Honors Algebra 1
10.2 Performance Task Activity - Egg Launch Contest

Name:
Period: **Key**

The Scenario:
Mrs. Walker's Honors Algebra class is holding an egg launch contest on the football field. Teams of students have built catapults that will hurl an egg down the field. Mrs. Walker will judge the contest and will work with the students to measure each launch in order to determine the winner.

Team A used their catapult and hurled an egg down the football field. Students used a motion detector to collect data while the egg was in the air. They collected the following data organized in the table below.

$100 = 100a + 10(-20a)$
$100 = 100a - 200a$
$$\frac{100}{-100} = \frac{-100a}{-100}$$
$-1 = a$

$-20(-1) = b$
$20 = b$

$y = -x^2 + 20x + 1$

Distance from the Catapult (in feet)	Height (in feet)
0	1	Y-int
3	52
6	85
9	100
10 $_x$	101 $_y$	vertex
11	100
14	85
17	52
20	1

$y = ax^2 + bx + c$
$101 = a(10)^2 + b(10) + 1$
$100 = 100a + 10b$ ✳

$x = -\frac{b}{2a}$
$10 = -\frac{b}{2a}$
$20a = -b$
$-20a = b$ ✳

Team B's egg flew through the air and landed down the field. The group of students who tracked the path of the egg determined that the equation $y = -\frac{1}{4}x^2 + 9x + 1$ represented the path the egg took through the air, where x measures the distance from the catapult (in feet) and y measures the height of the egg from the ground (in feet).

$y = -\frac{1}{4}(18)^2 + 9(18) + 1 = 82$

vertex: (18, 82)

$x = \frac{-9}{2(-\frac{1}{4})} = \frac{-9}{-\frac{1}{2}} = 18$

Team C launched their egg using a catapult from one foot off the ground (Hint: there is a point at (0,1)). The path of their egg can be represented by the graph below.

(15, 113.5)
(0, 1)
Height (ft)
Distance from Catapult (ft)
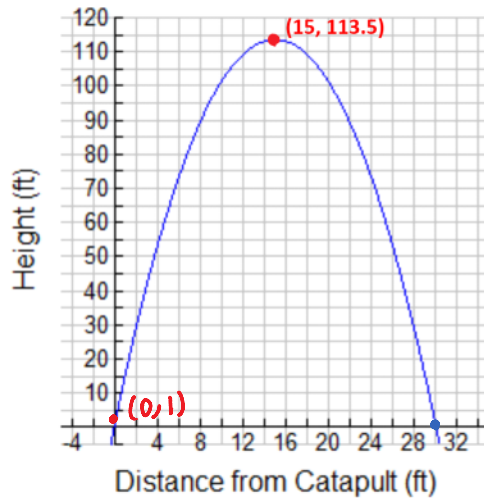
$113.5 = a(15)^2 + b(15) + 1$
$113.5 = 225a + 15b + 1$
$112.5 = 225a + 15b$

$15 = -\frac{b}{2a}$
$30a = -b$
$-30a = b$
$-30(-\frac{1}{2}) = b$
$15 = b$

$112.5 = 225a + 15(-30a)$
$112.5 = 225a - 450a$
$$\frac{112.5}{-225} = \frac{-225a}{-225}$$
$-\frac{1}{2} = a$

$y = -\frac{1}{2}x^2 + 15x + 1$

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Team A

1. Using the data from Team A, determine an equation that describes the path of the egg. Show work to support your answer.

$$y = -x^2 + 20x + 1$$

2. On the graph below (marked "Egg Launch"), graph the path of Team A's egg. Be sure to label it!

3. What is the maximum height that the egg reached? How far from the catapult did the egg land? Explain your answers.   101 ft high, ≈ 20 ft far
   (vertex)   (use a. of s.)

Team B

4. Using the equation provided by Team B, generate a table of values that shows different locations of the egg as it flew through the air.

x	0	4	10	18	26	32	36	
y	1	33	66	82	66	33	1	

5. On the graph below (marked "Egg Launch"), graph the path of Team B's egg. Be sure to label it!

6. What is the maximum height that the egg reached? How far from the catapult did the egg land? Explain your answers.   82 ft high, ≈ 36 ft far.
   (vertex)   (use a. of s.)

Team C

7. Using the graph provided by Team C, determine an equation that describes the path of the egg. *Hint*: identify specific points on the graph and solve using the same methods you used for Team A.

$$y = -\frac{1}{2}x^2 + 15x + 1$$

8. On the graph below (marked "Egg Launch"), graph the path of Team C's egg. Be sure to label it!

9. What is the maximum height that the egg reached? How far from the catapult did the egg land? Explain your answers.   113.5 ft high, ≈ 30 ft far

team A
team B
team C
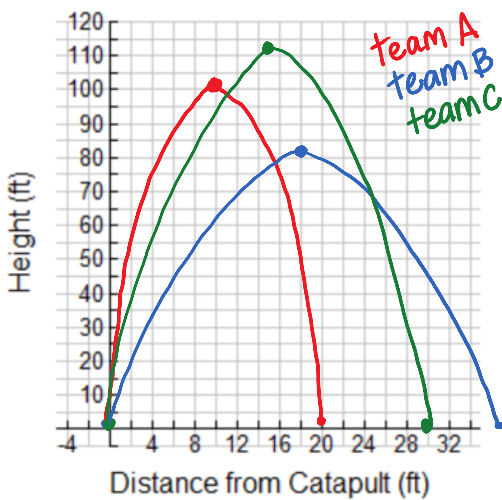
If the winner of the contest is the team whose egg reached the greatest height, then which team wins?

team C

If the winner of the contest is the team whose egg landed the furthest from the catapult, which team wins?

team B

There should be one team that did not win the height or the distance contest. Develop a contest where that specific team would win by beating out the other two teams.

EX: Shortest distance from the catapult

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