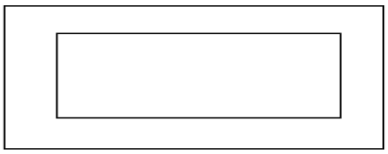
Word Problems
Quadratic Equations

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.

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

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

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

physically

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

Step 5.Check the answer.

$$x = 3, 22$$

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

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