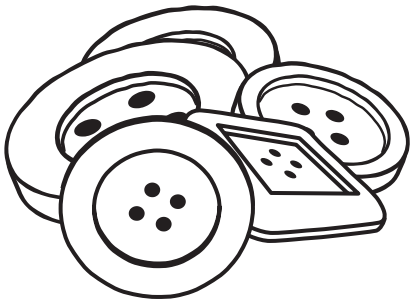
EXPLORATIONS™

Unit 17

# Buttons, Buttons, Buttons



**Concepts**

- Comparing
- Sorting and classifying
- Counting
- Data analysis
- Representation

**Materials**

- TI-10
- Book: *The Button Box*
- Buttons: a small bag or sheet of buttons, colored and cut apart (Large quantities of buttons may be purchased from most school supply companies or fabric stores. The Internet also lists many sources for craft buttons at various prices and a variety of quantities.)
- Box for buttons
- Graphing mats
- Grid paper

**Calculator Connections**

- Constant Function [Opl]
- Scrolling
- Inequality Keys [<] [>]

**Suggested Age/Grade Level**

- Ages 5-6
- Kindergarten through first grade

## Overview

After listening to *The Button Box* written by Margarette S. Reid and illustrated by Sarah Chamberlain (Dutton Children's Books, 1990), children sort and classify buttons by their attributes and display their findings on a graphing mat. This information is then represented in a choice of graphs. By using the inequality keys on the TI-10, students compare the quantities of buttons having specific attributes. The constant function is also used to support skip counting attributes of the buttons.

## Assessment

Throughout the activities, questions are included as a check for understanding. Student graphs should also be used as an assessment.

## Activity A: Connecting Literature and Mathematics

***Prerequisite Skills:***
Sort and classify
Graphing
Counting

***New Vocabulary:***
Color
Difference/Similarity
Graph
Greater than
Less than
Shape
Size

***Teaching Tip:***
Guide students to look for color, design, material, holes/ shanks, size, shape, and texture.

***Teaching Tip:***
As students use words to describe colors, design, surface material, composition, number of holes/shanks, size, shape, and texture, record their suggestions on chart paper or on the board.

1. Show students a closed container of buttons and have them guess what is inside. After a few guesses, shake the container and ask what they think might be in the container (small, numerous items, hard, and so forth). From the sound, what might it be made of? How many objects does it sound like? What size might the objects be?

Once students have guessed that there are buttons in the box, open it and have a discussion about the attributes of the buttons. Observe both similarities and differences.

Questions to ask:

- What do you notice about the size of the buttons?
- What do you notice about the shape of the buttons?
- What other statements can you make about the buttons?

2. Introduce and read *The Button Box*.
3. Read the book a second time and allow students to examine the buttons in the classroom box for some of the attributes in the story.

Instruct students to examine buttons on their own clothing or provide them with a button from the class button box.

Questions to ask:

- How are your buttons the same as or different from the buttons in the book?
- What words could you use to describe the buttons?
- Who in the class has a button that is different than yours? Discuss the differences and similarities.

# Activity B: Creating Real Graphs

For this activity, students work with a partner or in small groups. Each group will need a small bag of mixed buttons (or paper replicas of buttons) and a graphing mat.

Allow students time to explore their button collections. Ask them to state one way the buttons are different.

Have each group sort the buttons by their chosen attribute and place them on the graphing mat in appropriate groupings.

Circulate through the room and assess children's understanding of their real graphs.

Questions to ask if buttons are sorted by color:

- What color buttons do you have the most of?
- What color buttons do you have the least of?
- Do you have more white buttons or red buttons? How many more?
- Do you have the same amount of any two colors? Which ones?

For students to determine how many more buttons there are of one color than another, they can simply count how many more buttons extend beyond the end of the shorter row, or they could use TI-10 technology. Introducing technology at a young age and in basic form helps students view the TI-10 as a tool used to support mathematics.

***Teaching Tip:***
If using paper representations of buttons, children may color the buttons however they choose and then cut them apart. It may be helpful to limit the number of colors available.

# Extension

If you would like to experiment with different kinds of graphing, a Venn Diagram could be introduced as an extension of this activity. A Venn Diagram mat is located in Appendix A.

# Activity C: Discovering Inequalities with the TI-10

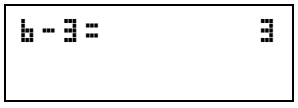
1. Press ON to begin.
2. Press AC to clear anything previously stored in memory.
3. Press Clear. The screen is blank (except for the cursor), the memory is clear, and you are ready to get started.

Tell students that they will be comparing numbers of buttons by using the TI-10. Have students count and record the number of red and white buttons they have. In this example, assume that a student has six red and three white buttons.

> ***Teaching Tip:*** Substitute the actual numbers in your activity as you proceed through the lesson.

