 TblStart=0
 ΔTbl=1
Indpnt: Auto Ask
Depend: Auto Ask
```

8. Show on the TI-73 a table of values for the equation.

    [2nd] [TABLE] (above the [GRAPH] key)

```
  X    │ Y₁  │
  61   │122  │
  62   │124  │
  63   │126  │
  64   │128  │
  65   │130  │
  66   │132  │
  67   │134  │
X=67
```

9. Move around on the table and find the number of antenna muffs needed for a community of 67 Martians.

    [▲] and [▼]

10. To find the number of antennas for even larger communities, go back to the **TABLE SETUP** screen and change **TblStart** to a larger amount, such as 1000.

    [2nd] [TBLSET]

```
TABLE SETUP
 TblStart=1000
 ΔTbl=1
Indpnt: Auto Ask
Depend: Auto Ask
```

11. Display the table.

    [2nd] [TABLE]

```
  X     │ Y₁   │
 1000   │2000  │
 1001   │2002  │
 1002   │2004  │
 1003   │2006  │
 1004   │2008  │
 1005   │2010  │
 1006   │2012  │
X=1000
```

12. Tell students:

    Digging deeper, the Rover found evidence of other communities that had different numbers of antennas.

13. Have your students repeat the above activity using other numbers of antennas per Martian. See if they can write a rule for each.

    Have them enter their rules in the Y= editor ([Y=]) and use the table as before.

Wrap-up

Have students draw their Martians with a different number of antennas and show how they adapt to their environment. Have them include a description and the rule for each.

Extensions

♦ Write problems telling other adaptations the Martians may have needed, such as more arms, toes, eyes, etc.

♦ Find the rules for each of their problems and explore on the table for different community sizes.

Activity 7

The Dolphin
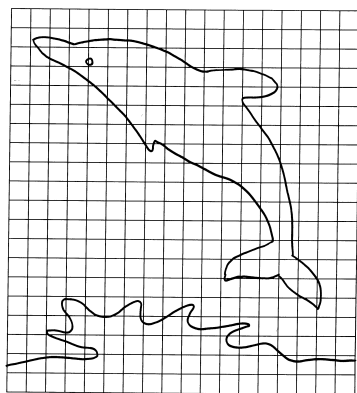
Students use ordered pairs to reproduce a picture of a dolphin on the TI-73 screen, and then set up an appropriate viewing window.

Setup

♦   On the grid paper, demonstrate how to draw the *x*- and *y*-axes.

♦   Have students draw and label the *x*- and *y-axes* on their papers. Ask: *What do we call the intersection of the x- and y*-axes? (the origin)

♦   Have students label the origin on their graphs. (0,0)

♦   Review how to graph points on the coordinate grid. Begin at the origin. Ask: *How do I graph (2,5), (5,2), (-2,5), (5,-2), (2,-5), (-5,2), (-5,-2)?*

Activity

Have students perform the steps unless otherwise indicated.

1. On the transparency of the dolphin picture, label the x- and y-axes using whole numbers. Have students label their copies, too.

2. Lead the class in a discussion of selecting the first few key points to make a dot-to-dot outline of the dolphin. Depending on the level of your students, these points may be at whole number values, integral values, or fractional values.

3. Have students work with partners to complete the dot-to-dot outline of the dolphin. Ask: *How could you get the curved lines smoother?* (select points closer together, use fractional or decimal values for coordinates)

4. On the transparency, label the points in alphabetical order and as ordered pairs counter-clockwise around the outline of the dolphin. Have students label their copies.

5. Record the coordinates of each of those points on a sheet of paper.

6. Using the TI-73, enter the x-coordinates of the dolphin outline into **L1** and the y-coordinates of the dolphin outline into **L2**.

    a. Display the List editor.

    $\boxed{\text{LIST}}$

    b. If necessary, clear **L1**.

    $\boxed{\blacktriangle}$ to highlight **L1**
    $\boxed{\text{CLEAR}}$ $\boxed{\text{ENTER}}$

    c. Starting from the first line in **L1**, enter the x-coordinates. (You'll get an error if **L1** is still highlighted.) Press $\boxed{\text{ENTER}}$ after each list item.

    d. Now follow the same procedure and enter the y-coordinates in **L2**.

➩ Depending on the level of your students, the dolphin may be in the first quadrant only or it may be in more than one quadrant.

➩ Remember, for a closed figure, the first point's coordinates need to be reentered as the last point, also.

➩ It is critical that students enter the pairs of numbers in the proper order, because the order entered is the order in which they are plotted. You also need to make sure that both lists in each pair are the same length (**L1** and **L2** are the same length).

L1	L2	L3	1
■■■■■■■	------	------	
L1(1)=			

---

7. Set up the xyLine plot (connected line graph).

    a. Access the **STAT PLOTS** menu.

        [2nd] [PLOT] (above the [Y=] key)

    b. Select **Plot 1**.

        [ENTER]

    c. With the cursor blinking on the word **On**, select it.

        [ENTER]

    d. Move to **Type** and select the xyLine plot (first row, second from left ⌐△).

        [▼] [▶] [ENTER]

    e. Move to **Xlist** and select **L1**.

        [▼] [2nd] [STAT] [ENTER]

    f. Move to **Ylist** and select **L2**.

        [▼] [2nd] [STAT] [▼] [ENTER]

    g. Move to **Mark** and select the **.** (dot) as the mark for the xyLine plot.

        [▼] [▶] [▶] [ENTER]

    h. Set up the viewing window to match the part of the coordinate grid that you used.

        [WINDOW]

        The values shown in the screen at the right are the standard default values ([ZOOM] **6:Zstandard**). For more information, see "Setting the Window Format" and "Defining Window Values" in the Function Graphing chapter of the *TI-73 Guidebook* 📖.

    i. Turn on the grid.

        [2nd] [FORMAT] [▼] [▶] [ENTER]

    j. Make sure the axes are turned on.

        [2nd] [FORMAT] [▼] [▼] [ENTER]

8. Display the picture of the dolphin.

    [GRAPH]

    You may want to link the student picture to the viewscreen calculator to display on the overhead. If you want to turn off the grid, press [2nd] [FORMAT] [▼] [ENTER].
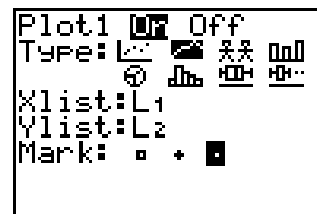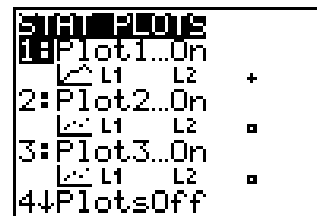
⇨ Your students should learn how to set up the WINDOW, but you can use [ZOOM] 7:ZoomStat to get the ideal WINDOW values.
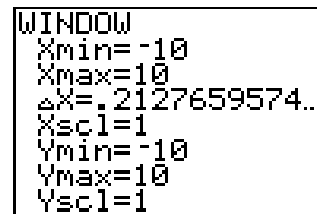
⇨ If a student gets a dim mismatch error, it means that the 2 corresponding lists have a different number of elements. You may also need to check the Y= editor to clear or turn off any functions ([Y=] [CLEAR]).

Wrap-up

Have students compare their team's picture graph with another team's picture. Have them discuss with their partner and the other team whether or not the graphs are exactly alike and why or why not.

➪ *Students can press* TRACE *and then* ▶ *to view the coordinates of each point of their picture.*

Assessment Suggestions

♦ Ask: *What was represented by the numbers in* **L₁** *and* **L₂**$?$

♦ Have students write a journal entry explaining what they learned.

Extensions

♦ Have students draw their own picture and label the ordered pairs. Have them graph the drawings.

♦ Have students change the appearance of the dolphin without changing the data in the lists.

♦ Have students explore what happens if they reverse the x- and y-coordinates. (Change which list is the **Xlist** and which is the **Ylist** in the **Stat Plot** setup.)

♦ If students want to store their picture to recall at another time,

1. Turn off the axes.

   2nd [FORMAT] ▼ ▼ ▶ to **AxesOff** ENTER

2. Access the **DRAW STO** menu and select **StorePic**.

   DRAW ▶ ▶ ENTER

