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 = Length of Reduced Pad

20 - 2x = Width of Reduced Pad



Step 3.

Area of Reduced Pad = (Length of Reduced Pad)(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.

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