Solving Quadratics: Square Root Method

Warm up: Simplify the following:

1. $\sqrt{18}$

$\sqrt{3}\,\sqrt{9}$

$3\sqrt{3}$

2. $\sqrt{2} * \sqrt{10}$

$\sqrt{20}$

$\sqrt{4}\cdot\sqrt{5} = 2\sqrt{5}$

3. $\sqrt{45}$

$\sqrt{9}\cdot\sqrt{5}$

$3\sqrt{5}$

4. $\sqrt{5} * \sqrt{20}$

$\sqrt{100}$

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The Square Root method

Can only be used when there is no "b" term (only an x^2 and constant).

Looks like:

$y = 2x^2 + 90$ or $y = (x+2)^2 - 25$

We CANNOT solve by taking square roots when the problem looks like this:

$x^2 - x + 15 = 4$

Follow these steps to solve:

Step 1 – ~~Move~~ isolate the perfect square (x^2)

Step 2 – take square root of both sides (+, −)

Step 3 – simplify radical & isolate x.

* Notes: Keep answers in simplified radical form

If get a negative underneath square root → answer is $\boxed{\text{no real solution}}$ Ex: $x = \sqrt{-2}$

Example 2: Solve each quadratic equation by using square roots.

a.) $3x^2 = 75$	b.) $24x^2 - 6 = 0$	c.) $6 - 4x^2 = -18$	d.) $8x^2 - 10 = 214$	e.) $2x^2 + 16 = 0$
$\frac{3x^2}{3} = \frac{75}{3}$	$\frac{24x^2}{24} = \frac{6}{24}$	$-4x^2 = -24$	$8x^2 = 224$	$2x^2 = -16$
$\sqrt{x^2} = \sqrt{25}$	$\sqrt{x^2} = \sqrt{\frac{1}{4}}$	$\sqrt{x^2} = \sqrt{6}$	$\sqrt{x^2} = \sqrt{28}$	$\sqrt{x^2} = \sqrt{-8}$
$\boxed{x = \pm 5}$	$\boxed{x = \pm\frac{1}{2}}$	$x = \pm\sqrt{6}$	$\boxed{x = \pm 2\sqrt{7}}$	No solution

f.) ~~$(2x+4)^2 - 24 = 0$~~

$(x+4)^2 - 16 = 0$

$\sqrt{(x+4)^2} = \sqrt{16}$

$x + 4 = \pm\sqrt{16}$

$x = -4 \pm \sqrt{16}$

$x = -4 \pm 4$

$\boxed{x = 0 \quad x = -8}$

g.) $2(x-2)^2 - 24 = 0$

$2(x-2)^2 - 24 = 0$

$+24 \quad +24$

$\frac{2(x-2)^2}{2} = \frac{24}{2}$

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

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

$+2 \quad +2$

$x = 2 \pm \sqrt{12}$

simplify

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

Elementary Algebra Skill

Solving Quadratic Equations: Square Root Law 017DS

Solve each equation by taking square roots.

1) $\sqrt{r^2} = \sqrt{96} = \sqrt{16} \cdot \sqrt{6}$

$\boxed{r = \pm 4\sqrt{6}}$

2) $x^2 = 7$

3) $\sqrt{x^2} = \sqrt{29}$

$\boxed{x = \pm\sqrt{29}}$

4) $r^2 = 78$

5) $\sqrt{b^2} = \sqrt{34}$

$\boxed{b = \pm\sqrt{34}}$

6) $x^2 = 0$

7) $a^2 + 1 = 2$

$\sqrt{a^2} = \sqrt{1}$

$\boxed{a = \pm 1}$

8) $n^2 - 4 = 77$

9) $m^2 + 7 = 6$

$\sqrt{m^2} = \sqrt{-1}$ $\boxed{\text{no sol.}}$

10) $x^2 - 1 = 80$

11) $4x^2 - 6 = 74$

$4x^2 = 80$

$\sqrt{x^2} = \sqrt{20}$ $\boxed{x = \pm 2\sqrt{5}}$

12) $3m^2 + 7 = 301$

13) $7x^2 - 6 = 57$

$7x^2 = 63$

$\sqrt{x^2} = \sqrt{9}$ $\boxed{x = \pm 3}$

14) $10x^2 + 9 = 499$

15) $\sqrt{(p-4)^2} = \sqrt{16}$

$p - 4 = \pm 4$ $\boxed{p = 8, 0}$

$p = 4 \pm 4$

16) $(2k-1)^2 = 9$

17) $(6x+2)^2 + 4 = 28$

$\sqrt{(6x+2)^2} = \sqrt{24}$

$6x + 2 = \pm\sqrt{24}$

$6x = -2 \pm \sqrt{24}$

$x = \frac{-2 \pm \sqrt{24}}{6}$

18) $10(x-7)^2 = 440$

$x = \frac{-\cancel{2}^{1} \pm \cancel{2}^{1}\sqrt{6}}{\cancel{6}\,3}$

$x = \frac{-1 \pm \sqrt{6}}{3}$

19) $9(2m-3)^2 + 8 = 449$

$\frac{9(2m-3)^2}{9} = \frac{441}{9}$

$\sqrt{(2m-3)^2} = \sqrt{49}$

$2m - 3 = \pm 7$

$\frac{2m}{2} = \frac{3 \pm 7}{2}$

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$m = \frac{3+7}{2}$ $m = \frac{3-7}{2}$

$\boxed{m = 5, -2}$

20) $4(6x-1)^2 - 5 = 223$