EXPLORATIONS ™

Unit 16

Constant Weight Gain

Overview

Tiger Math, Learning to Graph from a Baby Tiger written by Ann Whitehead Nagda and Cindy Bickel (Henry Holt and Company, 2000) is thoroughly discussed as the story is read. Students are provided opportunities to do simple calculations to support the mathematics represented in the pictured graphs. Using the TI-10 as a tool, students investigate the weights of the baby tiger and of his father at the same age as if they had gained weight at a constant rate. Students then represent the information gathered in the class survey in graphic form similar to that shown in the book.

Assessment

Teacher observation of the use of measurement tools and of the process of measuring could be incorporated into a checklist where the teacher moves around the room assessing student ability. Items that should be considered throughout the unit could include the following.

Does the student:

- Correctly find information in a picture graph?

- Correctly find information in a bar graph?

- Correctly find information in a line graph?

- Correctly find information in a circle graph?

- Recognize more/less than half of a circle graph?

- Organize information to construct a graph?

- Make predictions based on graphs?

- Extract correct numbers for computation from information given?

- Identify the correct operation needed?

- Use a correct number sentence to reflect the problem?

- Identify and use the correct TI-10 keys to perform simple operations?

- Use the constant key ⎡Opl⎤ correctly when applying a constant function?

- Explore to determine the effect of using a different constant?

Activity A: Connecting Literature and Mathematics

Begin a class discussion about the zoo.

Questions to ask:

- Who has been to the zoo?

- What did you see there?

- How were the animals at the zoo different from those you might see in your neighborhood?

- Describe some of the different areas where zoo animals are kept (for example, cages, pens, natural habitat areas, and so forth).

- What is your favorite animal at the zoo?

After asking for students' favorite zoo animals, record their responses on chart paper or on the board. Group animals together such as wild cats (lion, tiger, jaguar, cheetah, leopard) or monkeys/gorillas.

Tell your students that you are going to read a book about an animal that was at the Denver Zoo. This book tells the story of T.J., a tiger cub, on the right hand pages of the book and on the left hand pages, math is used to give information graphically about tigers and T.J.

Gather students around you on a rug or similar reading area so that they will be able to see the illustrations in the book.

Following are questions that could be asked prior to and during the reading. Students may use a TI-10 to perform the simple subtraction needed to solve the problems. Discuss which of the answers can be found by counting the difference in the boxes of the grid in the bar graphs.

Questions to ask:

- How long do you think it takes a baby tiger to be fully grown?

- How long does it take a human baby to be fully grown?

Prerequisite Skills:
Interpreting information from graphic representation

Constructing graphs

Concept of subtraction

New Vocabulary:
Bar graph
Circle graph
Constant
Gain
Line graph
Picture graph
Population

Teaching Tip:
This book lends itself to much mathematical discussion, interpretation of graphs, and making inferences and generalizations.

• Is there a difference? Why do you think that?

Read the story. As you progress through the book, the following questions guide you through the first part of the lesson. Explain that the information presented in the picture graph on page 8 is the same information on page 10, where it is shown in a circle graph.

Questions to ask:

• What kind of tiger has the greatest population?

• T.J. is a Siberian tiger. What other kind of tiger has about the same population as Siberian tigers?

• If all the other kinds of tigers were added together, would there be more or less than the number of Bengal tigers? How do you know that?

Activity B: Finding Differences

To get the students started, give the following instructions:

1. Press ⊙.

2. Press ⒶⒸ to clear anything previously stored in memory.

3. Press Ⓒⁱᵉᵃʳ. The screen is blank (except for the cursor), the memory is clear, and you are ready to get started.

Always ask students how they might solve these problems. Ask things such as:

• What numbers would you use?

• What operation would you apply?

• How would you write the problem? Which number would come first?

• What keys would you need on the TI-10?

The following directions are to provide teacher guidance in executing this lesson. If students can determine the processes needed, follow their lead.

Question to ask:

• How much weight did T.J. gain in the first 6 weeks of his life?

4. Press ☐ ☐ for T.J.'s weight at 6 weeks.

5. Press ☐ ☐ to take away T.J.'s weight at birth.

6. Press ☐ to find the difference.

The TI-10 displays:

```
 10 - 3 =           7
```

Point out how the graph shows this information.

Questions to ask:

• Four weeks later, T.J.'s weight was recorded again. He weighed 13 pounds. How much weight has he now gained since he was born?

7. Press ⓒ.

8. Press ☐ ☐ for T.J.'s weight at 10 weeks.

9. Press ☐ ☐ to take away T.J.'s weight at birth.

10. Press ☐ to find the difference.

The TI-10 displays:

```
 13 - 3 =          10
```

Point out how the graph shows this information.

