$y = 3x^2 + 24x + 44$

1) Move number
2) Take out "a"
3) complete the square

$y - 44 = 3x^2 + 24x$

$y - 44 + 48 = 3(x^2 + 8x + \underline{16})$

$y + 4 = 3(x+4)^2 \quad (-4, -4)$

Optimum $B = \frac{-b}{2a}$

$y = 3x^2 - 24x + 43$

find the vertex $\frac{+24}{2 \cdot 3}$ $(4, -5)$ $\frac{-b}{2a}$

plug in 4 $y = 3 \cdot 4^2 - 24 \cdot 4 + 43$

$48 - 96 + 43 = -5$

Today Max/Min Word Problems

The height of an object over time is $h(t) = -5t^2 + 60t + 7$

Find the maximum height.

down → maximum

all we need is the vertex

$a = -5$, $b = 60$, $c = 7$

$\frac{-b}{2a}$ $\frac{-60}{2(-5)}$ $\frac{-60}{-10} = 6$ when

Plug in $t = 6$ $h(t) = -5(6)^2 + 60 \cdot 6 + 7$

$= 187$

#2 You want to maximize the area of a fence that you are making along the side of a barn

$L + 2w = 120$

If you have 120m of fencing

What is the maximum area of the pen?

1. What is maximized? Area $= L \times W$

2. Write the formulas a quadratic with one variable

$A = L \cdot W$

Also know $2W + L = 120$ $-2W$ $-2W$

if $L = 120 - 2w$ $L = (120 - 2w)$

$A = (120 - 2w)w$

$A = 120w - 2w^2$

Vertex $= \frac{-b}{2a}$ $\frac{-120}{2(-2)} = 30$

$W = 30$

$L =$

You sell 5000 tickets at 10 dollars if you reduce prices by 1 dollar then 2000 more people will come. What price maximizes the revenue

Maximize? Revenue = number x Price

original start $= R = (5000 + 2000x)(10 - 1x)$

Foil it $R = 50{,}000 - 5000x + 20{,}000x - 2000x^2$

$= 50{,}000 + 15{,}000x - 2000x^2$

$= -2000x^2 + 15000x + 50{,}000$

Vertex $\frac{-b}{2a}$ $\frac{-15{,}000}{2(-2000)} = 3.75$

Sell tickets for $6.25