

HW: Polynomial Applications

Solve each problem algebraically. MUST SHOW WORK FOR CREDIT.

$$P = y^2 + 40y$$

$$(y^2 + 40y + 400) - 400$$

$$(y + 20)^2 - 400$$

$$y = -20 \quad x = 20$$

1. Find two numbers whose difference is 40 and whose product is a minimum.

$$x - y = 40 \quad P = x \cdot y \quad \text{Solve for } x \quad x = y + 40 \quad P = (y + 40) \cdot y$$

2. A rectangle has a perimeter of 24 meters. Find the dimensions of the rectangle with the maximum area.

$$2l + 2w = 24 \quad \text{Solve for } w \quad 2w = -2l + 24 \quad A = -l^2 + 12l$$

$$A = l \cdot w$$

$$w = -l + 12$$

$$= -(l^2 - 12l + 36) + 36$$

$$l = 6 \quad w = 6$$

3. Melissa plans to put a fence around her rectangle garden. She has 150 feet of fencing material to make the fence. If there is to be a 10 foot opening left for an entrance on one side of the garden, what dimensions should the garden be for the maximum area?



$$2l + 2w = 160 \quad A = -l^2 + 80l$$

$$w = -l + 80$$

$$= -(l^2 - 80l + 1600) + 1600$$

$$l = 40 \quad w = 40$$

4. Kyle has 120 feet of fence to make a rectangular kennel for his dogs. If the house is to be used as one side of the kennel, what dimensions should the garden be for the maximum area?

$$2l + w = 120$$

$$A = -2l^2 + 120l$$

$$w = -2l + 120$$

$$= -2(l^2 - 60l + 900) + 1800$$

$$l = 30 \quad w = 60$$

5. The Center Stage Community Theater can seat 500 people. They sold out for every performance last season. They intend to raise the \$3 admission price for the upcoming season. They estimate that for every \$.20 increase in price, 25 fewer people will attend a performance. What ticket price will maximize the theater's income?

$x = \#$ of increases

$$(3 + .20x)(500 - 25x)$$

$$-5x^2 + 25x + 1500$$

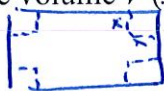
$$(x - 9/2)^2$$

$$1500 - 75x + 100x - 5x^2$$

$$-5(x^2 - 5x + 25/4) + 1500 + 125/4$$

$$x = 5/2$$

6. An open box is made from an 8-by-10-inch rectangular piece of cardboard by cutting squares from each corner and folding up the sides. If x represents the side length of the squares, which of the following is a function giving the volume $V(x)$ of the box in terms of x ?



$$V = (10 - 2x)(8 - 2x)(x)$$

7. The volume of a fudge tin must be 120 cubic centimeters. The tin is 7 centimeters longer than it is wide and six times longer than it is tall. Find the dimensions of the tin.

$$120 = w(w+7) \cdot \frac{1}{6}(w+7)$$

$$\Rightarrow 720 = w(w+7)^2$$

$$l = w + 7 \quad l = 6h \Rightarrow h = 1/6 l$$

$$w = 5$$

8. The volume of a milk carton is 200 cubic inches. The base of the carton is square and the height is 3 inches more than the length of the base. What are the dimensions of the carton?

$$200 = x^2(x+3)$$

$$x = 5$$

$$0 = x^3 + 3x^2 - 200$$

9. A rectangular solid has a volume of 14 cubic units. The width is twice the height and the length is 2 units more than the width. Find the dimensions of the solid.

$$14 = w \left(\frac{1}{2}w \right) (w+2)$$

$$w = 2h \quad l = w + 2$$

$$h = 1/2 w$$

$$28 = w^2(w+2)$$

width length

$$w = 2.5$$

10. A ball is thrown straight up with an initial velocity of 64 ft per second. The height of the ball t seconds after it is thrown is given by: $h(t) = 64t - 16t^2$.

- a) What is the height of the ball after 1.5 seconds? $-16(1.5)^2 + 64(1.5) = 60$

- b) What is the maximum height? $-16(t^2 - 4t + 4) + 64$
 $-16(t - 2)^2 + 64$ max $h = 64$

- c) After how many seconds will the ball return to the ground? $(2, 64)$
 4 secs. 2 up + 2 down.

USE CALC