```
DRAW POINTS STO
1█StorePic
2:RecallPic
```

```
StorePic
```

3. Access the **VARS** menu and select **Picture**.

   [2nd] [VARS] **4**

```
VARS
1:Window…
2:Y Vars…
3:Statistics…
4:Picture…
5:Table…
6:Factor
```

4. At **PICTURE**, select where you want to store your picture.

   [ENTER] to select **Pic1** or
   2 to select **Pic2** or
   3 to select **Pic3**

```
PICTURE
1:Pic1 (Empty)
2:Pic2 (Empty)
3:Pic3 (Empty)
```

♦ To recall the picture,

   1. Turn off the axes.

      [2nd] [FORMAT] [▼] [▼] [▶] [ENTER]

   2. Starting at the Home screen ([2nd] [QUIT]), go to **DRAW STO** and select **RecallPic**.

      [DRAW] [▶] [▶] **2**

```
DRAW POINTS STO
1:StorePic
2:RecallPic
```

   3. Go to **VARS** and select **Picture**.

      [2nd] [VARS] **4**

   4. Select where your picture is stored (**Pic1**, **2** or **3**).

   5. Press [GRAPH].
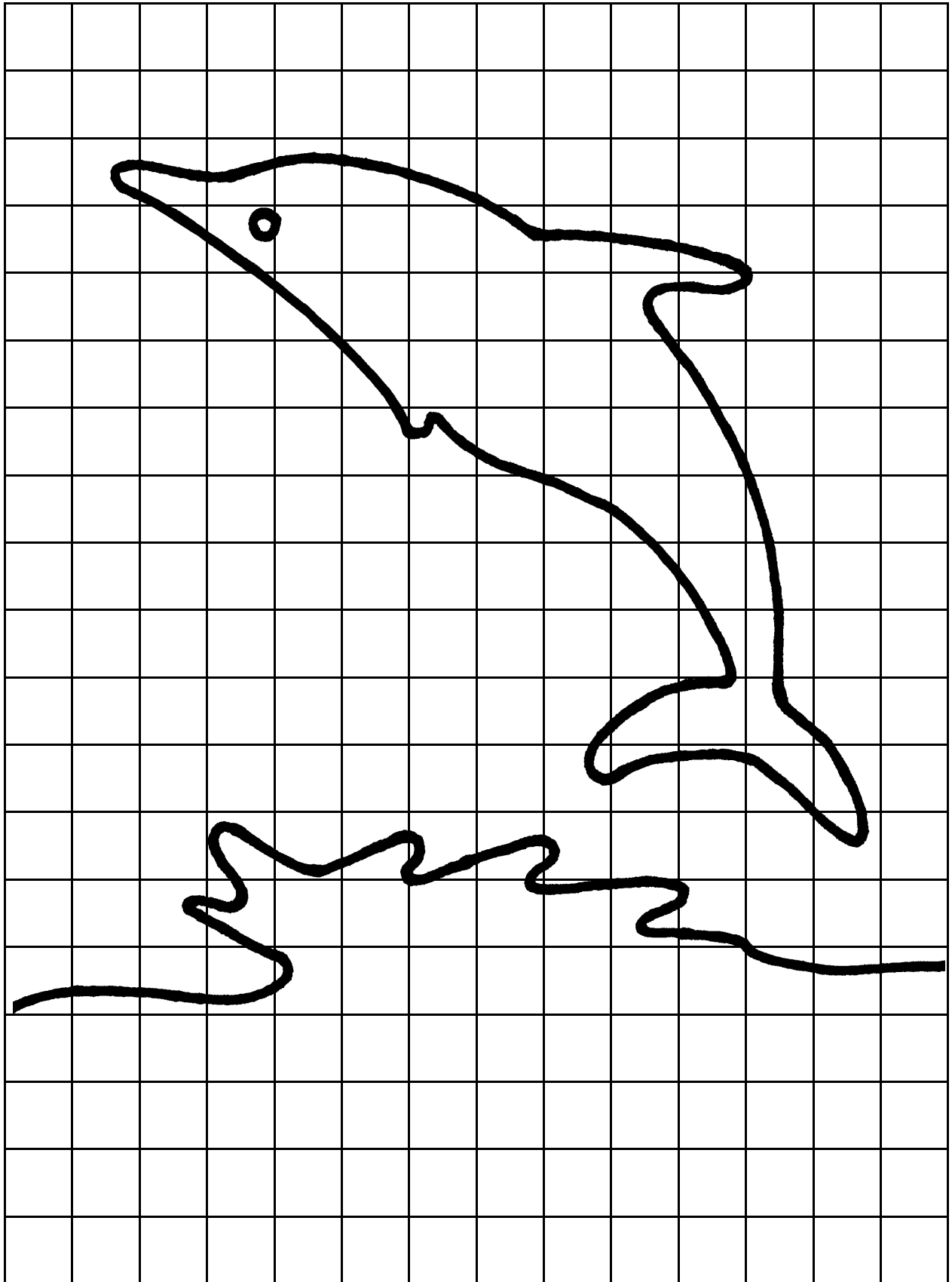
Activity 8

Drip, Drip, Drip

Students collect data from a dripping faucet. Then, using the TI-73, they produce data on the Home screen. Afterwards, they view the same data using a table, a graph, and the **Trace** feature.

Activity—Part A

Have students perform the steps unless otherwise indicated.

1. Turn on the faucet to a slow drip, and place a container to collect the water.

2. Record on the student activity sheet the exact time when you begin to collect the data.

3. Collect the data for 10 minutes.

4. During the collection, count and record the number of drops for any 2-minute period.

5. Use the TI-73 to calculate the number of drops per minute.

   a. Go to the Home screen.

      [2nd] [QUIT]

   b. Enter your 2-minute drip count and divide by 2.

      Drip count [÷] [2] [ENTER]

6. Measure the volume of the water collected in the 10-minute period.

⇨ If a faucet is not available, a large container with a small hole can be used (plastic gallon milk jug, large can, etc.). Leave the lid on the container to get a drip rather than a steady stream of water.

7. Ask students:

   Why did we count for 2 minutes? (Ten minutes is a long time to count. Counting for 2 minutes allows you to get an average for 1 minute. Counting for 3 or 4 minutes might give a more accurate average per minute, but it might be too long for your students.)

   Could you calculate the volume of each drop? (*volume of water / number of drops*)

   How much water would be collected in 1 hour? In 1 day?

   What changes to increase the total amount of water? (time)

   > A T-chart may help students see the change.

   What is the variable in this problem? (the number of hours)

8. Use the above questions to have students help you develop the formula for the following situation. Since the amount of water that would be collected changes with the number of hours you are collecting it, you could write an equation to describe this occurrence.

   The volume of water equals the amount of water that would be collected in 1 hour times the number of hours.
     *Y= (amount of water collected in one hour) * X*

   > The TI-73 displays the multiplication symbol as an asterisk *.

9. Enter the equation in the Y= editor (`Y=`).

   Example   If your calculation were two cups of water per hour, your equation would be *Y = 2X* (`2` `x`). (See screen at the right.)

   ```
   Plot1  Plot2  Plot3
   \Y₁■2X█
   \Y₂=
   \Y₃=
   \Y₄=
   ```

10. To view this graph, set up an appropriate, friendly viewing window.

    `WINDOW`
    Enter the numbers as shown in the screen at the right. Use `▾` to move down the fields.

    (For more information about the viewing window, see "Setting the Window Format" and "Defining Window Values" in the Function Graphing chapter of the *TI-73 Guidebook* 📖.)

    ```
    WINDOW
     Xmin=-47
     Xmax=47
     ∆X=1
     Xscl=10
     Ymin=-31
     Ymax=31
     Yscl=10
    ```

    > ∆**X** is determined by the TI-73, depending on what you entered for **Xmin** and **Xmax**.

11. View and trace the graph.

    GRAPH TRACE
    ◄ or ► to trace until **X=0**

    Ask: *What is the value of Y? What does this point represent?* (When time = 0, there is no water.)
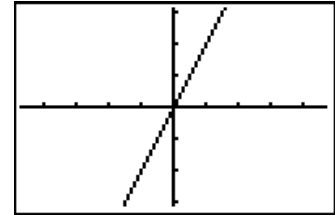
12. Now look at this same information in a table.

    2nd [TBLSET] (above the WINDOW key)

    The screen should look like the one at the right.

    2nd [TABLE] (above the GRAPH key)

13. Scroll down (▼) in the **X** column to **24**.
    Ask:
    What is in the Y₁ column?

    What does this value mean?

    Is this the same amount of water that you calculated on the Home screen for 1 day?

➡ If you want to go directly to X=24, set your table start (**TblStart**) to 24 on the **TABLE SETUP** screen (2nd [TBLSET]).

Wrap-up for Part A

♦ Using the table, have students answer these questions.
   How much water would be wasted if the drip continued over a weekend?

   How much water would be wasted over the Christmas holiday?

   How much water would be wasted in a year?

   How long would it take to fill our classroom with water?

♦ Make sure students have completed their activity sheets.

Activity—Part B

Have students perform the steps unless otherwise indicated.

1. Ask students: *If the faucet were dripping twice as fast, what would be the volume after 1 hour? After 2 hours?*

2. Tell students to predict what the graph of this equation would look like compared to the graph in Part A, step 11.

3. Use the **Manual-Fit** function to plot these data points for 1 hour and 2 hours.

   ```
   WINDOW
    Xmin=-9.4
    Xmax=9.4
    ΔX=.2
    Xscl=1
    Ymin=-12.4
    Ymax=12.4
    Yscl=1
   ```

   a. First, change the settings for the viewing window.

      WINDOW
      Enter the numbers as shown in the screen at the right. Use ▼ to move down the fields.

   b. Now return to the Home screen and clear a line.

      2nd [QUIT] to return to the Home screen
      CLEAR to clear a line
      Be sure you're on a clear line because **Manual-Fit** must display on its own line.

   c. Access the 2nd [STAT] **CALC** menu and select **Manual-Fit**.

      ```
      Ls OPS MATH CALC
      1:1-Var Stats
      2:2-Var Stats
      3▮Manual-Fit
      4:Med-Med
      5:LinReg(ax+b)
      6:QuadReg
      7:ExpReg
      ```

      2nd [STAT] ▶ ▶ ▶ 3

   d. Access the 2nd [VARS] menu and select **Y₁**.

      ```
      Manual-Fit Y₁▮
      ```

      2nd [VARS] (above the APPS key)
      2 ENTER

   e. Now display the graph.

      ENTER

      If you change your mind after pressing ENTER, you'll have to press ON to get out of the **Manual-Fit** screen.
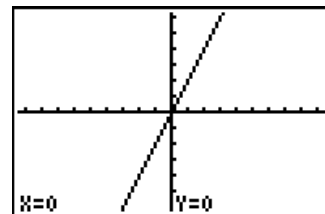
f. Now select the first point on the line.

▸ until **X=1**
▲ until **Y=4**
ENTER to select the first point on the line
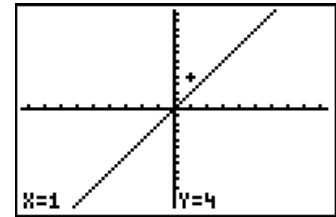
