Square Roots and Cube Roots

Check the Root and Recover the Input

Name _____ **Date** _____ **Score** _____ / 10

QUICK REVIEW

Check a proposed root by reversing it: square a square-root candidate or cube a cube-root candidate. The equation $x^2 = 9$ has solutions -3 and 3, but $\sqrt{9} = 3$ only. No real square is negative; a real cube can be negative. Evaluate sums inside a radical before taking the root, since $\sqrt{a+b}$ need not equal $\sqrt{a}+\sqrt{b}$.

Worked example

Correct the solution $x = 9$ as the only answer to $x^2 = 81$.

1. The principal root is $\sqrt{81} = 9$, but the equation asks for all numbers whose square is 81, not just the nonnegative root.

2. Check both signs: $9^2 = 81$ and $(-9)^2 = 81$. Therefore $x = \pm 9$; the original answer omitted the negative solution.

Answer: $x = -9$ or $x = 9$.

Practice Problems

Show your thinking.

1. A student writes $\sqrt{100} = \pm 10$. Correct the principal-root value.

2. A student solves $x^2 = 49$ with only $x = 7$. Find the missing real solution.

3. Correct the claim $\sqrt[3]{-64} = 4$ by checking a signed product.

4. Find n if $\sqrt{n} = 14$.

5. Find n if $\sqrt[3]{n} = -9$.

6. Does $\sqrt{-36}$ have a real value? Compare with $\sqrt[3]{-216}$.

7. Correct $\sqrt{25+144} = 5+12 = 17$. Find the original expression exactly.

8. Compare $\sqrt{64}$ and $\sqrt[3]{512}$ exactly.

9. Find every real x satisfying $x^2 = 0.04$.

10. Choose the integer k for which $\sqrt[3]{k} = \sqrt{81}$.

Answer Key

1. $\sqrt{100} = 10$.
2. $x = -7$ is also a solution.
3. -4
4. $n = 196$.
5. $n = -729$.
6. No real square root; cube root -6.
7. 13.
8. Equal; both are 8.
9. $x = -0.2$ or $x = 0.2$.
10. $k = 729$.

Step-by-Step Solutions

Follow each calculation, then check your own work.

Problem 1

1. Both $10^2 = 100$ and $(-10)^2 = 100$ are true, but these calculations describe solutions of an equation $x^2 = 100$.

2. The principal square-root symbol specifies the nonnegative solution only. Thus $\sqrt{100} = 10$; the $\pm$ notation does not belong in this evaluation.

Problem 2

1. The stated solution works because $7^2 = 49$. Squaring a negative number also gives a positive result, so test the opposite sign.

2. Compute $(-7)^2 = (-7)(-7) = 49$. Therefore the complete real solution set is $\{-7, 7\}$, and the missing solution is -7.

Problem 3

1. Test the candidate -4 by multiplying 3 identical factors: $(-4) \cdot (-4) \cdot (-4) = -64$. This reproduces the given radicand exactly.

2. Cubing preserves the sign, so the real cube root of -64 is -4. Thus $\sqrt[3]{-64} = -4$, the unique real number with the verified cube.

Problem 4

1. The principal square root is stated as positive 14. Square both sides: $(\sqrt{n})^2 = 14^2$, so $n = 196$.

2. Check the reverse operation: $\sqrt{196} = 14$, since $14 \cdot 14 = 196$ and 14 is nonnegative. The radicand is therefore exactly 196.

Problem 5

1. Cube the stated root to recover the radicand: $n = (-9)^3 = (-9)(-9)(-9)$. The third negative factor determines the final sign.

2. The first two factors give 81; then $81(-9) = -729$. Checking $\sqrt[3]{-729} = -9$ confirms the negative radicand.

Problem 6

1. Every real square is nonnegative, so no real number has square -36. Thus $\sqrt{-36}$ has no real value in this worksheet.

2. For the cube root, $(-6)^3 = -216$. Odd powers can be negative, so $\sqrt[3]{-216} = -6$ is a valid real number.

Problem 7

1. Add inside the radical first: $25 + 144 = 169$. The expression is the square root of this single sum, not a sum of two roots.

2. Since $13^2 = 169$, $\sqrt{25 + 144} = \sqrt{169} = 13$. The proposed 17 would square to 289, not to the required 169.

Problem 8

1. The square-root candidate satisfies $8 \cdot 8 = 64$, so $\sqrt{64} = 8$. It is nonnegative as required for a principal square root.

2. The cube-root candidate satisfies $8 \cdot 8 \cdot 8 = 512$, so $\sqrt[3]{512} = 8$. Different indices and radicands can yield the same exact root.

Problem 9

1. The principal square root is 0.2 because $0.2 \cdot 0.2 = 0.04$. This determines the magnitude of either possible real solution.

2. Also $(-0.2)(-0.2) = 0.04$. Therefore both signs solve the equation: $x = \pm 0.2$; a negative sign is not excluded by the positive right side.

Problem 10

1. Evaluate the right side first: $\sqrt{81} = 9$, since $9^2 = 81$. The cube root on the left must therefore equal 9.

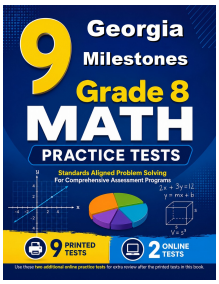
2. Cube to recover its radicand: $k = 9^3 = 729$. Checking $\sqrt[3]{729} = 9 = \sqrt{81}$ verifies the required equality.

TESTINAR

Keep Building Grade 8 Math Skills

Choose the practice book matched to your state assessment and turn worksheet practice into a complete test-prep plan.

All Grade 8 books



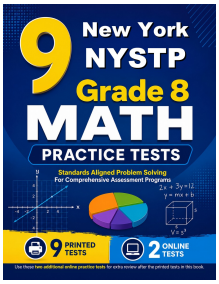
GEORGIA MILESTONES

9 Full-Length Math Practice Tests

Build Grade 8 accuracy, confidence, and test stamina with 9 printable practice tests.

Printable eBook • Instant PDF access

View eBook



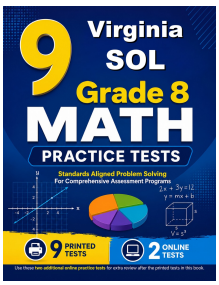
NEW YORK NYSTP

9 Full-Length Math Practice Tests

Build Grade 8 accuracy, confidence, and test stamina with 9 printable practice tests.

Printable eBook • Instant PDF access

View eBook



VIRGINIA SOL

9 Full-Length Math Practice Tests

Build Grade 8 accuracy, confidence, and test stamina with 9 printable practice tests.

Printable eBook • Instant PDF access

View eBook

Need a different state?
Testinar has Grade 8 math practice books for state assessments across the country.

TESTINAR.COM/GRADES/8