

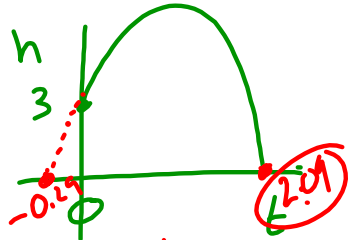
Unit 6: Solving Quadratic Equations

Day 7: Solving Word Problems Using the Quadratic Equation

Example 1:

Sylvie does a reverse 2 and a half somersault dive from a 3 m springboard. Her height, h , in metres, t seconds after she leaves the board is given by the equation:

$$h = \boxed{-4.9}t^2 + \boxed{8.8}t + \boxed{3}$$



How long will she be in the air?

Need to find the zeros.

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{-8.8 \pm \sqrt{(8.8)^2 - 4(-4.9)(3)}}{2(-4.9)}$$

$$= \frac{-8.8 \pm \sqrt{136.24}}{-9.8}$$

$$= \frac{-8.8 \pm 11.67}{-9.8}$$

$$t = \frac{-8.8 + 11.67}{-9.8} \quad \text{OR} \quad t = \frac{-8.8 - 11.67}{-9.8}$$

$$= \frac{2.87}{-9.8}$$

$$= -0.29$$

t can't be negative

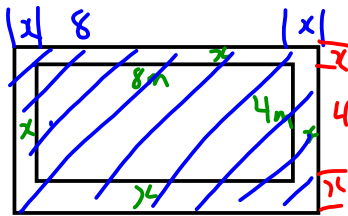
$$= \frac{-20.47}{-9.8}$$

$$= 2.09$$

\therefore she is in the air for 2.09 s.

Example 2:

A rectangular lawn measuring 8m by 4m is surrounded by a flower bed of uniform width. The combined area of the lawn and the flower bed is 165m^2 . What is the width of the flower bed?



Let x represent the width of the flower bed.

$$A = lw$$

$$165 = (8 + 2x)(4 + 2x)$$

$$0 = 32 + 16x + 8x + 4x^2 - 165$$

$$0 = 4x^2 + 24x - 133$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{-24 \pm \sqrt{(24)^2 - 4(4)(-133)}}{2(4)}$$

$$= \frac{-24 \pm \sqrt{576 + 2128}}{8}$$

$$= \frac{-24 \pm \sqrt{2704}}{8}$$

$$= \frac{-24 \pm 52}{8}$$

$$x = \frac{-24 + 52}{8} \quad \text{or} \quad x = \frac{-24 - 52}{8}$$

$$x = 3.5$$

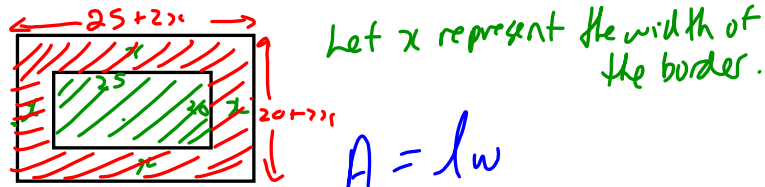
$$x = -9.5$$

can't have negative width.

\therefore the flower bed is 3.5m wide.

Example 3:

A uniform border on a framed photograph has the same area as the photograph. What are the dimensions of the border if the dimensions of the photograph are 20 cm by 25 cm?



$$A_{\text{photo}} = A_{\text{border}}$$

$$(20)(25) = A_{\text{whole}} - A_{\text{pic}}$$

$$(20 \times 25) = (25 + 2x)(20 + 2x) - (25 \times 20)$$

$$500 = 500 + 50x + 40x + 4x^2 - 500$$

$$0 = 4x^2 + 90x - 500$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{-90 \pm \sqrt{(90)^2 - 4(4)(-500)}}{2(4)}$$

$$= \frac{-90 \pm \sqrt{8100 + 8000}}{8}$$

$$= \frac{-90 \pm \sqrt{16100}}{8}$$

$$= \frac{-90 \pm 126.89}{8}$$

$$x = \frac{-90 + 126.89}{8} \quad \text{or} \quad x = \frac{-90 - 126.89}{8}$$

$$x = 4.61$$

$$x = -27.11$$

can't have neg width.

\therefore the dimensions are
 $25 + 2(4.61) = 34.22 \text{ cm}$
 $20 + 2(4.61) = 29.22 \text{ cm}$