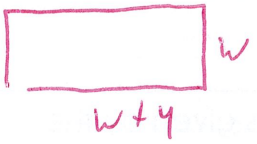
Name: Key Date: _____

Quadratic Applications

For each problem, highlight the key words that would indicate the best method or what you are supposed to be solving for. Set up the problem and be ready to solve in class.

1. The length of a rectangle is 4 cm more than the width. The area is 96cm. Find the dimensions of the rectangle.



$w(w+4) = 96$

$w^2 + 4w = 96$

$w^2 + 4w - 96 = 0$

$(x+12)(x-8) = 0$

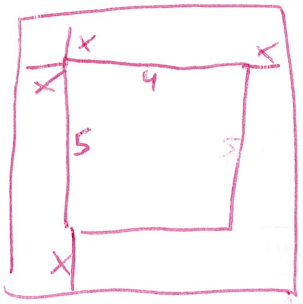
$x = -12, 8$

$W = 8$ cm

$l = 12$ cm

---

2. The dimensions of a rectangular garden were 4 m by 5 m. Each dimension was increased by the same amount. The garden then had an area of 56 m. Find the dimensions of the new garden. (Hint: Let x be the amount of increase.)



$(2x+5)(2x+4) = 56$

$4x^2 + 8x + 10x + 20 = 56$

$4x^2 + 18x - 36 = 0$

$2x^2 + 9x - 18 = 0$

$(2x-3)(x+6) = 0$

$2x - 3 = 0$ | $x = -6$

$2x = 3$

$x = 3/2$

$2(\frac{3}{2}) + 5$

$3 + 5$

8

$2(\frac{3}{2}) + 4$

$3 + 4$

7

8m x 7m

---

3. You drop a water balloon off a cliff at 800 ft. How long does it take the ball to hit the ground? $h(t) = -16t^2 + 800$

$0 = -16t^2 + 800$

$16t^2 = 800$

$t^2 = \frac{800}{16}$

$t = \sqrt{\frac{800}{16}} \approx 7.07$ sec

---

4. The population of a city can be modeled by the function $P(t) = 0.4t^2 + 10t + 50$ where P(t) is the population in thousands and t is the time in years since 1995. How many people will live in the city in 2021?

2021
−1995
26

$P(26) = 0.4(26)^2 + 10(26) + 50$

$P(26) = 580.4$

580,400 people

5. A football is punted into the air. Its height *h*, in meters, after *t* seconds is given by the equation $h = -4.9t^2 + 24.5t + 1$

a. How high is the ball after 1 second?

$h = -4.9(1)^2 + 24.5(1) + 1 =$ 20.6 m

b. When is the ball at its highest point? = max = vertex = (h, k)

Ve $h = \frac{-b}{2a} = \frac{-24.5}{2(-4.9)} = \frac{-24.5}{-9.8} =$ 2.5 sec

c. When will the ball reach a height of 25 meters?

$25 = -4.9t^2 + 24.5t + 1$

$4.9t^2 - 24.5t + 24 = 0$

$a = 4.9 \quad b = -24.5 \quad c = 24$

$x = \frac{-(-24.5) \pm \sqrt{(-24.5)^2 - 4(4.9)(24)}}{2(4.9)}$

$x = \frac{24.5 \pm \sqrt{129.85}}{9.8}$

x = 3.66, 1.34 sec

6. A pizza shop has weekly production costs that can be modelled by the equation $C = 0.5x^2 + 15x + 130$ where C is the total cost (in dollars) for that week, and x is the number of pizzas made that week. What is the average rate of change in the cost per unit as the manager increases their weekly production from 90 to 120 pizzas?

$C(90) = 0.5(90)^2 + 15(90) + 130 = 5530$ $\quad (90, 5530)$ (x_1, y_1)

$C(120) = 0.5(120)^2 + 15(120) + 130 = 9130$ $\quad (120, 9130)$ (x_2, y_2)

$\frac{9130 - 5530}{120 - 90} = \frac{3600}{30} =$ 120