# MODELING WITH QUADRATIC FUNCTIONS

# WARM UP

A model for the path of a toy rocket is given by

$$h = 68t - 4.9t^2$$

Where h is the altitude in meters and t is time in seconds. Find the maximum altitude of the rocket and how long it takes to reach that altitude.

# FINDING A QUADRATIC EQUATION

You can write the equation of a quadratic function given three types of information:

1. The vertex and a point
2. Three points on the function
3. A set of data

# GIVEN THE VERTEX AND A POINT

A circus performer is shot out of a cannon and follows a parabolic path where y is the height (in feet) and x is the horizontal distance (in feet) that she travels. The path starts at (0,15) and has a vertex at (50, 35). Write an equation for the parabola.

The performer lands in a net 90 feet from the cannon, what is the height of the net?

# PROBLEM #1

Write the quadratic equation that passes through the point (-1, 2) and has vertex (4, 9)

# Given three points on the parabola

A former NASA employee designs a model airplane that flies in a parabolic path. The table shows the heights h (in feet) of a plane t seconds after starting the flight path. Write and evaluate a function to approximate the height of the model airplane after 6.5 seconds

| Time, t | Height, h |
|---|---|
| 0 | 14 |
| 1 | 19 |
| 2 | 21 |
| 3 | 20 |
| 4 | 17 |

# PROBLEM #2

Write an equation of the parabola that passes through the points (-1, 4) (0, 1) and (2, 7).

# Given a set of data

The table shows the fuel efficiencies of a vehicle at different speeds. Write a function that models the data. Use the model to approximate the optimal driving speed.

| Miles per Hour, x | Mile per gallon, y |
|---|---|
| 23 | 17.1 |
| 34 | 23.4 |
| 42 | 27.5 |
| 47 | 28.6 |
| 50 | 29.6 |
| 61 | 26.2 |
| 72 | 22 |

# PROBLEM #3

The table shows the estimated profits y (in dollars) for a concert when the charge is x dollars per ticket. Write a function that models the data.

Use the model to estimate what to charge per ticket to maximize the profit.

| Ticket price, x | 2 | 5 | 8 | 11 | 14 | 17 |
|---|---|---|---|---|---|---|
| Profit, y | 2600 | 6500 | 8600 | 8900 | 7400 | 4100 |