4. To find the difference between the number of red and white buttons, press the number of either red or white buttons, which ever is greater, minus the smaller number of buttons (for example, 6 − 3 =).

The TI-10 displays:




Question to ask:

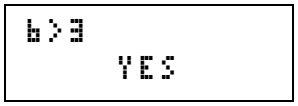
- Look at your buttons. Do you have more red or white buttons?

5. Press Clear to reset the device.
6. Press the problem solving key ◈ and Auto until the Auto text is not on the screen.

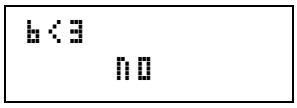
The TI-10 displays:


7. Press 6 > 3 and Enter.

If the inequality entered is correct, the TI-10 displays:



If the inequality entered is incorrect, the TI-10 displays:



Shortly after the incorrect inequality displays, the correct inequality displays on the TI-10.

Encourage students to further explore inequalities using the TI-10 and their real graphs. Circulate through the classroom to assess understanding and to help guide students if they are having any difficulty.

## Activity D: Graphing Attributes

Once students show an understanding of the graph, choose a different attribute to graph. Buttons can be graphed by number of holes or size.

1. Instruct students to clear their graphing mats.

Questions to ask:

- What other ways can you graph your buttons (for example, number of holes, size, shape, and so forth)?
- How might you record this information to use at a later time when you might not have the buttons?

Introduce the idea of recording the information on a graph. Show samples of a bar graph, a picture graph, and a Venn Diagram.

2. Have students (using their graphing mats) create graphs of their buttons by the number of holes or shanks found on the buttons. (Students may graph other characteristics as well.)

Questions to ask:

- What is the most common number of holes in your buttons?
- What is the difference in the number of buttons with two holes and the buttons with four holes?
- What is the difference in the number of buttons with shanks and the number of buttons with holes?

## After the Activity

Student graphs should be displayed for others to view and compare with their own graphs. If students used the same group of buttons but graphed different attributes, have students explain the differences in the results of the graphs

## Activity E
## Skip Counting with the TI-10

After students have completed their graphs, ask the following question:

- If you were to count all the holes on your two-hole buttons, how many would there be?
- How can you find out the total number?

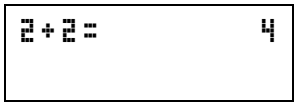
Use the TI-10 to support solving the question.

1. Reset the TI-10.
2. Instruct students to place their finger on the first two-hole button on their graph and press [2].

The TI-10 displays:


3. Instruct students to place their finger on the next two-hole button and press [+] [2] [=].

The TI-10 displays:



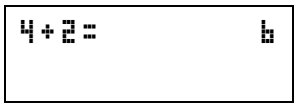

***Resetting the TI-10:***
Press (On/Off) to wake it up if it has turned off.

Press (AC) if you need to clear the memory.

Press (Clear) to clear the display.

4. Instruct students to place their finger on the third two-hole button and press [+] [2] [=].

The TI-10 displays:




Continue this pattern until the holes of the last two-hole button on their graph have been added.

Explain that adding is just one way to solve the problem. The solution can also be found through skip counting.

Introduce the constant function on the TI-10. In this case the constant function is +2.

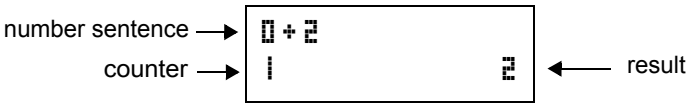
5. Reset the TI-10.

6. Because you are counting two holes in each button, press [Opl] [+] [2] [Opl] to set the function.

7. Press [0] because no buttons have been counted yet.

8. Touch the first button on your graph and press [Opl] to begin skip counting.

The TI-10 displays:




9. Touch the second button on your graph and press [Opl] to automatically add 2.

The TI-10 displays:


Continue this process until all two-hole buttons have been added.

Questions to ask:

- How many total holes are there in the two-hole buttons?
- What will you have to do if you want to find out how many two-hole buttons it would take to have 100 holes?

***Teaching Tip:***
Explain that in this example, it is a constant function because the same operation and number are being repeated over and over.

***Teaching Tip:***
Students should use the scroll buttons to view patterns. Have students notice the patterns such as: The second addend is always 2 and the sum on the first line is always the first addend on the second line, and so forth.

## Extension

- Students may design their own button investigations. An example might be: there are 100 holes in the buttons and each button has four holes. How many buttons are there?

  Students may use the constant function of -4 on the TI-10 and begin with 100 holes. The TI-10 will display counting backward by 4 from 100.
- Students may investigate other graphs and diagrams.
- Students may work in pairs to create patterns with the buttons. Others may identify and extend the pattern.
- Students may create a button “whirly” by using a button and a length of string as the child did in the book. Some spin-off investigations could be:
  - What size button makes the best whirly?
  - What material (plastic, metal, wood, or cloth) works best?
  - Does the length of the string make a difference? Is a short or long string better?