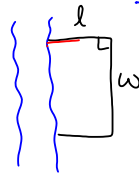


## Applications of Quadratics in Factored Form Apr. 12/2016

Note: All examples from lesson are included in handout.  
You only need to write out solutions.

1. A rectangular lot is bounded on one side by a river and on the other three sides by 80m of fencing. Determine the dimensions of the largest lot possible.



$$2l + w = 80$$

$$w = 80 - 2l$$

$$A = lw$$

$$A = l(80 - 2l) \quad \text{factored form}$$

$$y = (x)(80 - 2x)$$

① find zeroes

② A.o.S.  $\rightarrow x_v$

③ sub  $x_v$   
 $\rightarrow y_v$

① set  $A = 0$ , find  $l$

$$0 = (l)(80 - 2l)$$

$$l = 0 \text{ or } 80 - 2l = 0$$

$$80 = 2l$$

$$l = 40$$

$$\textcircled{2} l_v = \frac{0 + 40}{2}$$

$$= 20$$

$$\textcircled{3} A_v = (20)(80 - 2(20))$$

$$= 20(40)$$

$$= 800$$

$$\textcircled{4} w = 80 - 2l$$

$$= 80 - 2(20)$$

$$= 40$$

$\therefore$  the dimensions are 20m by 40m.

Apr 19-7:41 PM

2. Supermarket cashiers try to memorize current sale prices while they work. A study showed that, on average, the percent,  $P$ , of prices memorized after  $t$  hours is given approximately by the formula

$$P = -40t^2 + 120t$$

What is the greatest percent of prices memorized, and how long does it take to memorize them?

① factored form

$$P = -40t^2 + 120t$$

$$P = -40t(t - 3)$$

③ A.o.S.,  $t_v$

$$t_v = \frac{0 + 3}{2}$$

$$= \frac{3}{2}$$

$$= 1.5$$

② zeroes, set  $P = 0$

$$0 = -40t(t - 3)$$

$$t = 0 \text{ or } t - 3 = 0$$

$$t = 3$$

④ find  $P_v$ , sub  $t_v$

$$P_v = -40(1.5)(1.5 - 3)$$

$$= -60(-1.5)$$

$$= 90$$

$\therefore$  a max of 90% can be memorized in 1.5h.

Apr 20-5:48 PM

3. The cost of a ticket to a hockey arena is \$3, and the arena holds 800 people. At this price, every ticket is sold. A survey indicates that for every dollar increase in price, attendance will fall by 100 people.
- (a) What ticket price results in the greatest revenue?  
 (b) What is the greatest revenue?

$$R = (3)(800)$$

$$R = (3+1)(800-100)$$

$$R = (3+2)(800-200)$$

$$R = (3+x)(800-100x)$$

Let  $x$  represent the number of \$1 price increases.

① zeroes, set  $R=0$       ② A.O.S.

$$0 = (3+x)(800-100x)$$

$$3+x=0 \text{ or } 800-100x=0$$

$$x=-3 \qquad 800=100x$$

$$\qquad \qquad x=8$$

$$x_v = \frac{-3+8}{2}$$

$$= \frac{5}{2}$$

$$= 2.5$$

③ Sub  $x=2.5$

$$R_v = (3+2.5)(800-100(2.5))$$

$$= (5.5)(550)$$

$$= 3025$$

$\therefore$  a price of \$5.50 gives a max. revenue of \$3025.

Apr 20-5:50 PM

4. Determine the number which exceeds the square of the same number by the greatest possible amount.

Apr 20-5:51 PM

Many word problems dealing with quadratic relations in factored form are concerned with financial situations (i.e., money). You may find the following definitions useful:

**Revenue:** The income for the business; the amount of money that comes into the business; positive.

**Cost:** The expenses for the business; the amount of money that goes out of the business; negative.

**Profit:** The difference between *revenue* and *cost*.

$$\text{Profit} = \text{Revenue} - \text{Cost}.$$

A positive profit is good for a business, and a negative profit (also called a *loss*) is bad.

**Break-Even Point :** The point where profit is zero. This is where profit changes between positive and negative.

Nov 3-11:03 PM

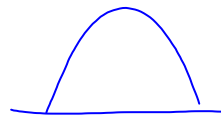
Assigned Work:

p. 147 # 12, 13, 14  
p. 157 # 13, 14, 15

p. 147

$$12. h = 20t - 5t^2$$

$$h = 5t(4-t)$$



$$13(a) P = 120x - 60x^2$$

$$P = 60x(2-x)$$

$$\text{set } P = 0$$

$$0 = 60x(2-x)$$

$$x = 0$$

$$2 - x = 0$$

$$2 = x$$

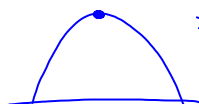
$$x = 2$$

$$\text{MP: } x_v = \frac{0+2}{2}$$

$$= 1 \rightarrow 1000 \text{ MP3 players sold}$$

$$\text{sub } x = 1, P_v = 60(1)(2-1)$$

$$= 60 \rightarrow \text{profit of } \$60,000$$



p. 147 #14.

$$y = 500 - 5x^2$$

(a) height helicopter

→ initial height of raft

→ set  $x = 0$  (time = 0)

$$y = 500 - 5(0)^2$$

$$= 500$$

(b) water at  $y = 0$ , set  $y = 0$ 

$$0 = 500 - 5x^2$$

$$0 = 5(100 - x^2)$$

$$(10)^2 - (x)^2$$

$$0 = 5(10+x)(10-x)$$

$$10+x=0$$

$$x = -10$$

does not fit  
the "real"  
situation.

$$10-x=0$$

$$10=x$$

$$x = 10$$

∴ raft lands  
after 10 seconds.

(c) set  $x = 6$ (d) set  $y = 100$ 

Apr 13-12:43 PM

p. 157 # 14.

$$R = (10)(80)$$

$$R = (10+1)(80-5)$$

$$R = (10+2)(80-10)$$

$$\rightarrow R = (10+x)(80-5x)$$

Let  $x$  be the  
price increase.

Apr 13-12:52 PM