Bernoulli Bug and Grace Grasshopper are best friends. Bernoulli lives near the creek and Grace lives 92 feet away in the garden. They often visit each other. One afternoon, Grace left Bernoulli’s place and started toward her home.

Shortly after Grace leaves, Bernoulli sees that Grace forgot to take her knapsack. He decides to try to catch up with Grace so he can give it to her. Bernoulli crawls at 5 feet per minute and Grace hops at only 3 feet per minute, but Grace has a four-minute head start.

1. Use the diagram below to show where each critter is as Bernoulli starts after Grace. Place the letter B at Bernoulli’s location and the letter G at Grace’s location.

2. Use the diagram below to show where each critter is two minutes after Bernoulli starts after Grace. Place the letter B at Bernoulli’s location and the letter G at Grace’s location.

3. Complete this table to show how far Bernoulli and Grace are from the creek for each time value.

<table>
<thead>
<tr>
<th>Time (minutes) Since Bernoulli Left the Creek</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bernoulli’s Distance (feet) from the Creek</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grace’s Distance (feet) from the Creek</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4. Use words to describe a pattern you see in the distance values of Grace’s row of the table.
Let $t$ represent the number of minutes from the time that Bernoulli started after Grace.

5. Write an expression in terms of $t$ for Bernoulli’s distance from the creek.

6. Write an expression in terms of $t$ for Grace’s distance from the creek.

7. What does the coefficient of $t$ in your answer to Question 6 mean? Include appropriate units in your explanation.

8. What meaning does the constant term in your answer to Question 6 have in this problem? Include appropriate units in your explanation.

9. Write an equation that can be used to find the value of $t$ at which Bernoulli catches up with Grace. Explain why the equation works and tell what each side of the equation means.

10. If Bernoulli left his place near the creek at 1:00 p.m., at what time would he catch up with Grace?

11. How long will it take Grace to reach her home from the spot where Bernoulli catches up with her? Explain your answer.
12. Write a description of a situation involving Bernoulli and Grace that could be described by each equation:

   a. \(3t + 12 = 2(5t)\)

   b. \(92 - 5t = 42\)

Bernoulli and Grace have a turtle friend, Hypatia, who sometimes plays in the field with them. Hypatia arrived at Bernoulli’s place shortly after he left to catch up with Grace. She tried to overtake them to tell them that tomorrow there would be a Critter Race between a tortoise and hare!

The equation \(H = 6.4t - 7.2\) describes Hypatia’s attempt to catch up with Bernoulli and Grace. In this equation, \(H\) represents Hypatia’s distance from the creek and \(t\) represents the number of minutes from the time Bernoulli left the creek.

13. Tell in words what this equation tells you about Hypatia’s attempt to catch up with them.

14. The graph to the right shows the distance each critter is from the creek during the first four and one-half minutes after Bernoulli left the creek to catch up with Grace. Label each line to show which critter’s travel is represented by that line. Explain clearly why you made each association.
This is a larger version of the graph on page 89. The larger graph helps you find a more accurate answer to Item 15.

15. Remember that the graph shows the distance each critter is from the creek during the first four and one-half minutes after Bernoulli left the creek to catch up with Grace.

a. Use the graph to estimate how far from each other the critters are three minutes after Bernoulli left the creek.

b. Check your estimates by using appropriate algebraic expressions.

Hypatia wants to tell Bernoulli and Grace that the race tomorrow between a tortoise and a hare is part of a celebration of fables. In one of Aesop's fables, a hare challenges a tortoise to a race.
16. This graph gives information about part of that race. Use the graph to answer each question.

- **a.** Who got a head start? How many minutes was it?

- **b.** How far did the racer with the head start go before the second racer started?

- **c.** What is the speed of the tortoise? Of the hare?

- **d.** How far ahead of the tortoise was the hare eight minutes after the tortoise started the race?

- **e.** Give a possible explanation for the change in the hare’s line, eight minutes after the tortoise started the race.

- **f.** If the patterns in the graph of the race continue to be the same after 12 minutes as they are for 8 to 12 minutes, and the tortoise finishes the race in 16 minutes, who wins the race? Explain how you determined your answer.

_SUGGESTED LEARNING STRATEGIES: Look for a Pattern_
17. Suppose you were hired by a local radio station to give a live report of the race of the tortoise and the hare described in Question 16. Your report should include all of the information from Question 16 and any other details that you feel are important. Write the script for your live radio report on a sheet of paper.

**CHECK YOUR UNDERSTANDING**

Write your answers on notebook paper. Show your work.

Janice and Patricia each want to buy a new DVD player. They go to Hot Electronics and find a DVD player for $75.00. Hot Electronics offers different payment plans. Janice is going to pay $15 now, and then $7.50 per month. Patricia is going to pay $12.50 per month.

1. How much will Janice and Patricia pay for each month?

<table>
<thead>
<tr>
<th>Time in Months</th>
<th>0</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Janice’s Payment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patricia’s Payment</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. Write expressions for the amounts that Janice and Patricia will have paid on the DVD player at the end of any month, \( m \).

3. What is the meaning of the coefficient of \( m \) in the expressions that you wrote?

4. What is the significance of any constant term in the expressions that you wrote?

5. Write and solve an equation that shows when Janice and Patricia would have paid off the same amount on their DVD players.

6. Describe in words a situation involving Janice and Patricia that could be represented by the equation

\[
5m + 13.50 = 3m + 18.
\]

Marcy was offered two jobs during the summer. With both jobs, she earns a certain amount plus an hourly rate. The graph below gives information about her pay for each job.

7. Which job starts her off with more pay? How do you know?

8. How many hours will she have to work before both jobs pay the same?

9. Which job would you recommend that Marcy take? Explain why.

10. **MATHEMATICAL REFLECTION** You have used tables, equations, and graphs to study patterns in this activity. When would you use each representation? Explain why.