Introduction to Square Roots

Spot mistakes, reason, and work backward

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

QUICK REVIEW

$\sqrt{N}$ is the nonnegative number whose square is N. For example, $2^2 = 4$, so $\sqrt{4} = 2$, not -2. An equation such as $x^2 = 4$ can have two solutions. A side length is never negative.

Worked example

A square has area 121 cm^2. Find its side and perimeter.

1. $11 \times 11 = 121$, so the side is $\sqrt{121} = 11$ cm.
2. Four equal sides give $4(11) = 44$ cm.
3. Check area: $11^2 = 121$ cm^2.
Answer: Side 11 cm; perimeter 44 cm.

Practice Problems

Show your thinking.

1. A student claims $\sqrt{16} = 8$ because $16 \div 2 = 8$. Correct the claim.

2. A square has perimeter 20 cm. Find its side and area, then write the related square-root equation.

3. Test the claim $\sqrt{36} = -6$. Distinguish the principal square root from all solutions to $x^2 = 36$.

4. Find consecutive whole numbers that bound $\sqrt{51}$. Explain without a calculator.

5. Find N if $\sqrt{N} = 8$. Verify the result.

6. A square of area 81 m^2 is labeled as having side 81 m. Find the correct side length.

7. Signal record: a student says $\sqrt{144} = -12$. Correct the principal root and list both solutions of $x^2 = 144$.

8. Distance marker: between which consecutive whole numbers is $\sqrt{172}$? Use nearby perfect squares.

9. Balance check: recover N from $\sqrt{N} = 14$. Verify by multiplication.

10. Reference scale: evaluate $\sqrt{225}$ and its opposite.

Answer Key

1. $\sqrt{16} = 4$.
2. Side 5 cm; area 25 cm^2; $\sqrt{25} = 5$.
3. $\sqrt{36} = 6$; $x = 6$ or $x = -6$.
4. $7 < \sqrt{51} < 8$.
5. $N = 64$.
6. 9 m.
7. Principal root 12; equation solutions ± 12.
8. $13 < \sqrt{172} < 14$.
9. $N = 196$.
10. Root 15; opposite -15.

Step-by-Step Solutions

Follow each calculation, then check your own work.

Problem 1

1. Taking a square root is not halving.
2. $8^2 = 64$, so 8 is not the square root of 16.
3. The nonnegative number 4 has $4^2 = 16$, giving the correct root.

Problem 2

1. Four equal sides give $s = 20 \div 4 = 5$ cm.
2. The area is $5 \times 5 = 25$ cm^2.
3. Since the side is nonnegative, $\sqrt{25} = 5$ recovers its length in centimeters.

Problem 3

1. $6^2 = 36$ and $(-6)(-6) = 36$.
2. Both values solve $x^2 = 36$.
3. The square-root symbol itself selects the nonnegative value, 6.

Problem 4

1. $7^2 = 49$ is below 51.
2. $8^2 = 64$ is above 51.
3. $49 < 51 < 64$, so the nonnegative root lies between 7 and 8.

Problem 5

1. Squaring reverses the square root: $N = 8^2$.
2. $8 \times 8 = 64$.
3. As 8 is nonnegative, $\sqrt{64} = 8$ verifies the given equation.

Problem 6

1. A side of 81 m would give $81^2 = 6561$ m^2, not 81.
2. Use the nonnegative root: $9 \times 9 = 81$.
3. The side is 9 m. Side length uses meters; the area uses square meters.

Problem 7

1. $12 \times 12 = 144$.
2. The nonnegative root is $\sqrt{144} = 12$.
3. Its opposite is -12; both numbers square to 144.

Problem 8

1. Lower square $13^2 = 169$.
2. Upper square $14^2 = 196$.
3. $169 < 172 < 196$ gives the stated root bounds.

Problem 9

1. $14 \times 14 = 196$.
2. The nonnegative root is $\sqrt{196} = 14$.
3. Thus $N = 14^2 = 196$; check $\sqrt{196} = 14$.

Problem 10

1. $15 \times 15 = 225$.
2. The nonnegative root is $\sqrt{225} = 15$.
3. Its opposite is -15; both numbers square to 225.

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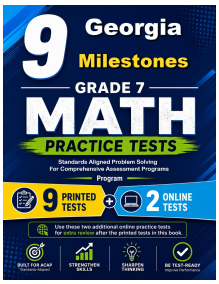

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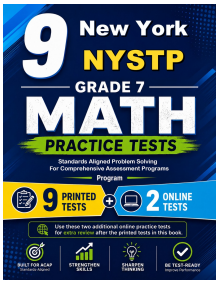

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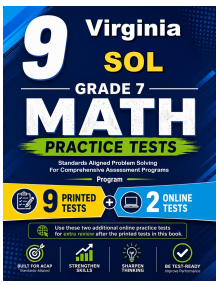

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