11. Press ☐ to store this value in memory. This value is used to find the difference between Matthew's weight gain, T.J.'s father, and T.J.'s weight gain during their first 10 weeks of life.

Question to ask:

• How much weight has T.J. gained in the past 4 weeks? (13 - 10 = 3 pounds)

12. Press ⓒ.

13. Press ☐ ☐ for T.J.'s weight at 10 weeks.

14. Press ☐ ☐ ☐ to take away T.J.'s weight at 6 weeks.

Teaching Tip:
This information can be found on the graph entitled T.J.'s Weight found on pages 12 and 14 in the story.

15. Press ⌷ to find the difference.

The TI-10 displays:

```
13-10=        3
```

Point out how the graph shows this information.

Questions to ask:

• Why are the zoo workers concerned about T.J.?

• Why do you think T.J. is not eating much?

• Look at the graph titled Comparing Matthew and T.J. How much weight did Matthew gain from birth to 10 weeks old?

16. Press Ⓒˡᵉᵃʳ.

17. Press ⒈ ⒐ for Matthew's weight at 10 weeks.

18. Press ⊟ ⒊ for Matthew's weight at birth.

19. Press ⌷ to find the difference.

The TI-10 displays:

```
19-3=        16
```

20. Press M+ to add this value to memory.

Question to ask:

• How much more is this than what T.J. gained in the same amount of time?

21. Press MR/MC to find the difference between Matthew's weight gain and T.J.'s weight gain during their first 10 weeks of life.

The TI-10 displays:

```
6
```

Continue to ask questions about the graphs in the book. Use the following questions as a guide.

Questions to ask:

- Look at the line graph on page 18. What do you think the red line slanting downward on the right side means?

- On page 20, the red line starts to go up again on the right. Why?

- The end of the black line shows Matthew's weight at 12 weeks old. About how heavy is he?

- Look at T.J.'s red line. About how much did T.J. weigh at 12 weeks old?

- How much heavier was Matthew than T.J. at 12 weeks old? (25 - 13 = 12 pounds) That's almost twice as heavy!

- If T.J. weighed 19 pounds at 14 weeks old, where would his red line be on the line graph on page 22?

- Look at the bar graph on page 24. During which week did T.J. gain the most weight?

- What would you say about his eating habits that week?

- Look at the information on page 26. How much less did T.J. weigh than his father at 18 weeks old?

- At 4 years old, T.J. weighed 500 pounds. His father weighed 350 pounds as a fully grown tiger. Who weighed more? How much heavier was T.J. than his father?

T.J. weighed 150 pounds more than his father by the time he was grown.

Activity C:
Constant Operation of Adding 2 Starting at 3

Students may wish to record their work on the Student Activity sheet at the end of this lesson.

Questions to ask:

- T.J. weighed 3 pounds at birth. According to the line graph on page 20, how much did he weigh when he was 2 weeks old?

- How many pounds did T.J. gain in his first 2 weeks of life?

- If T.J. continued to gain 2 pounds in each 2-week period for a year, how much would he weigh at the end of a year.

1. To determine the number of 2-week periods in a year, reset the TI-10.

2. Press 5 2 for the number of weeks in a year.

3. Press ÷ 2 to find the number of 2-week periods in 1 year.

4. Press = to see the answer.

The TI-10 displays:

```
52÷2 =26 r0
```

To add 2 pounds for each of the 2-week periods in a year, use the constant function on the TI-10.

5. Reset the TI-10.

6. Press Opl to use the constant function.

7. Press + 2 for the 2 pounds added each 2-week period.

8. Press Opl to continue programming for the constant function.

9. Press 3 for T.J.'s weight at birth.

Teaching Tip:
If students do not know the number of weeks in a year, they may be given calendars to find the answer.

Teaching Tip:
Explain that the r 0 means that there are no extra weeks left over.

Resetting the TI-10:
Press ⊙ to wake it up if it has turned off.

Press AC if you need to clear the memory.

Press Clear to clear the display.

10. Press ⏢Opl⏢ for T.J.'s weight at 2 weeks.

The TI-10 displays:

```
3 + 2

1                5
```

11. Press ⏢Opl⏢.

The TI-10 displays his weight at 4 weeks:

```
5 + 2

2                7
```

Each time the ⏢Opl⏢ key is pressed, another 2 pounds is added for another 2-week period.

12. Since there are 26 two-week periods in 1 year, continue pressing the ⏢Opl⏢ key until the TI-10 displays:

```
53 + 2

26              55
```

If T.J. gained 2 pounds every 2 weeks during his first year, he would weigh 55 pounds at the end of 1 year.

