

Word Problems Quadratic Equations

Example:

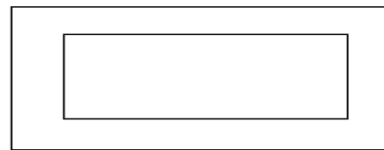
A radiation control point is set up near a solid waste disposal facility. The pad on which the facility is set up measures 20 metres by 30 metres. If the health physicist sets up a controlled walkway around the pad that reduces the area by 264 square metres, how wide is the walkway?

Step 1. Let x = Width of the Walkway

Step 2. Then,

$$30 - 2x = \text{Length of Reduced Pad}$$

$$20 - 2x = \text{Width of Reduced Pad}$$



Step 3.

$$\text{Area of Reduced Pad} = (\text{Length of Reduced Pad})(\text{Width of Reduced Pad})$$

Step 4. Solve this quadratic equation.

$$(30 - 2x)(20 - 2x) = 336$$

$$4x^2 - 100x + 264 = 0$$

Using the Quadratic Formula, substitute the coefficients for a, b, and c and solve for x.

$$x = \frac{-(-100) \pm \sqrt{(-100)^2 - 4(4)(264)}}{2(4)}$$

The two roots are $x = 22$ feet and $x = 3$ feet. Since $x = 22$ feet is not meaningful, the answer is $x = 3$ feet.

$$x = \frac{100 \pm \sqrt{5776}}{8} \text{ physically}$$

$$x = \frac{100 \pm 76}{8}$$

Step 5. Check the answer.

$$(30 - 2(3))(20 - 2(3)) = 336$$

$$x = 3, 22$$

The area of the reduced area pad is 264 square feet less than the area of the original pad.