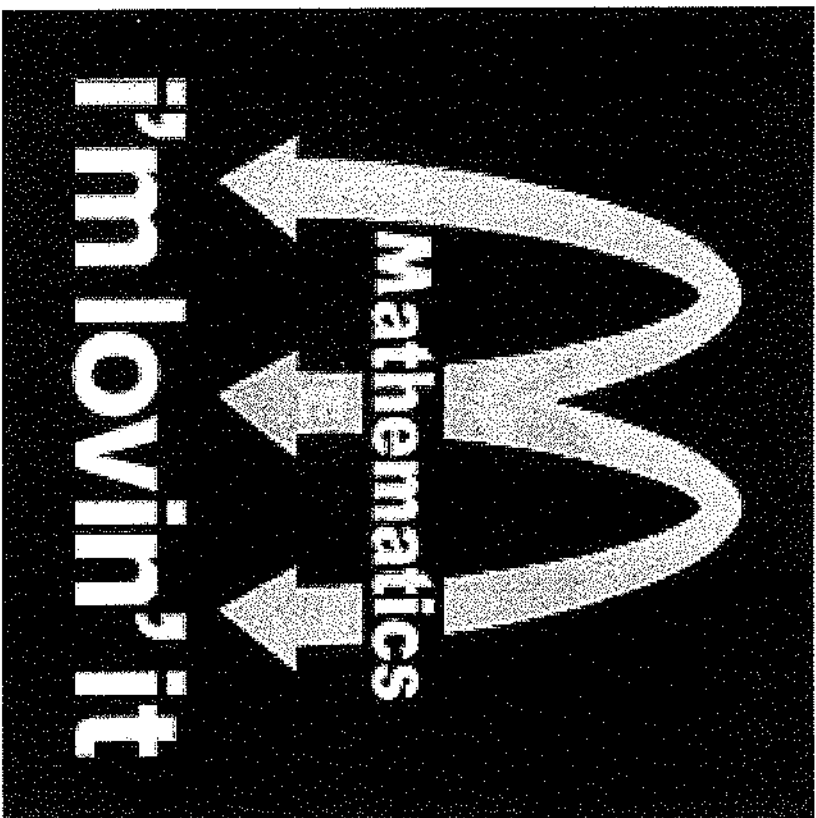


Notes

Solving Quadratics Using Square Roots



ex: What value(s) of x make the equations true?

a) $x^2 = 81$

$x = 9, -9$

$(9)^2 = 81$

$(-9)^2 = 81$

Every Quadratic
Equation has
2 Solutions

b) $(x+1)^2 = 4$

$x = 1, -3$

$(2)^2 = 4$

$(-2)^2 = 4$

c) $x^2 = -81$

No Real # Solution

but ... there's more to learn.

Solving Quadratics Using Square Roots

(SP)

*Use square roots when...

① Standard form

$$ax^2 + bx + c = 0$$



$$b = 0$$

NO Middle term!

$$\text{EX. } 7x^2 + 5 = 0$$

② Vertex form

$$a(x-h)^2 + k = 0$$

$$\text{EX. } 7(x-15)^2 - 21 = 0$$

ex: Solve using square roots.

↳ 2 solutions

$$a) 2x^2 - 3 = 29$$

$$-29 - 29$$

$$2x^2 - 32 = 0$$

Standard form

w/ no middle term

middle $b = 0$

Use square root method

$$2x^2 = \frac{32}{2}$$

$$x^2 = 16$$

$$x^2 = 16$$

$$\sqrt{x^2} = \sqrt{16}$$

$$|x| = 4$$

$$x = \pm 4$$

① Isolate

$$x^2 \text{ or } (x-h)^2$$

② Take the

square root

of both sides.

$$\sqrt{x^2} = |x|$$

③ Solve for x .

$$\text{or } x = -4, 4$$

ex: Solve using square roots.