g. Select the second point on the line.

▸ until **X=2**
▲ until **Y=8**
ENTER to select the second point
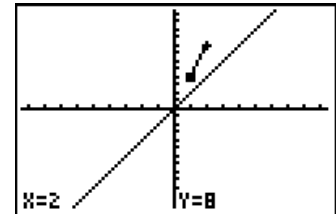
The screen shows the expression for the line.

h. Save the line.

ENTER
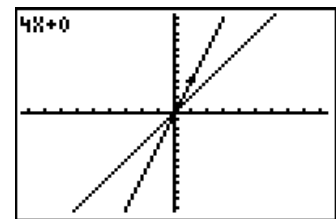
4. Turn on **Trace**.

GRAPH TRACE.

Ask: *Was your prediction correct?*

5. Investigate if the drip were half as fast. Use the same procedure as above to place a manual-fit line on the graph and paste the expression into the Y= editor.
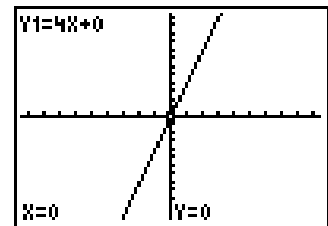
Extensions

If there are approximately 55,000,000 homes in North America and each has one dripping faucet, how much water is wasted per day? Per year?

Name   _____

Date   _____

Activity 8
Drip, Drip, Drip

Activity—Part A

1. Record start time.   ➡ _____

2. How many drips did you count in 2 minutes?   ➡ _____

3. How much water did you collect in 10 minutes?   ➡ _____

4. What did you calculate for number of drips in
   1 minute?   ➡ _____

5. How much water would be collected in 1 hour?   ➡ _____

   In 1 day?   ➡ _____

6. What changes to increase the total amount
   of water?   ➡ _____

7. What is the variable in this problem?   ➡ _____

8. Describe, in words, the rate of change in
   this problem.   ➡ _____

9. Translate your description in words into a
   math sentence (an equation).   ➡ _____

Name _____

Activity—Part B

1. If the faucet were dripping twice as fast, what
    would be the volume after 1 hour?   ⟹ _____

    After 2 hours?   ⟹ _____

    Write these as data points.   ⟹ _____

2. Predict what the graph of this equation would
    look like compared to our graph. Sketch the graph
    on the screen at the right.

    Use **Manual-Fit** to plot these data points.
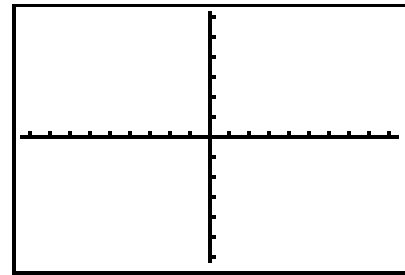
3. Paste this equation into the Y= editor and view
    the graph.

    Did the graph match your prediction?   ⟹ _____

4. Investigate if the drip were half as fast.

Activity 9

Only the Height Has Been Changed

Students collect data and examine variables that may cause a change in the distance a toy car will travel on the floor when it is rolled down a ramp.

- ♦ length
- ♦ mean
- ♦ collecting data
- ♦ graphing

- ♦ ruler
- ♦ yardstick, meterstick, or measuring tape
- ♦ ramp (cardboard or wood) - length should be divisible by 6
- ♦ toy car
- ♦ student activity sheet (provided)
- ♦ TI-73 📱

Setup

- ♦ Ask students:

    Have you ever made a ramp for your bicycle?

    What angle was the best?

    If your ramp were straight up, what would happen?

    If your ramp were lying flat, what would happen?

- ♦ Tell students that they are going to investigate how the height of a ramp will affect the distance that a toy car will travel when it rolls down the ramp.

- ♦ Divide the students into groups, with group members having the following responsibilities.

    - One student will hold a ruler perpendicular to the floor.

    - One or two students will hold the ramp with one end touching the ruler and the other end on the floor.

    - One student will release the car from the top of the ramp.

    - One student will measure the distance the car travels from the end of the ramp on the floor to where the car stops on the floor.

Activity

Have students perform the steps unless otherwise indicated.

1. As a class, measure the ramps. They should all be the same length.

2. Divide the length by 6 so students have 5 different intervals to test their ramp height. (For example, if the ramp is 24cm, the intervals would be 4cm, 8cm, 12cm, 16cm, and 20cm. Zero cm would be flat and 24cm would be straight up. If you wish to use inches, for example, a 12-inch ramp, the intervals would be 2 in., 4 in., 6 in., 8 in., and 10 in.)

3. Make predictions of the height of the ramp that will make the car roll the longest distance.

4. Test each height and record it on the student activity sheet.

5. Ask students: *At what height did your car roll the longest distance? The shortest distance?*

    Find out the distances for all groups.

6. Set up a graph on the board by asking students the following questions.
    What is the lowest ramp height? (zero)

    Highest ramp height? (straight-up position)

    What are the intervals in between? Set these numbers up on the vertical line of the graph.

    What should we label the vertical line or y-axis? (Height of ramp)

    What is the shortest distance the car traveled?

    What is the longest distance the car traveled?

    How should we set up the numbers in between? (as equal intervals) This will go on the horizontal line of the graph.

    What should we label the horizontal line or x-axis? (Distance the car traveled)

7. Using the group data, create a horizontal bar graph on the student activity sheet graph.

8. Now using the TI-73, create a horizontal bar graph, and then compare it to the graph made on the activity sheet.

    a. In **L1**, enter the ramp heights from 0 to the straight-up position.

        (1) Display the List editor.

             [LIST]

        (2) If necessary, clear **L1**.

             [▲] to highlight **L1**
             [CLEAR] [ENTER]

        (3) Enter each ramp height. Press [ENTER] after each entry.

    b. Now follow the same procedure to enter in **L2** the group data showing the distance the car traveled.

        The screen at the right shows an example of student data in list format.

    c. Now set up the bar graph.

        (1) Access the **STAT PLOTS** menu.

             [2nd] [PLOT] (above the [Y=] key)

        (2) Select **Plot 1**.

             [ENTER]

        (3) With the cursor blinking on the word **On**, select it.

             [ENTER]

        (4) Move to **Type** and select the bar graph (first row, last icon from left ▥).

             [▼] [▶] [▶] [▶] [ENTER]

        (5) Continue setting up the rest of your TI-73 screen to match the one shown at the right. Use [2nd] [STAT] to select **L1**, **L2**, **L3**, and **L4**. Press [ENTER] at **Hor** and at **1**.

9. Before graphing, set up the viewing window for each TI-73 ($\boxed{\text{WINDOW}}$).

   - **Xmin** will be 0.

   - **Xmax** will be the height of the ramp straight up plus 5 (so you can see the full graph).

   - **Ymin** will be 0.

   - **Ymax** will be the longest distance a car traveled plus 5.

   For more information, see "Setting the Window Format" and "Defining Window Values" in the Function Graphing chapter of the *TI-73 Guidebook* 📖.

10. Display the graph and discuss the data. Have students compare this graph to the graph they made on their activity sheets.

    $\boxed{\text{GRAPH}}$ $\boxed{\text{TRACE}}$
    $\boxed{\blacktriangle}$ and $\boxed{\blacktriangledown}$ to view data

