CYCLE 3 **FOCUS PROBLEM TEMPLATE** Write over all the *blue italic* words.

If the *… random animal from table* can run at *… 15 mph for 5 miles*, then it can maintain its top speed for *… 0.333 hours*, as shown in the following calculation:

Insert (image of) calculation here $5\ miles * \frac{1\ hour}{15\ miles} = .333\ hours$

In this time, a person running at 10 mph could run *… 3.33 miles*, as shown by this calculation:

Insert (image of) calculation here $0.333\ hours * \frac{10\ miles}{1\ hour} = 3.33\ miles$

If the animal can run *… 5 miles* and the person can run *… 3.33 miles* in this time, then the person needs to be at least *… 5 - 3.33 = 1.67 miles* from the animal to be safe.

Repeating this process for the remaining animals, we get the head starts shown in the following table.

ANIMAL	TOP SPEED (MPH)	DISTANCE AT TOP SPEED	TIME AT TOP SPEED	HEAD START NEEDED
Polar Bear	20	1 mile	*Time*	*Distance*
Black Bear	25	2 miles	*Time*	*Distance*
Lion	30	48 meters	*Time*	*Distance*
Moose	35	400 meters	*Time*	*Distance*
Rhinoceros	35	100 meters	*Time*	*Distance*

From the table, we can see that you would need the greatest head start if you were running from *… (state animal)*.

The distance run by *… (state chosen animal from table)* can be modeled by the equation *… (state equation and define variables)*.

The person's distance run can be modeled by the equation *… (state equation and define variables)*.

The slopes of the lines represent *… (explain slopes)*. The *y*-intercepts *… (explain y-intercepts)*. From the graph of these two functions shown below, we can see that the lines intersect at *… (state intersection and explain its significance)*.

(show graph)

A *… (choose another animal not given in the table)* can run at a top speed of *... (calculate and state the head start)*.

CYCLE 3 FOCUS PROBLEM RUBRIC

	BELOW EXPECTATIONS	MEETS EXPECTATIONS	EXCEEDS EXPECTATIONS
Mechanics	Numerous spelling errors. Grammatical and punctuation mistakes make reading of solution difficult.	Few spelling, grammatical, or punctuation errors.	No spelling errors. No punctuation errors. No grammatical mistakes.
Head Starts	Head starts are not correctly calculated for any of the animals in the table and/or appropriate details are not shown.	Head starts are correctly calculated for some animals in the table and appropriate details are shown.	Head starts are correctly calculated for each animal in the table and appropriate details are shown.
Models	No models are given.	Models are given, but they are not correct or the variables are not defined.	Correct models are given for the animal and the person. All variables are defined.
Graph	No graph is given.	A graph is given, but it is not correct or the intersection point is not shown.	A correct graph is shown with both models included and the intersection point visible.
Slope and *y*-Intercept	The slopes and *y*-intercepts are not identified.	The slope and *y*-intercepts are identified but not correctly explained.	The slope and *y*-intercepts are correctly identified and explained.
Intersection Point	The intersection point is not identified.	The intersection point is identified but not correctly explained.	The intersection point is identified and correctly explained.
Another Animal	Another animal is not chosen.	An animal is chosen, but either sufficient detail is not given or the minimum safe distance is not correctly calculated.	An animal is chosen and sufficient detail is given. The minimum safe distance is correctly calculated.
Cycle Question	Solution does not address the question "When is it worth it?"	Some effort is made to explain when it's worth it to run from an animal.	Solution thoroughly explains when it's worth it to run from an animal.

Total Points: 24

3.1 Deciding to Run

Focus Problem

Double-click here to be able to zoom in

If you have ever spent any time in a wilderness area, you have likely wondered about the animals there and your safety. Could you stumble upon a bear on a path in the woods? Could you accidentally come between a moose and her calf? What should you do? It's said that you should never run from a bear, for example, but is that always true? What if the bear is far enough away from you that you think you can get away before it catches you? How far away would you need to be in order to be safe?

Obviously, any serious consideration or calculation has to be done well before you actually encounter a wild animal and must face this decision. We know the top speed at which many animals can run, and we know how long they are able to maintain that top speed. This information is shown in the table for a few animals.

ANIMAL	TOP SPEED (MILES PER HOUR)	DISTANCE AT TOP SPEED
Polar bear	20	1 mile
Black bear	25	2 miles
Lion	30	48 meters
Moose	35	400 meters
Rhinoceros	35	100 meters

Let's assume that the average person can run 10 miles per hour (at least for short distances while being chased). Let's also assume that a person and an animal each achieve top speed immediately. Determine how much of a head start you would need in order to escape from each animal listed in the table if it was chasing you at full speed. From which animal would you need the greatest head start? Consider that each animal can maintain its top speed for only a certain distance. You can use that distance to determine how long the animal can run and, therefore, how much time it has to catch you. How far can you run in that time? When you calculate the head start that you would need, you are determining the minimum safe distance to be away from that animal. This is useful information to know before heading into that animal's natural habitat.

Choose one of the animals listed in the table and write an equation to model its distance run vs. time. Write a separate equation to model your distance from the animal vs. time. Graph both of these equations on the same coordinate grid. Explain how the graphs illuminate the situation. What does the slope represent? Where do the graphs intersect, and how do you interpret that point? What do the *y*-intercepts represent?

Finally, choose another animal that you are interested in and find the minimum safe distance from it.

When we're considering running from a wild animal or heading into its natural habitat, we have to consider . . .

WHEN IS IT WORTH IT?

This focus problem can be solved in many different but related ways. You might begin by trying to understand the issues numerically by "running the numbers." At some point, though, you might discover that representing the information in equations might be more efficient. And, if you're trying to explain what you've discovered about the issues to someone else, a graph might be the most useful way to do it. It's important that you can use multiple representations not only to solve a problem but also to explain your solution to an audience. This is true for the focus problem as well as for many other problems that you'll solve during this cycle.

The question "When is it worth it?" will be the focus of the third cycle of the book. Sometimes the focus will be on determining when it is worth it to use algebraic methods. Other times, the question will relate to particular contexts, such as buying a hybrid vs. gas-powered car or buying an e-reader vs. books. By the end of the cycle, you'll have many tools that you can use to answer this type of question.

You will see periodic sticky notes throughout the cycle to encourage you to keep working on your solution to this problem as you learn new methods to apply.