# Quadratic Gallery Walk - Automotive

The number of horsepower needed to overcome a wind drag on a certain automobile is given by $H(s) = 0.005s^2 + 0.007s$, where s is the speed of the car in miles per hour.

1) According to the function, as the speed increases, does the wind drag increase or decrease? How do you know?

2) Will the wind drag ever become negative?

3) What is the minimum wind drag of a vehicle?

4) What will the wind drag be at 50mph?

5) Could the domain have negative elements? Why or why not?

# Quadratic Gallery Walk - Biology

The number of bacteria in a refrigerated food is given by the function $N(t) = 20t^2 - 20t + 120$, where t is the temperature of the food in Celsius.

1) Does the number of bacteria ever reach a maximum? How can you tell?

2) What will be the amount of bacteria present in the food if the temperature is 2°C?

3) At what temperature will the number of bacteria reach the minimum?

4) What is the minimum number of bacteria present in the food?

5) Does the domain have an interval or is the domain "all real numbers"? How do you know?

# Quadratic Gallery Walk - Business

A company's weekly revenue in dollars is given by $R(x) = 2x(1000 - x)$, where $R(x)$ is the revenue in dollars and x is the number of items produced during a week.

1) As the number of items produced increases, what happens to the revenue?

2) The company is capable of producing 80 products per week. Should they produce the maximum amount to maximize their revenue?

3) What is the optimal quantity of items produced to maximize revenue?

4) What is the maximum revenue for the company?

5) Can the domain of this function include negative numbers? Why or why not?

# Quadratic Gallery Walk - Nature

A bird-watcher spots a hawk flying above a field at a steady altitude. The hawks spots prey on the ground and dives in a freefall to catch the prey. The height, $h(t)$, of the hawk is given by the formula $h(t) = -16t^2 + 720$, where t is time (in seconds) after the hawk dives and $t \geq 0$.

1) If there was no restriction on t (namely $t \geq 0$), what would happen to the height of the hawk if t was negative?

2) What is the maximum height of the hawk (if possible)?

3) At what time will the hawk reach the ground?

4) In the context of the problem, what can you tell about the position of the hawk at $t = 0$?

5) Is 10,000 in the domain of the function? Why or why not?

# Quadratic Gallery Walk - Sports

After a ball is batted from home plate, its height is given by the function $h(t) = -16t^2 + 64t + 3$, where $h(t)$ is the height and t is time in seconds after being batted.

1) Will the ball ever reach a maximum? Will it ever reach a minimum? Explain.

2) What is the height of the ball the instant it is hit by the bat (where t=0)?

3) After how many seconds will the ball reach its maximum (if at all)?

4) After how many seconds will the ball hit the ground (if at all)?

5) Are negative numbers included in the domain?

# Quadratic Gallery Walk - Pies

The Student Council will sell pies at their annual bake sale. The president would like to determine the maximum revenue they can earn by raising the price charged per pie. He completes some research and determines that 150 buyers would pay $10 per pie, the same price as last year. He also determines that for each $1 increase in price, 5 of the 150 buyers would no longer purchase a pie. The president decides to model the revenue earned, R, as a function of the price increase, *x*. The function he calculates is $R(x) = (10+x)(150-5x)$.

1) How much should the student council increase their pie price in order to maximize their revenue?

2) What is this maximum revenue?

3) What is the new price per pie and how many pies would they sell at this new price?

4) What price per pie would be so high that nobody would buy one?

**Observational Checklist Quadratic Gallery Walk**

Objectives:

1. *Students can interpret key features of a quadratic graph.*
2. *Students can relate the domain of a function to its graph.*
3. *Students can relate real life problems to quadratic problems.*

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| *Coding:*<br>*I=Student needs instruction and cannot yet achieve this objective.*<br>*P=Student needs more practice on this objective, but is beginning to understand.*<br>*A=Student is ready to apply this objective to various situations.* |

| | ***Objective #1*** | | | ***Objective #2*** | | | ***Objective #3*** | | |
|---|---|---|---|---|---|---|---|---|---|
| ***Student*** | ***I*** | ***P*** | ***A*** | ***I*** | ***P*** | ***A*** | ***I*** | ***P*** | ***A*** |
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