Algebra 2 Name:
Modeling with Quadratic Functions Date: Period:

1) An object is launched at 19.6 meters per second (m/s) from a 58.8-meter tall platform. The equation for the object's height s at time t seconds after launch is $s(t) = –4.9t^2 + 19.6t + 58.8$, where s is in meters.
   a. What is the object's maximum height?
   b. When does the object strike the ground?

2) An object is launched directly upward at 64 feet per second (ft/s) from a platform 80 feet high. The equation for the object's height s at time t seconds after launch is $s(t) = –16t^2 + 64t + 80$, where s is in feet.
   a. What is the object's maximum height?
   b. When will it attain this height?

3) After the semester is over, you discover that the math department has changed textbooks (again) so the bookstore won't buy back your nearly-new book. You and your friend Ameya decide to get creative. You go to the roof of a twelve-story building and look over the edge to the reflecting pool 160 feet below. You drop your book over the edge at the same instant that Ameya chucks her book straight down at 48 feet per second. The equations for the books' height are: Your book: $s(t) = –16t^2 + 160$ and Ameya's book: $s(t) = –16t^2 - 48t + 160$.

   By how many seconds does her book beat yours into the water?

4) An object is launched from ground level directly upward at 39.2 m/s. The equation for the object's height s at time t seconds after launch is $s(t) = –4.9t^2 + 39.2t$, where s is in meters. For how long is the object at or above a height of 34.3 meters?

5) The International Space Agency has finally landed a robotic explorer on an extra-solar planet. Some probes are extended from the lander's body to conduct various tests. To demonstrate the crushing weight of gravity on this planet, the lander's camera is aimed at a probe's ground-level ejection port, and the port launches a baseball directly upwards at 147 feet per second (ft/s), about the top speed of a professional pitcher. The force due to gravity on this planet is 98 ft/s^2. Assuming no winds and that the probe can scurry out of the way in time, he equation for the baseball's height s at time t seconds after launch is $s(t) = –49t^2 + 147t$, where s is in meters. How long will it take for the ball to smack back into the surface?

6) Some fireworks are fired vertically into the air from the ground at an initial velocity of 80 feet per second. If the projectile's height before it explodes can be modeled by $s(t) = –16t^2 + 80t$, find the highest point reached by the projectile just as it explodes.

7) A pistol is accidentally discharged vertically upward at a height of 3 feet above the ground. If the bullet has an initial muzzle velocity of 200 feet per second, what maximum height will it reach before it starts to fall to the ground?

8) A man throws a ball off the top of a building. The table shows the height of the ball at different times.

Time (sec)	1	2	3
Height (ft)	63	48	1

a. Find a quadratic model for the data.
b. Find the height of the ball at 1.25 sec and 2.5 sec.

9) The table shows the percent of U.S. houses with cable TV.
   a. Find a quadratic model using 1960 as year 0, 1970 as year 10, and so on.
   b. Use the model to estimate the percent of households with cable TV in 1995.

Year	1970	1990	2000
% of Households	7	56	68

10) The table shows the price of first-class stamps. Find a quadratic model for the data. Use 1974 as year 0.

Year	1974	1978	1981	1983	1988	1995	2001	2002	2008
Price	10	15	18	20	25	32	34	37	42

a. Estimate when first-class postage was 29¢.

b. Predict when first-class postage will be 50¢.

c. Will everyone in the class have the same quadratic model and the same prediction? Explain your answer.

Answers:

1a. 78.4 m b. 6 sec	2. a. 144 ft b. 2 sec
3. 1.16 sec	4. a total of 6 sec (from 1 sec to 7 sec)
5. 3 sec	6. 100 ft
7. 628 ft	8. a. $h(t) = -16t^2 + 33t + 46$ b. $h(1.25) \approx 62.25$ ft $h(2.5) \approx 28.5$ ft
9. a. $P(x) = -0.4167x^2 + 4.1167x - 30$ b. In 1995, about 63.04% of households have cable.	