

## Building an Equation in Factored Form

Ex/ A parabola can be modelled by  $y = -2(x+10)(x-8)$ . What is the maximum height reached by this curve? optimal value

Zeros  
 $(-10, 0), (8, 0)$

AoS  

$$x = \frac{-10+8}{2}$$

$$x = -1$$

$$y = -2(-1+10)(-1-8)$$

$$= -2(9)(-9)$$

$$= 182$$

Max of 182

### Writing Equations in Factored Form

- To write an equation in this form:

- 1) Fill in the zeros \*\*Remember to change signs\*\*
- 2) Substitute a known point for x and y
- 3) Solve for a
- 4) Re-write the equation

Ex/ Determine the equation if the zeros are 6 and 8 and the parabola passes through  $(3, 15)$ .  
 Need 'a'  $y = a(x-6)(x-8)$  ← opposite signs'

$$15 = a(3-6)(3-8) \leftarrow \text{know } a \text{ (x,y)}$$

$$15 = a(-3)(-5) \left. \vphantom{15} \right\} \text{BEDMAS}$$

$$15 = 15a$$

$$1 = a \leftarrow \text{get } a$$

$$\therefore y = 1(x-6)(x-8)$$

Ex/ A parabola has x-intercepts of 7 and 3 and a y-intercept of 4. Find its equation.

$$y = a(x-7)(x-3)$$

$$4 = a(0-7)(0-3)$$

$$4 = a(-7)(-3)$$

$$4 = 21a$$

$$\frac{4}{21} = a$$

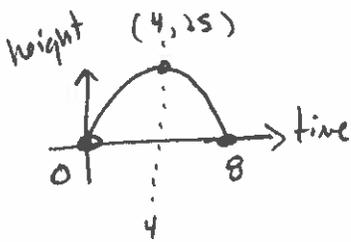
$$\therefore y = \frac{4}{21}(x-7)(x-3)$$

$$\star (0, 4)$$

↑ x is always zero at the y-int

Doesn't divide nicely so leave the fraction

Ex/ When a golf ball sitting on the ground is hit, its flight can be modelled by a quadratic function. If the ball reaches a maximum height of 25 metres, and lands after 8 seconds, determine the equation of this model. What is the height of the ball after 3 seconds?



$$y = a(x-0)(x-8)$$

$$25 = a(4-0)(4-8)$$

$$25 = a(4)(-4)$$

$$25 = -16a$$

$$- \frac{25}{16} = a$$

$$\text{or } -1.5625 = a$$

$$y = -1.5625(x-0)(x-8)$$

$$\text{At } 3 \text{ sec, } x = 3$$

$$y = -1.5625(3-0)(3-8)$$

$$= -1.5625(3)(-5)$$

$$= 23.4375 \text{ m}$$

Ex/ Sherri sells photos of athletes to baseball, basketball and hockey fans after their games. Her regular price is \$12 per photograph, and she usually sells about 22 photographs. Sherri finds that, for each reduction in price of \$0.50, she can sell an additional two photographs.

- Determine an equation for the revenue from photo sales.
- What price should Sherri charge to maximize her revenue?
- How many photos will she sell at this price?
- How much money will she make?

$$\text{Revenue} = \text{Price} \times \text{Sales}$$

$$a) R = (12 - 0.5x)(22 + 2x)$$

↑  
initial price
↑  
Price changes
↑  
initial sales
↑  
sales changes

$x = \#$  of changes

b) Need zeros!, then AoS, then plug in

$$12 - 0.5x = 0$$

$$22 + 2x = 0$$

$$\frac{12}{0.5} = \frac{0.5x}{0.5}$$

$$\frac{22}{-2} = \frac{-2x}{-2}$$

$$24 = x$$

$$-11 = x$$

zeros

$$\text{AoS: } x = \frac{-11 + 24}{2} = 6.5 \text{ changes}$$

$$\begin{aligned} \text{Price} &= 12 - 0.5x \\ &= 12 - 0.5(6.5) \\ &= 8.75 \end{aligned}$$

$$\begin{aligned} \text{Sales} &= 22 + 2x \\ &= 22 + 2(6.5) \\ &= 35 \end{aligned}$$

$$\begin{aligned} R &= 8.75(35) \\ &= \$306.25 \end{aligned}$$