```
WINDOW
 Xmin=0
 Xmax=10
 ⊿X=.1063829787…
 Xscl=1
 Ymin=0
 Ymax=10
 Yscl=1
```

➮ The **Xmax** and **Ymax** values shown here are just examples.
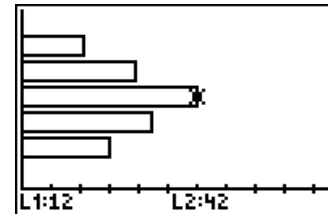
Wrap-up

♦ Combine class data and calculate the mean for each height using an overhead calculator. Do this on the Home screen of the TI-73 using traditional methods.

♦ Graph the class data on the overhead and compare the class graph to the individual group graphs.

Assessment Suggestions

Discuss as a class or have students write in their journals: *What is similar in all the graphs?*

Are there differences? What could have caused these differences?

Would a shorter or longer ramp affect the data?

Would a smaller or larger car affect the data? How?

Extension

Test the affect of varying the ramp length, car size or weight, or floor.

Name   _____

Date   _____

Activity 9

Only the Height Has Been Changed

L1 **Height of the Ramp**	L2 **Distance the Car Traveled**
(flat) 0	0
(straight up)	0

Height of ramp

Straight up

Flat

Distance the car traveled
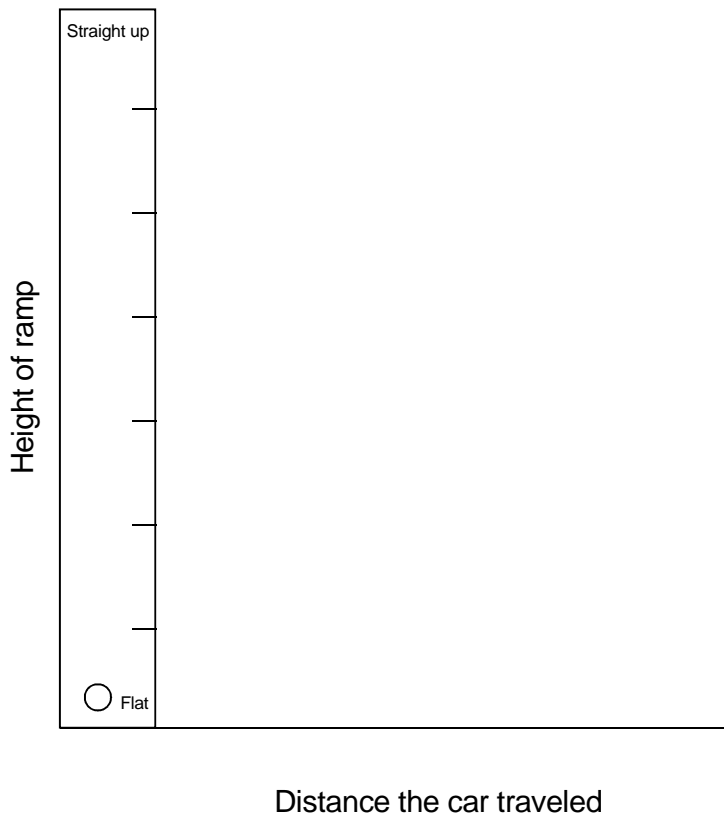
Activity 10

Give Me 5!

Students investigate the results of tossing 5 coins. They compare what happens to what is expected to happen.

Setup

♦ If your TI-73s have not been used for any random numbers prior to this activity, you and your students need to store an integer "seed value" to **rand** in each TI-73.

   With each **rand** execution, the TI-73 generates the same random-number sequence for a given seed value. The TI-73 factory-set seed value for **rand** is **0**. To generate a different random-number sequence, store any non-zero seed value to **rand**.

   1. Enter the number you want for your seed value. Have students use different seed values. (In the example at the right, **1** is used.)

   2. Now press STO▶ MATH ▶ ▶ **1** ENTER MATH ▶ ▶ **1** ENTER ENTER.

   (For more information about seed values, refer to the "MATH Probability Menu" section in the Math chapter of the *TI-73 Guidebook* 📖.)

♦ Discuss with students events that are equally likely to occur, such as tossing a coin and getting a head or a tail.

⇨ If you *do not* enter a seed value, **rand** uses whatever value happens to be the current seed. If there is no seed, it uses the factory-set value of 0.

