

Solving Quadratic Equations with Square Roots

Solve each equation by taking square roots.

1) $k^2 = 76$

$$\begin{aligned}\sqrt{k^2} &= \sqrt{76} \\ k &= \pm \sqrt{76} \\ k &= \pm 2\sqrt{19}\end{aligned}$$

$$\begin{aligned}k &= 2\sqrt{19} \\ k &= -2\sqrt{19}\end{aligned}$$

2) $k^2 = 16$

$$\begin{aligned}k^2 &= 16 \\ \sqrt{k^2} &= \sqrt{16} \\ k &= \pm 4\end{aligned}$$

$$\begin{aligned}k &= 4 \\ k &= -4\end{aligned}$$

3) $x^2 = 21$

$$\begin{aligned}\sqrt{x^2} &= \sqrt{21} \\ x &= \pm \sqrt{21}\end{aligned}$$

$$\begin{aligned}x &= \sqrt{21} \\ x &= -\sqrt{21}\end{aligned}$$

4) $a^2 = 4$

$$\begin{aligned}\sqrt{a^2} &= \sqrt{4} \\ a &= \pm 2\end{aligned}$$

$$\begin{aligned}a &= 2 \\ a &= -2\end{aligned}$$

5) $x^2 + 8 = 28$

$$\begin{aligned}-8 \quad -8 \\ \hline \sqrt{x^2 + 20} \\ x &= \pm 2\sqrt{5}\end{aligned}$$

$$\begin{aligned}x &= 2\sqrt{5} \\ x &= -2\sqrt{5}\end{aligned}$$

6) $2n^2 = -144$

No solution

7) $-6m^2 = -414$

$$\begin{aligned}-6 \quad -6 \\ \hline m^2 = 69 \\ m &= \pm \sqrt{69}\end{aligned}$$

$$\begin{aligned}m &= \sqrt{69} \\ m &= -\sqrt{69}\end{aligned}$$

8) $7x^2 = -21$

No solution

9) $m^2 + 7 = 88$

$$\begin{aligned}-7 \quad -7 \\ \hline \sqrt{m^2 + 81} \\ m &= \pm 9\end{aligned}$$

$$\begin{aligned}m &= 9 \\ m &= -9\end{aligned}$$

10) $-5x^2 = -500$

$$\begin{aligned}-5 \quad -5 \\ \hline \sqrt{x^2 + 100} \\ x &= \pm 10\end{aligned}$$

$$\begin{aligned}x &= 10 \\ x &= -10\end{aligned}$$

11) $-7n^2 = -448$

$$\begin{aligned}-7 \quad -7 \\ \hline n^2 = 64 \\ n &= \pm 8\end{aligned}$$

$$\begin{aligned}n &= 8 \\ n &= -8\end{aligned}$$

12) $-2k^2 = -162$

$$\begin{aligned}-2 \quad -2 \\ \hline k^2 = 81 \\ k &= \pm 9\end{aligned}$$

$$\begin{aligned}k &= 9 \\ k &= -9\end{aligned}$$

13) $x^2 - 5 = 73$

$$\begin{aligned}+5 \quad +5 \\ \hline x^2 = 78 \\ x &= \pm \sqrt{78}\end{aligned}$$

$$\begin{aligned}x &= \sqrt{78} \\ x &= -\sqrt{78}\end{aligned}$$

14) $16n^2 = 49$

$$\begin{aligned}\frac{16}{16} \quad \frac{16}{16} \\ \hline \sqrt{n^2 + \frac{49}{16}} \\ n &= \pm \frac{7}{4}\end{aligned}$$

$$\begin{aligned}n &= \frac{7}{4} \\ n &= -\frac{7}{4}\end{aligned}$$

$$15) \ n^2 - 5 = -4$$

$$\begin{array}{r} +5 \ +5 \\ \hline n^2 = 1 \\ n = \pm 1 \end{array}$$

$$\begin{array}{l} n = 1 \\ n = -1 \end{array}$$

$$16) \ n^2 + 8 = 80$$

$$\begin{array}{r} -8 \ -8 \\ \hline n^2 = 72 \\ n = \pm 6\sqrt{2} \end{array}$$

$$\begin{array}{l} n = 6\sqrt{2} \\ n = -6\sqrt{2} \end{array}$$

$$17) \ 7v^2 + 1 = 29$$

$$\begin{array}{r} -1 \ -1 \\ \hline 7v^2 = 28 \\ \frac{7v^2}{7} = \frac{28}{7} \\ v^2 = 4 \\ v = \pm 2 \end{array}$$

