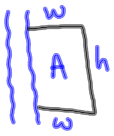
Applications of Quadratics in Factored Form

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 $\underbrace{\text{largest lot possible}}_{\text{maximum area}}$.



$A = w \times h$

$2w + h = 80$

want equation with only w or only h.

rearrange $2w + h = 80$

$h = 80 - 2w$

sub h into $A = w \times h$

$A = w \times (80 - 2w)$

$A = \underbrace{w(80-2w)}_{\text{factored form}}$

for zeroes, set $A = 0$

$0 = w(80 - 2w)$

$\boxed{w = 0}$ or $80 - 2w = 0$

$\frac{80}{2} = \frac{2w}{2}$

$\boxed{w = 40}$

$w_v = \frac{0+40}{2}$

$= 20$

Sub $w = 20$ into $h = 80 - 2w$

$= 80 - 2(20)$

$= 80 - 40$

$= 40$

∴ the dimensions of the largest lot are 20m wide by 40m high

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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

$P = -40t^2 + 120t$ ← standard form

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

x_v, or axis of symmetry

optimum value

y_v

find zeroes, need factored form

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

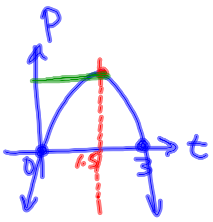
$= -40t(t - 3)$

Set $P = 0$

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

$-40t = 0$ or $t - 3 = 0$

$\boxed{t = 0}$ $\boxed{t = 3}$



t_v = MP of zeroes

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

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

$t_v = 1.5$

∴ it takes 1.5 hours to memorize the most items

Sub t_v into eqn

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

$= 90$

∴ they memorize 90% in 1.5 hours

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

Revenue = (# of tickets) × (cost per ticket)

$2400 = 800 \times 3$

$2800 = 700 \times 4$

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

Let x represent the # of \$1 increases

for zeroes, set $R = 0$

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

$800 - 100x = 0$ or $3 + x = 0$

$800 = 100x$ $\quad \boxed{x = -3}$

$\boxed{x = 8}$

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

$= \frac{5}{2}$

$= 2.5$

∴ max revenue at a ticket price of $3 + 2.5 = \$5.5$

for greatest R, sub $x = 2.5$

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

$= (800 - 250)(5.5)$

$= (550)(5.5)$

$R = 3025$

∴ max revenue is \$3025

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

optimum value

x $\quad x^2$

$y = x - x^2$

need vertex

the difference between # and its square

① factored form
② zeroes
③ MP → x_v
④ sub → y_v

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Assigned Work: #2 from handout

p. 282 # 6, 14, 16, 19
p. 300 # 14c, 15