1.) **Give a short synopsis of the story.**

Ten sleepy animals snuggle together for the night in their warm and cozy den, but Little Mouse just can’t get comfortable. “Roll over! Roll over!” he shouts – and the countdown begins. One by one the drowsy animals fall out of the den . . . rumbly . . . tumblly . . . bump! But no matter who rolls over, Little Mouse can’t stop fidgeting. How will all the animals ever get to sleep?

2.) **Identify the independent and dependent variables.**

**Independent variable:** \( x \): number of animals that fall out of the den

**Dependent variable:** \( y \): number of animals still in the den

3.) **Read the story.**

As you are reading the story to the students, have them fill in the table on their table, graph, function sheet.
Table Exploration – There Where Ten in the Den

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
<th>First Differences</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>7</td>
<td></td>
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<tr>
<td>4</td>
<td>6</td>
<td></td>
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<tr>
<td>5</td>
<td>5</td>
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<td>6</td>
<td>4</td>
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<td>7</td>
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<td>9</td>
<td>1</td>
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<tr>
<td>10</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

The x value is the __________________________________________________________
In the context of the story, the x value represents ____________________________
_______________________________________________________________________

The y value is the __________________________________________________________
In the context of the story, the y value represents ____________________________
_______________________________________________________________________

Is the x variable increasing at a constant amount?  Yes or  No
Are the first differences constant?  Yes or  No
What does this information tell us?  ______________________________________
NSpire Graphing Calculator Exploration

- Press Menu.
- Select 3: Add Lists & Spreadsheet

![Screen Shot](image)

- Press Enter.
- Use the up arrow on the Nav Pad and highlight the A portion (naming section) of the first column.
- Label the first column fell.
- Press Enter.
- Use the right arrow and up arrow of the Nav Pad and highlight the B portion (naming section) of the second column.
- Label the second column den.
- Press Enter.
- Use the left arrow and down arrow of the Nav Pad and put the cursor beneath the first column in row 1.
- Enter the x values into the first column. Press Enter after each data entry.
- Use the right arrow and up arrow of the Nav Pad and put the cursor beneath the second column in row 1.
- Enter the y values into the second column. Press Enter after each data entry.

**NOTE:** You can not see all the data on the screen shot above.
Now you will find the first differences on the calculator.

- Use the right arrow and up arrow of the Nav Pad and highlight the C portion (naming section) of the third column.
- Label the third column first.
- Leave the cursor where it is, right beneath the word first.

- Press the catalog key. It is the second key in the last column. The key has an open book on it.
- Find deltaList(

- Press Enter.
- Notice that the cursor has been placed between the parentheses. The calculator is waiting for the variable to use.
- Press the variable key. It is in the top row, second key.
- Highlight den.

- Press Enter.

- Press Enter.

Compare these first differences to the ones you computed by hand. Are the first differences constant? Yes or No

Therefore, this function is ________________________________
Now we will set up a scatter plot on the NSpire.

- Press Ctrl I to get a new page.
- Select 2: Add Graphs & Geometry

- Press Enter.

- Press Menu.
- Select 3: Graph Type
- Use the right arrow on the Nav Pad
- Select 4: Scatter Plot
- Press Enter.
- Notice the highlighted arrow at the bottom of the screen.
- Press Enter and the down arrow on the Nav pad to select fell.
- Press Enter.
- Press the Tab key to go to the y arrow.
- Press Enter and the down arrow on the Nav Pad to select den.
- Press Enter.

Now let's set the window.
- Press Menu.
- Select 4: Window
- Press the right arrow on the Nav Pad.
- Select 1: Window Settings
- Press Enter.
Look at your paper and pencil graph.
What was the Xmin: __________
What was the Xmax: __________
What was the Xscale: __________
What was the Ymin: __________
What was the Ymax: __________
What was the Yscale: __________

Make the same settings on the calculator.
Use the Tab key to move through the screen until you get to OK.
- Press Enter.

This scatter plot reflects the data from the story.

Since you determined that this function is linear from the table, do a linear regression.
- Press Ctrl and the left arrow key on the Nav Pad to get back to the lists and spreadsheet screen.
- Highlight row 1 in Column D.
- Press Menu.
- Select 4: Statistics
- Press the right arrow on the Nav Pad.
- Select 1: Stat Calculations
- Press the right arrow on the Nav Pad.
- Select 3: Linear Regression
  \[(mx + b)\]
- Press Enter.
- Set the x variable to fell by pressing the down arrow on the Nav Pad.
- Use the down arrow on the Nav Pad to select fell.
- Press Enter.
- Press Tab.
- Set the y variable to den by pressing the down arrow on the Nav Pad.
- Use the down arrow on the Nav Pad to select den.
- Press Enter.
- Press Tab.
- F1 is fine.
- Press Tab.
- Frequency List 1 is fine.
- Press Tab.
- Leave Category List alone.
- Press Tab.
- Leave the Include Categories List alone.
- Press Tab.
- Leave 1st Result Column alone.
- Press Tab.
- Now OK is highlighted.
- Press Enter.

So for our function: \( y = mx + b \), write out the screen below.

**Linear Regression**

\[
\begin{align*}
y &= \_\_\_\_\_\_ \\
m &= \_\_\_\_\_\_ \\
b &= \_\_\_\_\_\_
\end{align*}
\]

Write the function: ____________________________
Type this function into the NSpire.

- Press Ctrl and the right arrow on the Nav Pad to get back to the scatter plot.

- Press Menu.
- Select 3: Graph Type
- Press the right arrow on the Nav Pad.
- Select 1: Function

- Press Enter.
The data from the context of the story is focused only on Quadrant I. Since we are learning about functions, it is important to see the entire graph of \( y = -x + 10 \) by looking at all 4 quadrants. Getting a standard viewing screen on the calculator means a piece of grid paper with all four quadrants on it.

- Press Menu.
- Select 4: Window
- Use the right arrow on the Nav Pad.
- Select 5: Zoom-Standard
Use the new sheet of grid paper and graph the function \( y = -x + 10 \) without the context of the story.

At what point is the graph crossing the y-axis? ___________________________

Is this function a direct variation? Yes or No

Why? ______________________________________________________________

What is the slope of your graph? ______________________________

What was the value of the first differences from the y-values? _____________
What connection can you make between the first differences and the slope?

_________________________________________

_________________________________________

_________________________________________

Use two different colored pencils to show the rise and run on both pieces of grid paper.
NAME: ____________________________________________

FUNCTION

________________________________________

Slope: ___________ \( \frac{\text{rise}}{\text{run}} = \) ___________

y-intercept: __________

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