```
1→rand            1
rand
      .7455607728
rand
      .8559005971
```

⇨ If you want to restore the factory-set seed value, store **0** to **rand** or reset the defaults.

Activity—Part A

Have students perform the steps unless otherwise indicated. Have them play the game "Get Ahead with More Heads." The instructions follow.

1. Group students into pairs.

2. Using the coin-toss function of the TI-73, toss 5 coins.

    a. Return to the Home screen.

    2nd [QUIT]

    b. Access the **Math** menu and select **coin**.

    MATH ▶ ▶ 6

    c. Toss 5 coins.

    5) ENTER

    ```
    coin(5)
            {0 1 0 1 0}
    ```

    ⇨ In this game, **1** means heads
       and **0** means tails.

3. Explain to students that **1** means heads, and **0** means tails. Heads are worth 1 point each. Tails are worth 0 points each. Thus, **{0 1 0 1 0}** means **{T H T H T}** and earns a score of 2 points.

4. Press CLEAR.

5. Student A: Press ENTER. Record the value of the toss under Trial 1, Student A on the Get Ahead With More Heads Score Sheet.

6. Student B: Press ENTER. Record the value of the toss under Trial 1, Student B on the Score Sheet.

7. Let students keep taking turns until all 5 trials are completed.

8. Discuss with students:
    What is the greatest possible score? (25)

    What is the least possible score? (0)

    Raise your hand if you had the highest score in the game you played with your partner.

    What would the result have been if tails were worth 1 point and heads were worth 0 points?

9. Have students play 4 more games and record the results.

10. Discuss with students:
    How many total trials did you and your partner have?

    Raise your hand if you had a 5-point toss. Raise your hand if you had a 0-point toss.

    Which score on a single trial would you predict is more likely to occur, 0 or 5?

    Out of the 50 trials, how many trials would you predict to be worth 5 points?

11. Record group data in the Coin-Toss Trials Small Group Data table provided.

    To calculate the probability, use:

    # of times event occurred / total # of trials

12. Add the probability column, and then discuss why the sum is 1.

13. Convert the probability fraction to decimal form using the ⟨F⬥D⟩ key. Record this in the decimal column of the Small Group Data table.

14. Ask students:
    How do the probabilities between your group and other groups compare?

    Does one outcome seem to be more probable than others?

    Is one less probable?

15. Collect the class data and have students record it in the Class Data table.

16. Enter the class data into the TI-73 using lists. Use **L1** for the points and **L2** for the frequencies.

    a. Display the List editor.

        ⟨LIST⟩

    b. If necessary, clear **L1**.

        ⟨▲⟩ to highlight **L1**
        ⟨CLEAR⟩ ⟨ENTER⟩

➡ Students should record probabilities as unsimplified fractions and also in simplest fractional form. Verify the total number of trials as 50 by adding the frequency column.

➡ In the student pairs, have Student A call out frequencies for points on each roll while Student B keeps a running total of the frequencies either mentally or with the TI-73.

c. Starting from the first line in **L1**, enter the possible points as shown in the screen at the right. (You'll get an error if **L1** is still highlighted.) Press [ENTER] after each list item.

d. Follow the same procedure to enter the class data into **L2**.

17. Now graph a histogram.

a. Access the **STAT PLOTS** menu.

    [2nd] [PLOT] (above the [Y=] key)

b. Make sure the other plots are off.

    [4] [ENTER]

c. Select **Plot 1**.

    [2nd] [PLOT] [ENTER]

d. With the cursor blinking on the word **On**, select it.

    [ENTER]

e. Move to **Type** and select the histogram (second row, second from left 𝚍𝚑).

    [▼] [▶] [▶] [▶] [▶] [▶] [ENTER]

f. Move to **Xlist**. If **L1** is not already set, set it to **L1**.

    [▼] [2nd] [STAT] [ENTER]

g. Move to **Freq**. If **L2** is not already set, set it to **L2**.

    [▼] [2nd] [STAT] [2]

    Your screen should look like the one at the right.

h. Set up the viewing window.
    [WINDOW]
    Enter the numbers as shown in the screen at the right. Use [▼] to move down the fields.
    Change **Ymax** to match your class data.
    Set **Ymin** to **-50** so that both the values and the graph show during tracing.

⮕ Note that ΔX is determined by the TI-73, depending on what is entered for **Xmin** and **Xmax**. **Xscl** represents the width of the bar on the histogram.

18. Turn on trace.

$\boxed{\text{TRACE}}$
$\boxed{\blacktriangleleft}$ and $\boxed{\blacktriangleright}$ to move along the histogram

Discuss the following questions.
In our class data, which outcomes are least likely?
Which outcomes are most likely?

Compare this to your small group data. Is it the
same? If not, what makes the difference? (sample size)
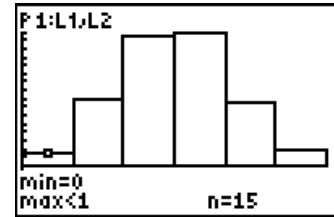
Wrap-up for Part A

♦ Ask students: *Which scores on a single toss are*
   equally likely (have the same probability)?

♦ Have students list the ways to get a sum of 1.
   (H T T T T   T H T T T   T T H T T   T T T H T
   T T T T H)

♦ Now have students list the ways to get a sum of 4 to
   verify that the sums of 1 and 4 are equally likely.
   (H H H H T   H H H T H   H H T H H   H T H H H
   T H H H H)

Assessment Suggestion for Part A

Have students record in their journals how they
determined which outcomes were most or least likely to
occur.

Activity—Part B (for Advanced Classes)

Have students perform the steps unless otherwise
indicated.

1. Discuss the difference between the probabilities that
   were gathered (*experimental* probabilities) and the
   probabilities that should have happened (*theoretical*
   probabilities).

2. Use the tree diagram on the activity sheet to find the
   expected (theoretical) probabilities and record them
   on the activity sheet.

3. Compare the group experimental probabilities with the theoretical probabilities from the tree diagram.

   a. Go to **L3** and calculate the group probabilities by dividing each entry in **L3** by the total number of trials (sum of **L2**).

      [LIST] [▶] [▲] to highlight **L3** (See screen at the right.)
      [2nd] [STAT] [2] [÷] [2nd] [STAT] [▶] [▶] [7]
      [2nd] [STAT] [2] [)] [ENTER]

   b. In **L4** enter the frequencies from the tree diagram. (See screen at the right.)

      [▶] to the first line of **L4**
      Enter the frequencies from the tree diagram. Press [ENTER] after each list item.

   c. Then in **L5**, find the theoretical probabilities by dividing the frequencies in **L4** by the total of **L4**, which is 32.

      [▶] [▲] to highlight **L5**
      [2nd] [STAT] [4] [÷] [2nd] [STAT] [▶] [▶] [7]
      [2nd] [STAT] [4] [)] [ENTER]

4. Compare the experimental probabilities in **L3** to the theoretical probabilities in **L5**. (See screen at the right.)

   ➩ Counting the frequency of the points on the tree diagram resulted in the frequencies listed in **L4**.

Wrap-up for Part B

Have students write in their journals the difference between experimental and theoretical probability.

Assessment Suggestion for Part B

Ask students: *Suppose you toss 4 coins. How many heads are most likely to occur? Explain.*

Extensions

♦ Find the probability of two equally likely events using combinations in Pascal's Triangle.

♦ Plot a histogram using the theoretical probabilities.

♦ Draw a pie chart comparing frequencies to total number of possible outcomes.

Activity 10
Give Me 5!

Name _____

Date _____

Get Ahead With More Heads
Score Sheet

Trial #	Student									
	A	B	A	B	A	B	A	B	A	B
1										
2										
3										
4										
5										
Total										

Coin-Toss Trials
Small Group Data

Points each roll	Frequency	Probability-fraction	Probability-decimal
0 (0 H, 5 T)			
1 (1 H, 4 T)			
2 (2 H, 3 T)			
3 (3 H, 2 T)			
4 (4 H, 1 T)			
5 (5 H, 0 T)			

Total number of trials—50

Name _____

Coin-Toss Trials
Class Data

Points each toss	Frequency	Probability - fraction	Probability - decimal	Percent equivalent
0				
1				
2				
3				
4				
5				
Totals				

Theoretical Probability of Tossing 5 Coins

