KEY

Solving Quadratic Equations with Square Roots (no x-term)

Exact Answers versus Rounded Answers: Consider the solution $x = \pm\sqrt{a}$

1. If a is a perfect square, take the square root and the solution is an exact integer.
2. If a is not a perfect square, leave in simplified radical form and the solution is exact.
3. If a is not a perfect square, take the square root and the solution is a rounded answer.

Pay attention to whether you are supposed to give exact answers (either integers or simplified radical form) or rounded answers.

Perfect Squares:
1, 4, 9, 16, 25, 36, 49, 64, 81, 100, ...

Examples: Solve and give both the exact answer and the rounded answer.

1. $x^2 = 49$

$\sqrt{x^2} = \pm\sqrt{49}$

$x = \pm 7$ exact

2. $x^2 = -121$

$\sqrt{x^2} = \pm\sqrt{-121}$

$x = \pm 11i$ No real answer

3. $x^2 = 169$

$\sqrt{x^2} = \pm\sqrt{169}$

$x = \pm 13$ exact

4. $x^2 = -16$

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

$x = \pm 4i$ No real answer

5. $x^2 = 300$

$\sqrt{x^2} = \pm\sqrt{300}$

$x = \pm\sqrt{300} = \pm\sqrt{3}\cdot\sqrt{100}$

$= \pm 10\sqrt{3}$ exact simplified radical form $\approx \pm 17.32$ rounded to nearest hundredth

6. $x^2 = 252$

$\sqrt{x^2} = \pm\sqrt{252}$

$x = \pm\sqrt{252} = \sqrt{4}\cdot\sqrt{9}\cdot\sqrt{7}$ (2, 3)

$= \pm 6\sqrt{7} \approx \pm 15.87$ exact simplified radical form, rounded

7. $\frac{-3x^2}{-3} = \frac{-24}{-3}$

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

$x = \pm\sqrt{8} = \sqrt{4}\cdot\sqrt{2}$

$\pm 2\sqrt{2}$ exact $\approx \pm 2.83$ rounded

8. $-\frac{1}{2}x^2 = (-36)(-2)$

$\frac{-\frac{1}{2}x^2}{-\frac{1}{2}} = \frac{72}{-\frac{1}{2}}$

$\sqrt{x^2} = \pm\sqrt{72}$

$x = \pm\sqrt{72} = \pm\sqrt{36}\cdot\sqrt{2}$

$\pm 6\sqrt{2} \approx \pm 8.49$ exact rounded

9. $3x^2 - 5 = 22$

$3x^2 = 27$

$x^2 = 9$

$x = \pm 3$ exact

10. $-5x^2 - 19 = 144$

$\frac{-5x^2}{-5} = \frac{163}{-5}$

$x^2 = \pm\sqrt{-\frac{163}{5}}$ No real solution

11. $3x^2 + 17 = 209$

$3x^2 = 192$

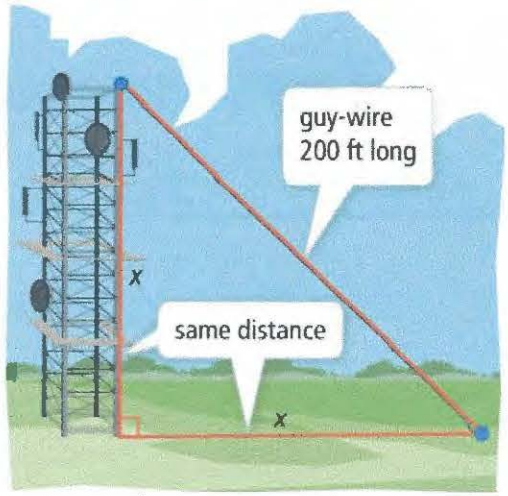
$\sqrt{x^2} = \pm\sqrt{64}$

$x = \pm 8$

exact

12.

A cell phone tower has a guy-wire for support as shown. The height of the tower and the distance from the tower to where the guy-wire is secured on the ground are the same distance. What is the height of the tower?



Pythagorean Thm

$a^2 + b^2 = c^2$

$x^2 + x^2 = 200^2$

$2x^2 = 40000$

$x^2 = 20000$

$x = \pm 141.4$ ft

negative doesn't make sense

Exact:

$\sqrt{x^2} = \pm\sqrt{20000}$

$x = \pm\sqrt{100} \cdot \sqrt{100} \cdot \sqrt{2}$

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

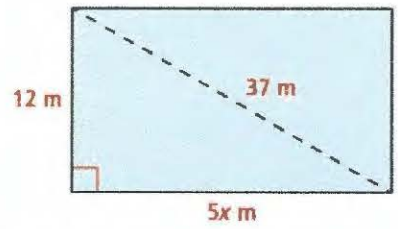
$x = \pm 100\sqrt{2}$ ← not meaningful in this context

141.4 ft

rounded

rounded is better.

13. Solve for x.



Pyth Thm:

$12^2 + (5x)^2 = 37^2$

$144 + 25x^2 = 1369$

$25x^2 = 1225$

$x^2 = 49$

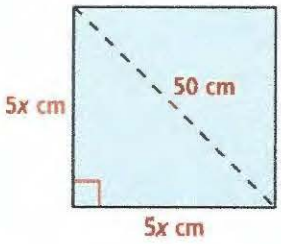
$x = \pm 7$

negative answer doesn't make sense

$x = 7$ cm

exact

14. Solve for x.



Pyth Thm:

$(5x)^2 + (5x)^2 = 50^2$

$25x^2 + 25x^2 = 2500$

$50x^2 = 2500$

$\sqrt{x^2} = \pm\sqrt{50}$

$x = \pm\sqrt{50} = \sqrt{25} \cdot \sqrt{2}$

$x = \pm 5\sqrt{2}$ or $x = \pm 7.1$

exact

$x = 5\sqrt{2}$ or $x = 7.1$ rounded

Better answer in this context

$x = 7.1$ cm