$$\begin{array}{l} v = 2 \\ v = -2 \end{array}$$

$$18) \ 10n^2 + 2 = 292$$

$$\begin{array}{r} -2 \ -2 \\ \hline 10n^2 = 290 \\ \frac{10n^2}{10} = \frac{290}{10} \\ n^2 = 29 \\ n = \pm \sqrt{29} \end{array}$$

$$\begin{array}{l} n = \sqrt{29} \\ n = -\sqrt{29} \end{array}$$

$$19) \ 2m^2 + 10 = 210$$

$$\begin{array}{r} -10 \ -10 \\ \hline 2m^2 = 200 \\ \frac{2m^2}{2} = \frac{200}{2} \\ m^2 = 100 \\ m = \pm 10 \end{array}$$

$$\begin{array}{l} m = 10 \\ m = -10 \end{array}$$

$$20) \ 9n^2 + 10 = 91$$

$$\begin{array}{r} -10 \ -10 \\ \hline 9n^2 = 81 \\ \frac{9n^2}{9} = \frac{81}{9} \\ n^2 = 9 \\ n = \pm 3 \end{array}$$

$$\begin{array}{l} n = 3 \\ n = -3 \end{array}$$

$$21) \ 5n^2 - 7 = 488$$

$$\begin{array}{r} +7 \ +7 \\ \hline 5n^2 = 495 \\ \frac{5n^2}{5} = \frac{495}{5} \\ n^2 = 99 \\ n = \pm 3\sqrt{11} \end{array}$$

$$\begin{array}{l} n = 3\sqrt{11} \\ n = -3\sqrt{11} \end{array}$$

$$22) \ 8n^2 - 6 = 306$$

$$\begin{array}{r} +6 \ +6 \\ \hline 8n^2 = 312 \\ \frac{8n^2}{8} = \frac{312}{8} \\ n^2 = 39 \\ n = \pm \sqrt{39} \end{array}$$

$$\begin{array}{l} n = \sqrt{39} \\ n = -\sqrt{39} \end{array}$$

$$23) \ 10n^2 - 10 = 470$$

$$\begin{array}{r} +10 \ +10 \\ \hline 10n^2 = 480 \\ \frac{10n^2}{10} = \frac{480}{10} \\ n^2 = 48 \\ n = \pm 4\sqrt{3} \end{array}$$

$$\begin{array}{l} n = 4\sqrt{3} \\ n = -4\sqrt{3} \end{array}$$

$$24) \ 8n^2 - 4 = 532$$

$$\begin{array}{r} +4 \ +4 \\ \hline 8n^2 = 536 \\ \frac{8n^2}{8} = \frac{536}{8} \\ n^2 = 67 \\ n = \pm \sqrt{67} \end{array}$$

$$\begin{array}{l} n = \sqrt{67} \\ n = -\sqrt{67} \end{array}$$

$$25) \ 4r^2 + 1 = 325$$

$$\begin{array}{r} -1 \ -1 \\ \hline 4r^2 = 324 \\ \frac{4r^2}{4} = \frac{324}{4} \\ r^2 = 81 \\ r = \pm 9 \end{array}$$

$$\begin{array}{l} r = 9 \\ r = -9 \end{array}$$

$$26) \ 8b^2 - 7 = 193$$

$$\begin{array}{r} +7 \ +7 \\ \hline 8b^2 = 200 \\ \frac{8b^2}{8} = \frac{200}{8} \\ b^2 = 25 \\ b = \pm 5 \end{array}$$

$$\begin{array}{l} b = 5 \\ b = -5 \end{array}$$

$$27) \ 2k^2 - 2 = 144$$

$$\begin{array}{r} +2 \ +2 \\ \hline 2k^2 = 146 \\ \frac{2k^2}{2} = \frac{146}{2} \\ k^2 = 73 \\ k = \pm \sqrt{73} \end{array}$$

$$\begin{array}{l} k = \sqrt{73} \\ k = -\sqrt{73} \end{array}$$

$$28) \ 3 - 4x^2 = -85$$

$$\begin{array}{r} -3 \ -3 \\ \hline -4x^2 = -88 \\ \frac{-4x^2}{-4} = \frac{-88}{-4} \\ x^2 = 22 \\ x = \pm \sqrt{22} \end{array}$$

$$\begin{array}{l} x = \sqrt{22} \\ x = -\sqrt{22} \end{array}$$