```
                              H 5  H, H, H, H, H = 1+1+1+1+1 = 5
                         H <  T 5  H, H, H, H, T = 1+1+1+1+0 = 4
                    H <       H 5  H, H, H, T, H = 1+1+1+0+1 = 4
                             T <  T 5  H, H, H, T, T = 1+1+1+0+0 = 3
               H <            H 5  H, H, T, H, H = 1+1+0+1+1 = 4
                        H <  T 5  H, H, T, H, T = 1+1+0+1+0 = 3
                    T <       H 5  H, H, T, T, H = 1+1+0+0+1 = 3
                             T <  T 5  H, H, T, T, T = 1+1+0+0+0 = 2
          H <                 H 5  H, T, H, H, H = 1+0+1+1+1 = 4
                        H <  T 5  H, T, H, H, T = 1+0+1+1+0 = 3
                    H <       H 5  H, T, H, T, H = 1+0+1+0+1 = 3
                             T <  T 5  H, T, H, T, T = 1+0+1+0+0 = 2
               T <            H 5  H, T, T, H, H = 1+0+0+1+1 = 3
                        H <  T 5  H, T, T, H, T = 1+0+0+1+0 = 2
                    T <       H 5  H, T, T, T, H = 1+0+0+0+1 = 2
                             T <  T 5  H, T, T, T, T = 1+0+0+0+0 = 1

                              H 5  T, H, H, H, H = 0+1+1+1+1 = 4
                         H <  T 5  T, H, H, H, T = 0+1+1+1+0 = 3
                    H <       H 5  T, H, H, T, H = 0+1+1+0+1 = 3
                             T <  T 5  T, H, H, T, T = 0+1+1+0+0 = 2
               H <            H 5  T, H, T, H, H = 0+1+0+1+1 = 3
                        H <  T 5  T, H, T, H, T = 0+1+0+1+0 = 2
                    T <       H 5  T, H, T, T, H = 0+1+0+0+1 = 2
                             T <  T 5  T, H, T, T, T = 0+1+0+0+0 = 1
          T <                 H 5  T, T, H, H, H = 0+0+1+1+1 = 3
                        H <  T 5  T, T, H, H, T = 0+0+1+1+0 = 2
                    H <       H 5  T, T, H, T, H = 0+0+1+0+1 = 2
                             T <  T 5  T, T, H, T, T = 0+0+1+0+0 = 1
               T <            H 5  T, T, T, H, H = 0+0+0+1+1 = 2
                        H <  T 5  T, T, T, H, T = 0+0+0+1+0 = 1
                    T <       H 5  T, T, T, T, H = 0+0+0+0+1 = 1
                             T <  T 5  T, T, T, T, T = 0+0+0+0+0 = 0
```

Pts each toss	Freq	Prob
0		
1		
2		
3		
4		
5		

Total number of outcomes_____

Activity 11

A Foot is a Foot–Or is It?

Students investigate how their own foot measurements compare to the customary measurement of a foot (12 inches).

Setup

♦ Tell students that the dictionary defines foot, as it relates to measurement, as a measure of length equal to 12 inches based on the average length of a human foot.

♦ Have students investigate this definition to see if the average human foot is equal to 12 inches, or a foot.

Ask questions to guide the students to determine how they will investigate this definition. Decide as a class your answers to these questions:
How will we find out if this statement is true?

Who will we survey (measure)?

What will we ask them?

Should we only survey students? (You will probably want to include adults in the survey.)

How many people should we survey?

Could we find out this information without a survey? Where could we find it?

♦ Demonstrate to students how to measure a foot, from heel to toe, so that everyone is measuring the same. Ask:

What unit should we use to measure? (inches)

What if there are parts of an inch left? Will we record it as a decimal or fraction? (Fraction would probably be easiest for this part.)

Do we need to measure both feet or just one foot?

Should we measure with the shoe on or off?

Activity

Have students perform the steps unless otherwise indicated.

1. Have each student measure 20 people, or the number of people that the class decides to measure. Students need to decide how many adults and how many children they will measure. They may use the activity sheet provided to organize their data.

2. Once students have collected data, ask:
    What is an average?

    How will we find out if the average foot size in our survey is 12 inches, or a foot? (Add them all together and divide by the number of feet measured.)

    How will we add the fractional parts? (If you wish, you can convert them to decimals using the TI-73. See the example in the next step.)

3. Find the averages from the data.

    a. Go to the Home screen.

        2nd [QUIT]

    b. Convert fractions to decimals by using the F↔D key on the TI-73.

        Example To convert 12¼ inches to a decimal, enter 1 2 UNIT 1 b/c 4 F↔D ENTER.

    c. From the Home screen, find the mean using traditional methods.
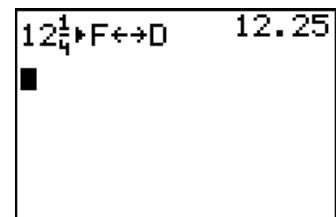
4. Now enter the data into a list (**L1**), and then find the mean.

    a. Display the List editor.

        [LIST]

    b. If necessary, clear **L1**.

        ▲ to highlight **L1**
        [CLEAR] [ENTER]

    c. Starting from the first line in **L1**, enter each length. (You'll get an error if **L1** is still highlighted.) Remember to press [ENTER] after each entry.

    d. Find the mean of the data in **L1**.

        (1) Return to the Home screen.

             [2nd] [QUIT]

        (2) Access the [2nd] [STAT] **MATH** menu and select **mean**.

             [2nd] [STAT] [▶] [▶] [3] (pastes **mean(** to the Home screen)

        (3) Calculate the mean.

             [2nd] [STAT] [ENTER] (selects **L1**)
             [)] [ENTER]

5. Ask students to analyze their data:
    Was your mean from **L1** *the same as the mean from the Home screen?*

    Did everyone find the same average foot size in their survey? Why or why not?

    Would our results be more accurate if we combined the class data?

    How can we combine the data?

    Should we combine all the lengths and then find the mean, or could we combine all the means and find the mean of that? Would we get the same answer both ways?

6. Combine the class data by either combining the individual foot lengths and finding the mean or by averaging the individual means. (It may be beneficial for students to do it both ways so students can see if the same answer comes up both ways).

7. Now enter the combined data into a list (**L2**), and then find the mean.

    a. Display the List editor.

        [LIST]

    b. If necessary, clear **L2**.

        [▲] to highlight **L2**
        [CLEAR] [ENTER]

    c. Starting from the first line in **L2**, enter each length. (You'll get an error if **L2** is still highlighted.) Remember to press [ENTER] after each entry.

    d. Find the mean of the data in **L2**.

        (1) Return to the Home screen.

            [2nd] [QUIT]

        (2) Access the [2nd] [STAT] **MATH** menu and select **mean**.

            [2nd] [STAT] [▶] [▶] [3] (pastes **mean(** to the Home screen)

        (3) Calculate the mean.

            [2nd] [STAT] [2] (selects **L2**)
            [)] [ENTER]

Wrap-up

Ask students:

Was the mean of the combined data from **L2** *the same as the mean from the Home screen?*

What does our combined class data show?

Is the statement true that the average length of a human foot is 12 inches, or a foot?

Do you think our class data is accurate?

How could we make it even more accurate?

Where could we find data without measuring feet?

Do you think average foot sizes differ around the world? How could we find out?

Assessment Suggestions

♦   Have students find averages of other sets of data, such as average arm length in the class, and so on.

♦   Have students write about the definition from the dictionary and support or disprove the statement using their class data.

Extensions

♦   Find the average adult foot size and compare it to the average child foot size.

♦   Research other countries and find out if average foot lengths differ around the world. Make speculations as to why foot lengths differ.

Name   _____

Date   _____

Activity 11

A Foot is a Foot–Or is It?

Name (indicate child or adult)	Length of foot in inches (use fractions for leftovers)	Convert fractions to decimals

Mean of my data _____

Mean of class data _____

Does our class data support the statement that the average human foot is 12 inches long?____

Activity 12

Which Brand Is Best?

In this real-world activity, students comparison shop in their community. Then they produce consumer reports to share their findings with their class.

- ♦ measures of central tendency (mean, median, mode, range, quartiles)
- ♦ graphs (box plot, pictograph, bar graph, pie chart)
- ♦ tables

Materials

- ♦ student activity sheets (provided)
- ♦ TI-73 🖩

Setup

- ♦ Explain to students that they need to find 5 or more different brand names of the *same* product. Then they need to record the brands and prices for the product chosen (*no purchase necessary*).

    Example

Brand Names	Prices
Brand A	$1.89
Brand B	$2.25
Brand C	$1.89
Brand D	$1.86
Brand E	$1.97

- ♦ Allow 2 to 3 days for each student to "shop" and select a product to research.

⇨ Make sure that the 5 prices the students list are not all the same.

Activity

Have students perform the steps unless otherwise indicated.

1. On the activity sheets provided, have students use their information to report the minimum and the maximum prices of the product they selected, the mode, the mean, the median, and the range of prices.

    a. First, enter the prices into List 1 (**L1**) on the TI-73, and set the decimal to the hundredths place.

        (1) Display the List editor.

        [LIST]

        (2) If necessary, clear **L1**.

        [▲] to highlight **L1**
        [CLEAR] [ENTER]

        (3) Starting from the first line in **L1**, enter each price. (You'll get an error if **L1** is still highlighted.) Press [ENTER] after each price.

        (4) Now set the decimal to the hundredths place.

        [MODE] [▼] [▶] [▶] [▶] [ENTER]

        (5) Go to the Home screen.

        [2nd] [QUIT]

    b. Now find the *minimum* price.

        (1) Access the [2nd] [STAT] **MATH** menu and select **min**.

        [2nd] [STAT] [▶] [▶]
        [ENTER] (pastes **min(** to the Home screen)

        (2) Calculate the minimum price.

        [2nd] [STAT] [ENTER] (selects **L1**)
        [ )] [ENTER]

    c. Follow the same procedure in step b for the *maximum* (**2:max()**, *mean* (**3:mean()**), *median* (**4:median()**), and *mode* (**5:mode()**).

2. Calculate the range.

3. Now make a box plot on the TI-73.

    a. Access the **STAT PLOTS** menu.

        2nd [PLOT] (above the Y= key)

    b. Make sure the plots are off.

        4 ENTER

    c. Select **Plot 1**.

        2nd [PLOT] ENTER

    d. With the cursor blinking on the word **On**, select it.

        ENTER

    e. Move to **Type** and select the box plot (second row, third from left ⊞⊢).

        ▼ ▶ ▶ ▶ ▶ ▶ ▶ ENTER

    f. Move to **Xlist**. If **L1** is not already set, set it to **L1**.

        ▼ 2nd [STAT] ENTER

    g. Move to **Freq**. If **1** is not already set, set it to **1**.

        ▼ 1

        Your screen should match the screen at the right.

    h. Turn off any Y= functions.

        Y= CLEAR

4. View the box plot.

    ZOOM 7

    Note that you may need to change the **Ymin** and **Ymax** values to 1 and 10, respectively, to match the screen shown at the right.

    WINDOW ▼ to **Ymin** 1
    ▼ to **Ymax** 1 0
    ZOOM 7

➡ *One way to find the range is shown in the screen below.*

