Mrs. Marcelino Name: _____
Unit 3 Date: _____ Period: _____

Practice: Using Mathematical Models to Solve (3A, 3B)

3A	I can apply the **problem-solving algorithm: approach** (know), **set-up** (given, want), **procedure** (analysis), **and justification/reasoning** to solve a variety of complex and novel problems and explain the purpose of the strategy.
3B	I can design a **mathematical model** to solve the following applications: **mixture**, **fence**, **garden**, **box**, **variation (direct, inverse, joint)**, and **projectile motion**. I can justify each step within the analysis and explain the validity of the solution to the **linear**, **quadratic**, cubic, or inequality mathematical model.

Level 2

1. A farmer has 2400 feet of fencing and wants to fence off a rectangular field that borders a straight river. He does not need a fence along the river. Find a function that models the area of the field in terms of the width (not along the river). What is the area of the garden if the width is 25 feet?

Level 3

2. A gardener has 46 feet of fencing to be used to enclose a rectangular garden that has a border 2 feet wide surrounding it (see the figure).
    a. If the length of the garden is to be twice its width, what are the dimensions of the garden? What is the area of the garden?
    b. If the length and width of the garden are to be same, what are the dimensions of the garden? What is the area of the square garden?

Level 3

3. A farmer has 300 feet of fencing available to enclose a 4500 square foot region in the shape of adjoining squares, with sides of length x and y (see the figure). Find x and y.

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Level 4

4. An open box with square base is to have a volume of 10 cubic feet. Express the amount of material, *M*, used to make such a box as a function of the length *l* of the base. How much material is required for a base of 1 foot by 1 foot?

Level 4

5. A rectangular piece of cardboard, whose area is 216 square centimeters, is made into an open box by cutting a 2-centimeter square from each corner and turning up the sides. See the figure. If the box is to have a volume of 224 cubic centimeters, what size cardboard should you start with?

Answers

1. $A = F(w) = 2400w - 2w^2$, $A = 58{,}750\ ft^2$
2. (a) 5 feet by 10 feet; area is 50 feet squared

   (b) 7.5 feet by 7.5 feet; area is 56.25 feet squared
3. x = 60, y = 30
4. $M = f(l) = \frac{40}{l} + l^2$; 41 feet squared
5. 18 centimeters by 12 centimeters