Algebra 2

3.5 Solving Quadratics by Square Roots

Simplifying Radicals

Product Property of Radicals

$$\sqrt{a \cdot b} = \sqrt{a} \cdot \sqrt{b}$$

$$\sqrt{48} = \sqrt{16} \cdot \sqrt{3} = 4\sqrt{3}$$

$16 \cdot 3$

Quotient Property of Radicals

$$\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$$

$$\sqrt{\frac{2}{25}} = \frac{\sqrt{2}}{\sqrt{25}} = \frac{\sqrt{2}}{5}$$

Examples

1) $\sqrt{\frac{9}{64}} = \frac{\sqrt{9}}{\sqrt{64}} = \boxed{\frac{3}{8}}$

2) $\sqrt{\frac{15}{4}} = \frac{\sqrt{15}}{\sqrt{4}} = \boxed{\frac{\sqrt{15}}{2}}$

3) $\sqrt{\frac{-36}{49}} = \frac{\sqrt{-36}}{\sqrt{49}} = \boxed{\frac{6i}{7}}$

4) $\sqrt{50}$ $\quad 25 \cdot 2$ $= \sqrt{25} \cdot \sqrt{2} = 5\sqrt{2}$ $\quad 5$

5) $\sqrt{368}$ $\quad 16 \cdot 23$ $= \sqrt{16} \cdot \sqrt{23} = 4\sqrt{23}$ $\quad 4$

$\sqrt{368} = 2\sqrt{92}$
$\sqrt{4} \cdot \sqrt{92} \quad \sqrt{4}\sqrt{23}$
$2 \cdot 2\sqrt{23}$
$4\sqrt{23}$

6) $\sqrt{-80} = i\sqrt{80}$
$\sqrt{4} \cdot 20$
$2i\sqrt{20}$
$\sqrt{4} \cdot 5$
$2 \cdot 2i\sqrt{5}$
$4i\sqrt{5}$

$i\sqrt{80}$
$16 \cdot 5$
$4i\sqrt{5}$

7) $\sqrt{126}$ $\quad 14 \cdot 9$ $= \sqrt{9}\sqrt{14} = 3\sqrt{14}$ $\quad 3$

Try this:

Simplify

1) $\sqrt{75}$

$25 \cdot 3$

$\sqrt{25} \cdot \sqrt{3}$

$5\sqrt{3}$

2) $\sqrt{\frac{-11}{144}}$

$\frac{i\sqrt{11}}{\sqrt{144}}$

$\frac{i\sqrt{11}}{12}$

Solving Quadratic Equations by Square Roots

ax^2+bx+c use when there is no x term

ax^2+c $\quad x^2-6=0$

ex 1) $3x^2+5=41$

$-5 \quad -5$

$\frac{3x^2}{3}=\frac{36}{3}$

$\sqrt{x^2}=\sqrt{12}$ (4·3)

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

★ Note sqrt both sides of the = sign means ±

2) $2x^2-15=-65$

$+15 \quad +15$

$\frac{2x^2}{2}=\frac{-50}{2}$

$\sqrt{x^2}=\sqrt{-25}$

$x=\pm 5i$

3) $\frac{1}{5}(z+3)^2=7.5$ (5·)

$\sqrt{(z+3)^2}=\sqrt{35}$

$z+3=\pm\sqrt{35}$

$-3 \quad -3$

$z=-3\pm\sqrt{35}$

4) $x^2+11=3$

$-11 \quad -11$

$\sqrt{x^2}=\sqrt{-8}$

$x=\pm\sqrt{-8}$

$x=\pm i\sqrt{8}$ (4·2)

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

Try this:

Find the solutions to the quadratic equations.

1) $\sqrt{x^2} = \sqrt{7}$

$x = \pm\sqrt{7}$

2) $\frac{1}{3}(x-4)^2 = 11$ ·3

·3

$\sqrt{(x-4)^2} = \sqrt{33}$

$x - 4 = \pm\sqrt{33}$

$+4 \quad +4$

$x = 4 \pm \sqrt{33}$

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Simplify each radical.

1) $\sqrt{28}$

2) $\sqrt{-192}$

3) $\sqrt{150}$

4) $\sqrt{-240}$

5) $\sqrt{\frac{5}{16}}$

6) $\sqrt{\frac{-35}{36}}$

7) $\sqrt{\frac{13}{28}}$

8) $\sqrt{\frac{-24}{9}}$

Solve the equations. Simplify radicals as much as possible if necessary.

9) $-16t^2 = 128$

10) $x^2 = -84$

11) $6z^2 = 150$

12) $4p^2 - 448 = 0$

13) $4(x - 1)^2 = 8$

14) $7(x - 4)^2 - 18 = 10$