```
max(L1)-min(L1)
              .39
■
```

```
Plot1 ▮▮ Off
Type:▱ ▱ ☆☆ ▥▥
       ⊕ ▥▥ ▥▥ ⊞⊢
Xlist:L1
Freq:1
```
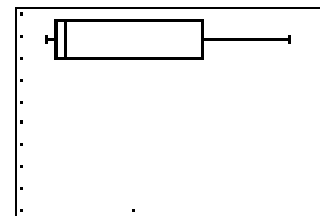
5. Move around the graph and see the data.

   TRACE

   ◄ and ► to view data

   ⇨ *A nice connection is to compare the trace values for* **Xmin**, **median**, *and* **Xmax** *with their calculated values.*

6. Have students sketch and label their plot on paper for their report. (If you have TI-73 TI-GRAPH LINK™, students may print their graphs to color and label.)

7. Have students poll 50 people (students, teachers, and other adults) to find out which of the brands they would actually buy. Have them record the responses in the table provided on the activity sheet.

   Students should try to poll those who would actually want to buy the product. They should ask the person why they chose that brand and include their responses with their student analyses.

   Example poll

Product Type:		
Brand Name	Price	Tally for each choice
1. Brand A	$1.89	IIIII IIIII IIIII II
2. Brand B	$2.25	IIIII IIIII IIIII IIIII
3. Brand C	$1.89	IIIII
4. Brand D	$1.86	III
5. Brand E	$1.98	IIII

8. In the table on the activity sheet, have students record the name of their product, the frequency, and their poll results as a fraction, decimal, and percent.

   ⇨ *You can use* b/c *to enter fractions (numerator* b/c *denominator* ► *) and* F◄►D *to convert them to decimals.*

   Example table

Brand Name	Frequency	Fraction	Decimal	Percent
Brand A	17	17/50	0.34	34%
Brand B	21	21/50	0.42	42%
Brand C	5	5/50	0.10	10%
Brand D	3	3/50	0.06	6%
Brand E	4	4/50	0.08	8%

9. Now enter the surveyed information into the TI-73.

a. Enter the brand names in **L2**. (In this example, we use the brand names from the example table.)

LIST ▶ to **L2** 2nd [TEXT] ▼ ▼, and then
▶ until **"** ENTER
▲ ▲, and then ◀ until **A** ENTER
▼ ▼ ▼ ▼ to **Done** ENTER ENTER
(Because **"** is only needed for the first element of a categorical list, you can enter the rest of the elements from the Text editor without it.)

b. Before entering the frequency, go back to **mode** and highlight **Float**.

MODE ▼ to **Float** ENTER

c. Now enter the tally.

LIST ▶ to **L3** and enter the frequency

d. Go to the Home screen.

2nd [QUIT]

10. Make a pictogram on the TI-73.

a. Access the **STAT PLOTS** menu.

2nd [PLOT] (above the Y= key)

b. Make sure the other plots are off.

4 ENTER

c. Select **Plot 1**.

2nd [PLOT] ENTER

d. With the cursor blinking on the word **On**, select it.

ENTER

e. Move to **Type** and select the pictogram (first row, third from left ♣♣).

▼ ▶ ▶ ENTER

f. Move to **CategList**. If **L2** is not already set, set it to **L2**.

▼ 2nd [STAT] 2

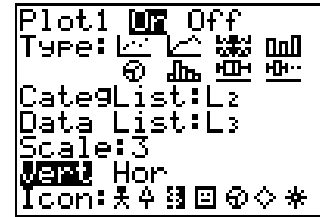g. Move to **Data List**. If **L3** is not already set, set it to **L3**.

⬇ 2nd [STAT] 3 ENTER

h. Continue setting up the plot. Your screen should look like the screen at the right. Press ENTER at **Vert** and at the **$** icon.