Question to ask:

• What would the graph look like if this had happened? (steady, regular incline)

Activity D: Constant Operation of Adding 4 Starting at 3

Have students follow the same process for Matthew, T.J.'s father. Use the line graph on either page 20 or 26 for the necessary information.

Questions to ask:

• Like T.J., Matthew weighed 3 pounds when he was born. About how much did he weigh when he was 2 weeks old?

• How many pounds did Matthew gain by the time he was 2 weeks old? (7 - 3 = 4 pounds)

- If Matthew continued to gain 4 pounds each 2-week period, how much would he weigh at 1 year old?

Students should follow a process similar to the previous one. It will look like this.

1. Reset the TI-10.

2. Press Opl to use the constant function.

3. Press ➕ ④ for the 4 pounds added each 2-week period.

4. Press Opl to continue programming for the constant function.

5. Press ③ for T.J.'s weight at birth.
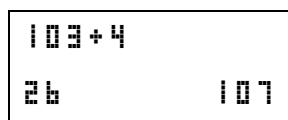
6. Press Opl for T.J.'s weight at 2 weeks.

The TI-10 displays his weight at 2 weeks:

```
3 + 4

1              7
```

Continue to press Opl for each 2-week period and record the findings on the student activity sheet. Do this until reaching the 26th two-week period, or 1 year.

The TI-10 displays:

```
103 + 4

26             107
```

Activity E: Using the Constant Operation with Subtraction

Instruct students to look at the bar graph on page 28 and ask the following questions.

- Which tiger is this graph about?

- How much did T.J. weigh when he was 1 year old?

- Is this more or less than if he had gained 2 pounds each week?

- About how many pounds do you think T.J. would have had to gain each week to weigh 200 pounds on his first birthday?

Allow students to explore this problem on their own or with a partner. The constant function may be used again. Set the constant as the number of pounds that he may have gained each week to reach 200 pounds. Students can also work backwards. To work backwards, the process will look something like this.

1. Reset the TI-10.

2. Press ⌊Opl⌋ to use the constant function.

3. Press ⌊−⌋ to subtract the number of pounds gained each week.

4. Press the number of pounds gained each week, for example ⌊4⌋.

5. Press ⌊Opl⌋ to continue programming for the constant function.

6. Press ⌊2⌋⌊0⌋⌊0⌋ for T.J.'s weight at 1 year.

7. Press ⌊Opl⌋.

The TI-10 displays:

```
200-4

1            196
```

Press ⌊Opl⌋ and the display will show

```
196-4

2            192
```

Students should continue to press the key until they have done this 52 times. The display will show the current number sentence (-4) and the number of weeks (52).

Oops! Your have gone too far. This number is less than the birth weight.

```
-4 - 4

52           -8
```

Negative eight indicates that 4 pounds each week is too much.

If students use 3 pounds gained each week, the display will show

```
47 - 3
52            44
```

Forty-four indicates that 3 pounds each week is too low.

If the students are young and your objective is to familiarize them with using the TI-10, these numbers are acceptable.

However, if students are older and show persistence, you may introduce using a decimal such as 3.5. Students may explore the effect of various amounts.

Questions to ask:

*   Did either T.J. or his dad gain a constant amount of weight each week?

*   How do you know? (None of the graphs show a steady constant increase.)

Conclusion

*   Revisit the favorite zoo animals chosen by the students. Have students construct picture graphs to record this information.

*   Students can show the results of the favorite zoo animal survey in a circle graph. Remember that results should be grouped by similar animals. For example, in a class of 22 students, the results might be:

Large cats	9	red
Monkeys/gorillas	5	blue
Snakes	3	yellow
Giraffes	2	green
Elephants	2	orange
Zebras	1	black

- Assign each group a color such as those previously listed. Give each student a sheet of colored construction paper that corresponds to his or her favorite zoo animal. Students with like colors should stand together. Instruct students to form a circle. Each student should place his or her sheet of construction paper down and sit on the paper in the circle. When students rise and move, a color coded circle graph is the result. Questions can be asked about the graph, like the questions used earlier in the lesson.

Extension

- Have students survey other classes to poll their favorite zoo animals. Picture graphs, bar graphs, and circle graphs can be created to show their results. Compare those graphs with the graphs made in class.

- Have students find out their birth weights to the nearest pound. They should also find their approximate weight to the nearest pound at 1 year old. Students can use this information to find what their weight would be now if their weight gain was constant. How much would they weigh at 10 years old? At 16 years old? At 21 years old?

- Introduce children to a graphing software program. They may devise their own question, conduct the survey, and then graph their findings. The same results can be graphed using a variety of graphic representations (picture, line, bar, circle).

Student Activity Sheet

Counter	Number Sentence	Solution
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		