

$$0 = x^2 - 7x + 12$$

$$0 = (x-3)(x-4)$$

$$x^2 + 4 = 8$$

$$\frac{-4 \pm \sqrt{16}}{2} = \frac{-4 \pm 4}{2}$$

$$x = \pm 2$$

$$\sqrt{(x+5)^2} = \sqrt{10}$$

$$x+5 = \pm \sqrt{10}$$

$$x+5 = \pm 3.162$$

Explain 2 Solving $a(x + b)^2 = c$ by Using Square Roots

Solving a quadratic equation may involve isolating the squared part of a quadratic expression on one side of the equation first.

Example 2 Solve the equation. Give the answer in radical form, and then use a calculator to approximate the solution to two decimal places, if necessary.

$$\begin{array}{r} +3.162 \\ -5 \\ \hline -1.838 \end{array} \quad \begin{array}{r} -3.162 \\ -5 \\ \hline -8.162 \end{array}$$

(A) $(x + 5)^2 = 36$

$$(x + 5)^2 = 36$$

Original equation

$$x + 5 = \pm\sqrt{36}$$

Take the square root of both sides.

$$x + 5 = \pm 6$$

Simplify the square root.

$$x = \pm 6 - 5$$

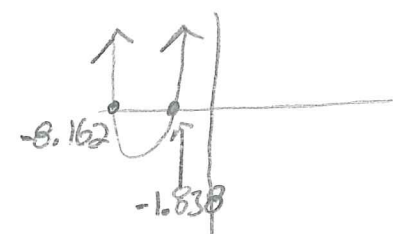
Subtract 5 from both sides.

$$x = -6 - 5 \quad \text{or} \quad x = 6 - 5$$

Solve for both cases.

$$x = -11 \quad x = 1$$

The solutions are $x = -11$ and $x = 1$.



(B) $3(x - 5)^2 = 18$

$$3(x - 5)^2 = 18$$

Original equation

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

Divide both sides by

$$x - 5 = \pm\sqrt{6}$$

Take the square roots of both sides.

$$x = \pm\sqrt{6} + 5$$

Add to both sides.

$$x = \sqrt{6} + 5 \quad \text{or} \quad x = -\sqrt{6} + 5$$

Solve for both cases.

Approx.

$$x \approx 7.45 \quad \text{or} \quad x \approx 2.55$$

The approximate solutions are $x \approx 7.45$ and $x \approx 2.55$.

Reflect

6. Find the solution(s), if any, of $\frac{2(x - 3)^2}{2} = -32$. Explain your reasoning.

$(x-3)^2 = -16$
NO SOLUTION!

6. $6x^2 - 21 = 33$

7. $6 - \frac{1}{3}x^2 = -20$

8. $5 - 2x^2 = -3$

9. $7x^2 + 10 = 18$

pg 1040

Solve each equation. Give the answer in radical form, and then use a calculator to approximate the solution to two decimal places, if necessary.

10. $5(x-9)^2 = 15$ Do not +9 to 15
 No Dist. Property
 $\sqrt{(x-9)^2} = \sqrt{3}$
 $x-9 = \pm 1.732 + 9$
 $x = 10.73$
 7.27

12. $\frac{3(x+1)^2}{3} = \frac{27}{3}$

$\sqrt{(x+1)^2} = \sqrt{9}$
 $x+1 = \pm 3 - 1$
 $x \rightarrow +3-1 \rightarrow 2$
 $x \rightarrow -3-1 \rightarrow -4$

14. $(x-12)^2 = 54$

$x-12 = \pm \sqrt{54}$
 $x-12 = \pm \sqrt{9} \sqrt{6}$
 $x-12 = \pm 3\sqrt{6} + 12$
 $x = 12 + 3\sqrt{6}$
 $12 - 3\sqrt{6}$

11. $\sqrt{(x+15)^2} = \sqrt{81}$
 $x+15 = \pm 9 - 15$
 $x \rightarrow +9-15 \rightarrow -6$
 $x \rightarrow -9-15 \rightarrow -24$

Calc
 $(x+15)^2 - 81 = 0$

13. $\frac{2}{3}(x-40)^2 = 24$ If you want to use the calc.
 $-24 = -24$

$\frac{2}{3}(x-40)^2 - 24 = 0$

15. $(x+54)^2 = 1.75$

~~$\frac{2}{3}(x-40)^2 = \frac{24}{3}$~~
 $\frac{24}{3} \cdot \frac{3}{2} = 36$
 $\sqrt{(x-40)^2} = \sqrt{36}$

$x-40 = \pm 6 + 40$
 $x = 46$
 $x = 34$

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