$$b) 5 - 7x^2 = 89$$

~~-5~~ -5

Standard form, $b=0$ term
no middle term
use square roots

$$\frac{-7x^2 = 84}{-7} \quad \frac{-7}{-7}$$

$$x^2 = -12$$

$$\sqrt{x^2} = \sqrt{-12}$$

$$|x| = 2i\sqrt{3}$$

$$x = \pm 2i\sqrt{3}$$

Isolate

$$\begin{array}{r} 7 \overline{) 84} \\ \underline{7} \\ 14 \\ \underline{14} \\ 0 \end{array}$$

$$\sqrt{-12}$$

$$\sqrt{-1 \cdot 12}$$

$$= \sqrt{-1} \cdot \sqrt{12}$$

$$= i \cdot 2\sqrt{3}$$

$$2i\sqrt{3}$$

$$\begin{array}{r} 3 \overline{) 12} \\ \underline{6} \\ 6 \\ \underline{6} \\ 0 \end{array}$$

ex: Solve using square roots.

$$c) x^2 - 200 = 0$$

Standard
form, middle
no term, SR
use

$$x^2 = 200$$

$$\sqrt{x^2} = \sqrt{200}$$

$$|x| = 10\sqrt{2}$$

$$x = \pm 10\sqrt{2}$$

$$2 \sqrt{\frac{200}{100}} \\ \frac{10}{10}$$

ex: Solve using square roots.

$$d) 4(x+1)^2 = 60$$

$$\frac{\quad}{4} = \frac{\quad}{4}$$

vertex form,
use SR

①

Isolate

$$x^2 \text{ or } (x-h)^2$$

$$(x+1)^2 = 15$$

$$\sqrt{(x+1)^2} = \sqrt{15} \quad 3\sqrt{5}$$

$$|x+1| = \sqrt{15}$$

$$\cancel{x+1} = \pm \sqrt{15}$$

\downarrow
-1

means:

$$x = -1 + \sqrt{15}$$

$$x = -1 - \sqrt{15}$$

$$x = -1 \pm \sqrt{15}$$

ex: Solve using square roots.

$$e) 42 = \cancel{2} - (x-2)^2$$

Vertex form
use SR

$$\cancel{-2} \quad \cancel{-2}$$

$$40 = - (x-2)^2$$

$$\frac{\quad}{-1} \quad \frac{\quad}{-1}$$

$$-40 = (x-2)^2$$

$$(x-2)^2 = -40$$

$$\sqrt{(x-2)^2} = \sqrt{-40}$$

$$|x-2| = 2i\sqrt{10}$$

$$x - \cancel{2} = \pm 2i\sqrt{10}$$

\uparrow
 $+2$

$$\sqrt{-40}$$

$$\sqrt{-1} \cdot \sqrt{40}$$

$$i \cdot 2\sqrt{2 \cdot 5}$$

$$2i\sqrt{10}$$

$$\begin{array}{r} 2 \overline{)40} \\ \underline{20} \\ 20 \\ \underline{20} \\ 0 \end{array}$$

$$\begin{array}{r} 2 \overline{)20} \\ \underline{20} \\ 0 \end{array}$$

$$\begin{array}{r} 2 \overline{)10} \\ \underline{20} \\ 0 \end{array}$$

$$\boxed{x = 2 \pm 2i\sqrt{10}}$$

ex: Solve using square roots.

f) $(x + 6)^2 + 5 = -20$ vertex form
use SP

$$-5 \quad -5$$

$$(x + 6)^2 = -25$$

$$\sqrt{(x + 6)^2} = \sqrt{-25}$$

$$\sqrt{-25}$$

$$= \sqrt{-1 \cdot 25}$$

$$|x + 6| = 5i$$

$$= \sqrt{-1} \cdot \sqrt{25}$$

$$= i \cdot 5$$

$$= 5i$$

$$x + 6 = \pm 5i$$

$$x = -6 \pm 5i$$

$$\begin{aligned} \rightarrow x &= -6 + 5i \\ \rightarrow x &= -6 - 5i \end{aligned}$$