Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  **Math 3**

**Applications with Polynomials Functions**

***Example 1: Projectile Motion***

A water balloon is catapulted into the air so that its height, in meters, after t seconds I modeled by the equation: *h(t) = -4.9t2 + 27t + 2.4*. Sketch the path of the water balloon on a set of axes before you begin answering questions.

1. What is the starting height of the balloon?
2. What is the maximum height of the balloon?
3. When will the balloon burst as it hits the ground?
4. How high is the balloon after 1 second?
5. For how long is the balloon more than 30 m high?

***Example 2: Open Boxes***

An open box with a square base is to be made from a square piece of cardboard that measures 24 inches on each side by cutting out a square from each corner and turning up the sides.

a) Express the volume of the box as a function of the length *x* of the square cut from each corner.

b) What is the volume if a 3 inch square is cut out?

c) What is the volume if a 10 inch square is cut out?

d) Graph your equation. For what values of *x* is the volume the largest? What are the dimensions of the box with the largest volume?

***Example 3: Sidewalks or Picture Frames***

A rectangular lawn measuring 8 meters by 4 meters is surrounded by a flower bed of uniform width. The combined area of the lawn and the flower bed is 165 square meters.

a) What is the width of the flower bed?

b) What are the dimensions of the lawn?

c) What are the dimensions of the lawn and the flower bed combined?

***Example 4: Volume***

a) Let *x*, *(x+1), (x – 4),* represent the width, length, and height respectively of a container. The container has a volume of 30 cubic feet. What are the dimensions?

b) The width of a box is 2 meters less than the length. The height is 1 meter less than the length. THe volume is 60 meters cubed. What is the length of the box?

c) Find the expression for the missing side of a rectangular prism if the volume of can be expressed as the polynomial

$$V=2x^{3}+17x^{2}+46x+40$$

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*Solve each of the following:*

1. The value of Jennifer’s stock portfolio is given by the function $v\left(t\right)=50+73t-3t^{2}$, where *v* is the value of the portfolio in hundreds of dollars and *t* is the time in months.

a)How much money did Jennifer start with?

b)When will the value of Jennifer’s portfolio be at a maximum?

2. The height *h* in feet of a projectile launched vertically upward from the top of a 96-foot tall tower when time *t*=0 is given by $h=96+80t-16t^{2}$.

a) How long will it take the projectile to strike the ground?

b) What is the maximum height that the projectile reaches?

3. An open box with a volume of 144 cm3 can be made by cutting a square of the same size from each corner of a square piece of tin 14 cm on each side and folding up the edges of the tin. What is the length of the side of the square that is cut from each corner?

4. Nancy has a piece of tin 14 cm wide and 18 cm long. She wants to make an open box with a volume of 180 cm3 by cutting a square out of each corner. To the nearest tenth of a centimeter, find the length of a side of the square that is cut from the corner.

5. A photograph is 16 inches wide and 9 inches high and is surrounded by a frame of uniform width. If the area of the frame is 84 square inches, find the outside perimeter of the frame.

6. A small playing field is 45 meters wide and 60 meters long. If a lawnmower cuts a border around the outside of the field, how wide must be the border so that one-half of the lawn is cut?

7. The length of a rectangular tank is 6 ft more than its height and the width is 3 ft more than its height. Find the dimensions of the tank if the volume of the tank is 80 ft3.

8. At the ruins of Caesarea, archaeologists discovered a huge hydraulic concrete block with a volume of 945 m3. The block’s dimensions are x meters high by 12x – 15 meters long by 12x – 21 meters wide. What is the height of the block?