```
Plot1 ▓▓ Off
Type:⌐  ∠  ▓▓  ▥▥
        ⊘  ▥▥  ▥▥  ▥▥
CategList:L₂
Data List:L₃
Scale:3
▓▓▓▓ Hor
Icon:♣ ♦ ▤ ▢ ⊘ ◇ ✳
```

➥ **Scale** *tells the TI-73 the value or quantity each icon represents. The display shows a maximum of 7 icons. Choose your scale based on the largest number in your data list, or you can select* ZOOM *7:ZoomStat and the TI-73 will select a scale for you. The largest data number divided by the scale must be less than or equal to 7. For example, if the largest data number is 21 then chose a scale of 3 because 21/3 ≤ 7.*

11. View the pictogram.

GRAPH

12. Now move around the graph and see the data.

TRACE
◀ and ▶ to view data

```
    ♣
♣  ♣
♣  ♣
♣  ♣
♣  ♣
♣  ♣
♣  ♣  ♣     ♣
♣  ♣  ♣  ♣  ♣
L2:A        L3:17
```

13. Have students sketch their graphs on paper for their report. (If you have TI-73 TI-GRAPH LINK™, students may print their graphs to color and label.)

14. Make a bar graph on the TI-73 showing the frequency results of the polls.
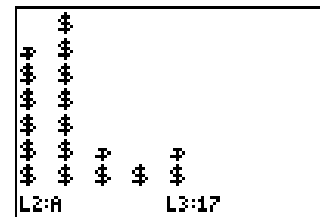
a. Access the **STAT PLOTS** menu.

2nd [PLOT] (above the Y= key)

b. Make sure the other plots are off.

4 ENTER

c. Select **Plot 2**.

2nd [PLOT] 2 ENTER

d. Select the bar graph ▥ (first row, last from left)
    and continue setting up the plot as in the picture at
    the right. (**DataList2** and **DataList3** allow you to do
    a double or triple bar graph. They are not relevant
    to this activity, and whatever is listed is okay.)

15. Display the graph.

    ZOOM 7

16. Now move around the graph and see the data.

    TRACE
    ◀ and ▶ to view data

17. Have students sketch their graphs on paper for their
    report (or use TI-73 TI-GRAPH LINK™ to print their
    graphs to color and label).

18. Make a pie chart on the TI-73 showing the percents
    from the polls.

    a. Access the **STAT PLOTS** menu.

        2nd [PLOT] (above the Y= key)

    b. Make sure the other plots are off.

        4 ENTER

    c. Select **Plot 3**.

        2nd [PLOT] 3 ENTER

    d. Select the pie chart ✪ (second row, first from left)
        and continue setting up the plot as in the picture at
        the right.
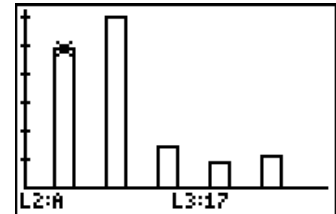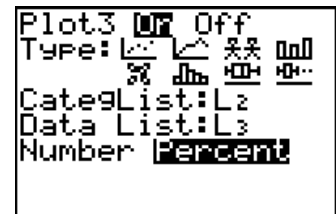

19. Display the pie chart.

    GRAPH

20. Move around the graph and see the data.

    TRACE
    ◀ and ▶ to view data
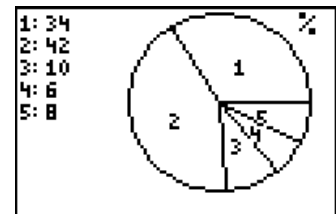
21. Have students sketch their graphs on paper for their report (or use TI-73 TI-GRAPH LINK™ to print their graphs to color and label).

22. Have students write analyses of their information. Here are some things you may want them to address: *Do you think that packaging, advertising, shipping, etc. have anything to do with different prices for the same product? Why or why not?*

    How can a company of a certain brand charge more?

    How can a company of a certain brand charge less?

    What are some of the things that the people you polled said as they told you their choice?

Wrap-up

♦ Have students make an attractive cover including pictures or drawings of their product. Have them organize their student activity sheets and graphs.

♦ Have students make their "consumer report" presentations for the class.

Assessment Suggestions

Collect reports to grade quality of student presentations.

Name   _____

Date   _____

Activity 12

Which Brand Is Best?

1. Choose a product that is distributed in at least 5 different brands. List the product type, the different brands, and the price for each brand.

Product Type:	
Brand Name	**Price**
1.	$
2.	$
3.	$
4.	$
5.	$

2. Record the following information. Show all calculations.

    minimum price   ⟹ _____

    maximum price   ⟹ _____

    range   ⟹ _____

    mode   ⟹ _____

    mean   ⟹ _____

    median   ⟹ _____

Name _____

3. Record the results of your poll of 50 people (students, teachers, and other adults). Try to poll those who would actually be doing the buying. Be sure to ask why they chose that brand and include their responses with your analysis.

Product Type:		
Brand Name	**Price**	**Tally for each choice**
1.	$	
2.	$	
3.	$	
4.	$	
5.	$	

4. Record the name of the item, the frequency, and your poll results as a fraction, decimal, and percent.

Brand Name	**Frequency**	**Fraction**	**Decimal**	**Percent**

TI-73 Index

ACTIVITY	PAGE NO.	TI-73 FUNCTIONS IN ACTIVITY
The Cookie Caper	1	Fraction-to-Decimal
Dice Digits	5	Random, Store, Dice, Probability
How Do You Measure Up?	9	List, Mean, Sum
Stadium Walls	13	Constant, Y=editor, Window, Graph, Trace, Table
The Twin's Towers	23	Last Answer (Ans), Text
Major Martian Headache	31	Constant, Y=editor, Table
The Dolphin	35	List, Stat Plots (xyLine plot), Window, Graph, Format, Store, Recall
Drip, Drip, Drip	41	Table, Manual-Fit, Y=editor, Window, Graph, Trace
Only the Height Has Been Changed	49	List, Stat Plots (Bar Graph), Window, Graph
Give Me 5!	55	Random, Store, Coin, List, Fraction-to-Decimal, Stat Plots (Histogram), Window, Trace
A Foot is a Foot–Or is It?	63	Fraction-to-Decimal, List, Mean
Which Brand is Best?	69	List, Decimal, Stat Plots (Box Plot, Pictogram, Bar Graph, Pie Chart) Minimum, Maximum, Mean, Median, Mode, Zoom, Trace, Graph, Fraction, Fraction-to-Decimal

Activity Content Index

ACTIVITY	PAGE NO.	PATTERNS	FRACTIONS	DECIMALS	OPERATIONS
The Cookie Caper	1		x	x	Add.
Dice Digits	5				Order of Ops, Mental Math, Basic Math
How Do You Measure Up?	9				
Stadium Walls	13	Relations, Rules			Order of Ops, Mental Math, Basic Math, Expressions
The Twin's Towers	23	Functions	x		Add.
Major Martian Headache	31	Rules			Add., Multi.
The Dolphin	35				
Drip, Drip, Drip	41				
Only the Height Has Been Changed	49				
Give Me 5!	55		x	x	Order of Ops, Mental Math, Basic Math
A Foot is a Foot–Or is It?	63		x	x	
Which Brand is Best?	69		x	x	Add.

Activity Content Index (continued)

ESTIMATION	RATIO	MEASUREMENT	GEOMETRY	PROBABILITY STATISTICS
x	Percent			
				x
x	x	x		Mean
Rounding				Graphing
	Percent			
			x	
		Rate of Change, Volume	x	Collecting Data
		x		Mean, Graphing, Collecting Data
	Percent			x
		x		x
	Percent			x