EXPLORATIONS™

Unit 13

Bats Triangular

Concepts

- Growing patterns
- Addition
- Triangular numbers
- Representation

Materials

- TI-10
- Book: *Bat Jamboree*
- 12” by 18” drawing paper
- Writing instruments
- Construction paper
- Glue
- Rubber stamps
- Ink pads
- Manipulatives

Calculator Connections

- Number sentences with two-line display
- Scrolling

Suggested Age/Grade Level

- Ages 6-8
- Upper first through second grade

Overview

Through the use of manipulatives, students construct a pyramid as the bats did in *Bat Jamboree* written by Kathy Appelt and illustrated by Melissa Sweet (Harper Collins Publishers, 1996). The manipulative pyramid then becomes the basis students use to construct a pictorial representation of a pyramid. The TI-10 is used to show symbolic representation of students’ actions and also aids students in viewing the developing pattern.

Assessment

Assessment should be done through student work samples and teacher observation. The following items should be considered.

Throughout the activities, questions are included for formative assessment. Student drawings should be used as a check for understanding and may also be used for homework review.

Activity A: Connecting Literature and Mathematics

New Vocabulary:
Consecutive
Different
Grand finale
Pictorial representation
Pyramid
Similar
Triangular

Prerequisite Skills:
Pattern recognition
Attributes of triangles
Positional words
Number sentences

Teaching Tip:
If a variety of manipulatives are used, students will see that the results are the same no matter what objects are used.

Teaching Tip:
As students are answering the questions, be sure they are placing their manipulatives accordingly.

1. Read *Bat Jamboree* to the class.

Questions to ask:

- What pattern did you notice in the story?
- If there were another act, how many bats would have come onto the stage, and what might they have done?

2. Describe the grand finale of the *Bat Jamboree* and explain to students that when people or other three-dimensional objects are arranged like this, it is usually called a pyramid. The shape resembles a triangle.

Questions to ask:

- How many bats were in the pyramid?
- How do you think the author got 55 bats?
- What basic shape does the pyramid look like?

3. Divide the students into small groups and place a large container of manipulatives with each group.
4. Instruct students to use the manipulatives to model the action on the stage in the story.

Students should recognize the pattern to know the number of manipulatives needed each time. They may need to reference the book for the bats' actions.

Questions to ask:

- What is the first thing that happened?
-

- What is the second thing that happened?

- How many bats does this represent?
- What happened next?

- How many bats does this represent?
- How is what you see now the same as what you saw before?
- How is it different?
- What should you do next?
- How is this shape the same?
- How is it different?
- What happens next?

Students should continue following the pattern of adding a new row with one more manipulative than the previous row until they reach a total of 55 bats.

Question to ask:

- Could the bats have built their pyramid like we did? Why not? (It had to be built from the bottom up.)

Teaching Tip:
As students build the triangle with their manipulatives, emphasize that the triangle shape remains but gets larger with each row.

Activity B: Triangular Numbers with the TI-10

> ***Teaching Tip:***
> In creating a pictorial representation of the pyramid, students may choose to draw their own pictures, use rubber stamps, and so forth.

1. Pass out large sheets of drawing paper to students. Have them place the paper next to their manipulative pyramids.

Model how to create a picture representation of pyramids on paper. At the side of each row, write a number sentence to show the total number in the pyramid from the top through that row.

2. Instruct students to place their first picture close to the upper edge of their paper. This bat represents the first bat who was singing. Remind students that they are constructing a pyramid/triangle and it will require room to fan out at the bottom.
3. Use the TI-10 to keep track of the total number of bats in the pyramid.
4. Press (On/Off).
5. Press (AC) to clear anything previously stored in memory.
6. Press (Clear). The screen is blank (except for the cursor), the memory is clear, and you are ready to get started.
7. Since the first row shows just one bat, press [1] [=].

The TI-10 displays:

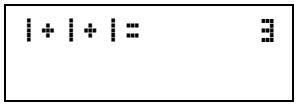
8. Write the number sentence to the right of the picture of the first bat, as shown in Step 13.

Have students look at the second row of their manipulative pyramid and add pictorial representations for this row by adding two individual pictures on the second row.

9. If the TI-10 has gone to sleep, press (On/Off).
10. Press [+] to add to the one already displayed.

11. Press [1] [+] [1] for the pictures on the second row.
12. Press [=] for the total now in the pictorial pyramid/triangle.

The TI-10 displays:



13. Write the displayed number sentence next to the pictures of the two bats.

1 = 1

1 + 1 + 1 = 3

Tell students to continue their pictorial representation of the manipulative pyramid, each time using the TI-10 to record the number sentence. The number sentences should be written next to the pictorial representation.

Teaching Tip:
Explain that the sums 3, 6, 10, 15, 21, 28, 36, 45, and 55 are known as triangular numbers because of the triangular shape that can be made with that number of objects.

Conclusion

Have students continue to explore triangular numbers through the use of objects, pictures, and symbols. The TI-10 can be used to support the concrete and pictorial mathematics. Students may use the symbol keys that reflect the actions done with objects and/or pictures.

Questions to ask:

- What are the next two triangular numbers after 55? (66 and 78)
- How many rows are in the triangular number closest to 100? (14 rows have 105 objects)
- Is 125 a triangular number? (no) How can you prove it?

- Is 135 a triangular number? (yes) How can you prove it?
- Thirty-six is a triangular number. Can you arrange 36 objects into another shape that you can recognize and name? (square, rectangle)

Discuss with the students what they did.

- How did you know how many bats would be on the next row?
- What did you notice about the number that you were adding each time?
- How might you describe this pattern?
- Where else have you seen this pattern? (This is a pattern found in many primary children's books. Children may recognize other stories where they have seen this pattern. They may also hunt for other places or instances where they may find this pattern in their world.)

Extension

For these investigations, students should be permitted to use any square manipulatives, paper, pencil, drawings, and/or a TI-10. Group work should be encouraged.

Investigation 1:

Consecutive numbers are numbers that follow one another in a particular sequence.

Add two consecutive triangular numbers together, for example 3 and 6.

Questions to ask:

- What shape can you make? (square)
- If you add two different consecutive triangular numbers, can you make the same shape? (yes)
- How has the shape changed? (It will be either bigger or smaller depending on the numbers used.)

Investigation 2:

1. Look at the following numbers: 1, 3, 6, 10, 15, 21, 28, 36, 45, 55 (the original triangular numbers) and 64, 72, 79, 85, 90, 94. 97, 99, 100.
2. Count out 100 manipulatives and build the shape.
3. Draw the shape.

Questions to ask:

- How would you describe the shape?
- What happens to the pattern?

Investigation 3:

Create a pictorial representation of the triangular number 15 using pictures or manipulatives.

Question to ask:

- How many triangles can you find in this configuration? (27)