Specific Expectations
Solving Problems by Interpreting Graphs of Quadratic Relations
In this Task, student will
QR3.01 solve problems involving a quadratic relation by interpreting a given graph or a graph generated with technology from its equation (e.g., given an equation representing the height of a ball over elapsed time, use a graphing calculator or graphing software to graph the relation, and answer questions such as the following: What is the maximum height of the ball? After what length of time will the ball hit the ground? Over what time interval is the height of the ball greater than 3 m?)
QR3.02 solve problems by interpreting the significance of the key features of graphs obtained by collecting experimental data involving quadratic relations

Teaching Suggestions for Home Run Derby
• Have students work in pairs to complete the Task.
• You may wish to use **BLM G1 Grid Paper** for this activity.
• As a class, discuss what is required for this Task and have students think about how to approach the task.
• Discuss strategies and review concepts related to solving problems involving quadratic relations using a graphing calculator.

Prompts for Getting Started
• Construct a table of values. Assign x-values to the horizontal distances and y-values to the heights of the ball.
• Use increments of 50 for the x-values and increments of 5 or 10 for y-values.
• If students use a graphing calculator, suggest they use these window settings:

```
WINDOW
 Xmin=0
 Xmax=550
 Xscl=50
 Ymin=0
 Ymax=70
 Yscl=5
 Xres=1
```

Hints for Evaluating a Response
• Student responses are being assessed for the level of mathematical understanding they represent. As you assess each response, consider the following questions:
  ▪ How much assistance did students need to get started with the task?
  ▪ How much assistance did students need to complete the task?
  ▪ Does the student show a clear understanding of different ways of representing quadratic relations?

Level 3 Sample Response

1. Juan

d (ft)	h (ft)
0	2.5
50	25
100	42.5
150	55
200	62.5
250	65
300	62.5
350	55
400	42.5

Barry

d (ft)	h (ft)
0	3
50	22
100	35
150	44
200	47
250	46
300	40
350	30
400	15

Mark
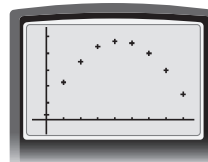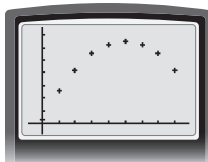
The numbers in the table of values are approximate so students' equations may be slightly different. $h = -0.0009d^2 + 0.39d + 4.2$

2. If the three equations are graphed together, we see that Juan's ball would travel the greatest distance and Barry's ball would travel the least distance. From the tables, Juan's ball reached the greatest height and Barry's ball reached the least height.

3. Juan's ball was 55 ft high when it went over the fence, Mark's ball was 38 ft high when it went over the fence, and Barry's ball was 30 ft high when it went over the fence.

Level 3 Notes

Look for the following:
- Clearly and correctly constructed graphs
- Complete explanations provided for questions 2 and 3
- Completed tables of values with reasonable x- and y-values
- Used a graphing calculator to find equations to represent the distance–height relationships for Mark's and Barry's balls

What Distinguishes Level 2

At this level, look for the following:
- Constructed graphs with some assistance
- Completed tables of values with assistance
- Used a graphing calculator to obtain the equations with assistance

What Distinguishes Level 4

At this level, look for the following:
- Used the equation for each player to find correct answers
- Gave a thorough, clear, and complete explanation for questions 2 and 3
- Completed a table of values using appropriate increments and used the equation of graph to find the heights
- Constructed graphs using appropriate scales (increments of 5 or 10 for height and increments of 50 for horizontal distances)
- Used a graphing calculator to obtain answers and find the equations