

Lesson 4.4.1

Saturday, February 4, 2017 4:44 PM

To solve a quadratic equation we can use:

1. graphing calculator
2. factoring
3. completing the square
- (and today....) 4. the quadratic formula

When a quadratic equation, $ax^2 + bx + c = 0$, is solved by completing the square, a formula is generated that can be used to solve any quadratic equation.

Derivation of the formula:



Quadratic Formula:

The solution to $ax^2 + bx + c = 0$ is given by:

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

Grade 10 Refresher: Simplifying Radicals

Simplify by writing as a mixed radical:

a. $\sqrt{28}$

$= 2\sqrt{7}$

b. $\sqrt{54}$

$= 3\sqrt{6}$

c. $\sqrt{7700}$

$= 10\sqrt{77}$

Example 1: Solve each equation:

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

a. $x^2 - 6x + 7 = 0$

$a = 1$
 $b = -6$
 $c = 7$

$$x = \frac{-(-6) \pm \sqrt{(-6)^2 - 4(1)(7)}}{2(1)}$$

$$= \frac{6 \pm \sqrt{36 - 28}}{2}$$

$$= \frac{6 \pm \sqrt{8}}{2} = \frac{6 \pm 2\sqrt{2}}{2} = 3 \pm \sqrt{2}$$

b. $x^2 - 5x + 7 = 0$

$a = 1$
 $b = -5$
 $c = 7$

$$x = \frac{-(-5) \pm \sqrt{(-5)^2 - 4(1)(7)}}{2(1)}$$

$$= \frac{5 \pm \sqrt{25 - 28}}{2}$$

$$= \frac{5 \pm \sqrt{-3}}{2}$$

No soln
(no real roots)

Example 2: Solve each equation:

a. $2x = 3(x-1)(x+1)$

$2x = (3x-3)(x+1)$

$2x = 3x^2 - 3$

$0 = 3x^2 - 2x - 3$

$a = 3$
 $b = -2$
 $c = -3$

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

$$= \frac{2 \pm \sqrt{40}}{6} = \frac{2 \pm 2\sqrt{10}}{6} = \frac{1 \pm \sqrt{10}}{3}$$

b. $6x\left(\frac{2}{3}x^2 + 1\right) = \left(\frac{5}{6}x\right)^2$

$4x^2 + 6 = 5x$

$4x^2 - 5x + 6 = 0$

$$x = \frac{-(-5) \pm \sqrt{(-5)^2 - 4(4)(6)}}{2(4)}$$

$$x = \frac{5 \pm \sqrt{-71}}{8}$$

No soln
(no real roots)



$$SA = 2\pi r h + 2\pi r^2$$

Example 3: The surface area of a cylinder is 250 cm^2 . The height of the cylinder is 7 cm.
What is the radius of the cylinder to the nearest hundredth of a centimetre?

$$250 = 2\pi r(7) + 2\pi r^2$$

$$250 = 2\pi r^2 + 14\pi r$$

$$0 = 2\pi r^2 + 14\pi r - 250$$

$$\begin{aligned} a &= 2\pi \\ b &= 14\pi \\ c &= -250 \end{aligned}$$

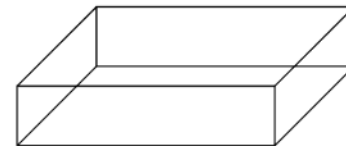
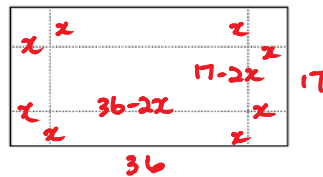
$$r = \frac{-14\pi \pm \sqrt{8217.62\pi\pi}}{4\pi}$$

$$= 3.71 \text{ or } \frac{-10.11}{\text{reject}}$$

Radius of cylinder is 3.71 cm

Example 4: A piece of cardboard 36 cm long and 17 cm wide is used to make a box by cutting squares from each corner, then folding up the sides. (Creating an open-top box)
The base of the box has an area of 330 cm^2

Let x be the length of square cut off corners



- a. What equation represents the surface area of the base of the box?

$$A = l \cdot w$$

$$A = (36-2x)(17-2x)$$

- b. What is the side length, x , of the square cut from each corner?

$$330 = (36-2x)(17-2x)$$

$$0 = 4x^2 - 106x + 282$$

$$x = \frac{106 \pm \sqrt{106^2 - 4(4)(282)}}{2(4)} = \frac{106 \pm \sqrt{6724}}{8}$$

- c. What are the dimensions of the box?

$$\begin{aligned} \text{Length} &= 36 - 2(3) = 30 \\ \text{width} &= 17 - 2(3) = 11 \\ \text{height} &= 3 \end{aligned}$$

Assignment: pg. 254 # 3, 4, 7 (ace), 9, 12, 13, 17, 21

only

30 cm by 11 cm by 3 cm

$x = 23.5$ or 3
reject cannot cut off 23.5 cm from 17 cm

$$x = 3$$