Root extraction is a method used when the $x$-term of a quadratic equation is missing, such as:

$$x^2 - 25 = 0$$

To solve this equation isolate the $x^2$-term by taking the constant to the other side.

So:

$$x^2 - 25 = 0$$

$$x^2 = 25$$

Now take the square root of both sides.

$$x = \pm \sqrt{25}$$

Simply the radical

$$x = \pm 5$$

So, the solutions are: 5 and -5

**Example 2:** Solve $-x^2 + 8 = 0$

$$-x^2 + 8 = 0$$

$$-x^2 = -8$$ Isolate the $x^2$-term.

$$x^2 = 8$$ Multiply both sides by -1.

$$x = \pm \sqrt{8}$$ Take the square root of both sides.

$$x = \pm 2\sqrt{2}$$ Simplify the radical.

**Example 3:** Solve $(x + 2)^2 - 12 = 0$

Again, isolate the squared expression by taking the constant to the other side.

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

Take the square root of both sides.

$$x + 2 = \pm \sqrt{12} \Rightarrow x + 2 = \pm 2\sqrt{3}$$

Isolate the $x$-term by taking the 2 to the other side.

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

The solutions are then: $-2 + 2\sqrt{3}$ and $-2 - 2\sqrt{3}$
PROBLEM SET

Solve the following

1. \(x^2 - 16 = 0\)
2. \(x^2 - 5 = 0\)
3. \(x^2 - 48 = 0\)
4. \(x^2 - 49 = 0\)
5. \(36 - x^2 = 0\)
6. \(7 - x^2 = 0\)
7. \(14 - x^2 = 0\)
8. \(64 - x^2 = 0\)
9. \((x - 1)^2 - 25 = 0\)
10. \(-12 + (x + 2)^2 = 0\)
11. \(15 - (x - 3)^2 = 0\)
12. \((x - 9)^2 - 9 = 0\)
13. \(-(x + 10)^2 + 81 = 0\)
14. \((x - 4)^2 - 32 = 0\)
15. \(-44 + (x + 5)^2 = 0\)
16. \((x + 7)^2 - 36 = 0\)
17. \(100 - (x + 3)^2 = 0\)
18. \(30 - (x + 9)^2 = 0\)
19. \(-(x - 8)^2 + 24 = 0\)
20. \((x + 5)^2 - 49 = 0\)

Answers:

1. \(\pm 4\)
2. \(\pm \sqrt{5}\)
3. \(\pm 4\sqrt{3}\)
4. \(\pm 7\)
5. \(\pm 6\)
6. \(\pm \sqrt{7}\)
7. \(\pm \sqrt{14}\)
8. \(\pm 8\)
9. \(-4, 6\)
10. \(-2 \pm 2\sqrt{3}\)
11. \(3 \pm \sqrt{15}\)
12. \(6, 12\)
13. \(-1, -19\)
14. \(4 \pm 4\sqrt{2}\)
15. \(-5 \pm 2\sqrt{11}\)
16. \(-13, -7\)
17. \(-9 \pm \sqrt{30}\)
18. \(-8 \pm 2\sqrt{6}\)
19. \(-12, 2\)
20. \(-13, 0\)
21. \(-12, 2\)

[MATH 80 SUPPLEMENTS: 8.3]

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