The Pythagorean Theorem

Investigate mistakes and missing measures

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

QUICK REVIEW

In a right triangle, $a^2 + b^2 = c^2$, where c is the hypotenuse opposite the right angle. For a missing leg, subtract: $a = \sqrt{c^2 - b^2}$. For a missing hypotenuse, add the leg squares. Use the positive root for a length. The converse tests whether three lengths form a right triangle; compare the longest-side square with the sum of the other squares.

Worked example

A right triangle has legs 5 and 7 units. Find its hypotenuse. Give an exact radical or integer; also round nonintegers to the nearest tenth.

1. The perpendicular legs are 5 units and 7 units, so $c^2 = 5^2 + 7^2$.
2. Evaluate the squares: $c^2 = 25 + 49 = 74$ square units. This is a squared length, not the side itself.
3. Take the positive root: $c = \sqrt{74} \approx 8.6$ units. It exceeds both legs; round only at the end.
Answer: $\sqrt{74} \approx 8.6$ units

Practice Problems

Show your thinking.

1. A student finds the hypotenuse for legs $5, 12$ as $5 + 12 = 17$. Correct the result.

2. A student uses $x^2 = 15^2 + 9^2$ to find a missing leg when 15 is the hypotenuse. Correct the equation and solve.

3. A student claims $9, 10, 14$ is a right-triangle set because $9 + 10 > 14$. Evaluate the right-angle claim.

4. Can $1.5, 2, 2.5$ be the side lengths of a right triangle? Justify numerically.

5. A right triangle has area 30 square units and one leg 5. Its other leg is therefore $2(30)/5 = 12$. Find its hypotenuse. Give an exact radical or integer; also round nonintegers to the nearest tenth.

6. A right triangle has hypotenuse $\sqrt{85}$ and leg 6. Find the other leg exactly.

7. A right triangle has equal legs x and hypotenuse 10. Find x exactly and to the nearest tenth.

8. For legs $2, 7$, a student gets $c = 53$. Explain the missing operation and correct to the nearest tenth.

9. Two right triangles have legs $3, 8$ and $5, 7$. Which has the longer hypotenuse? Compare without rounding.

10. A triangle has sides $8, 15, x$, and x is the hypotenuse. Find x and reject $x = 7$.

Answer Key

1. 13 units
2. 12 units
3. No; not a right triangle.
4. Yes; a right triangle.
5. 13 units
6. 7 units
7. $x = \sqrt{50} \approx 7.1$
8. $c = \sqrt{53} \approx 7.3$
9. The $5, 7$ triangle.
10. $x = 17$

Step-by-Step Solutions

Follow each calculation, then check your own work.

Problem 1

1. The correct equation is $c^2 = 5^2 + 12^2 = 25 + 144 = 169$, not $c = 5 + 12$.
2. Take the positive square root: $c = \sqrt{169} = 13$ units.
3. The check $13^2 = 169 = 25 + 144$ works; the proposed 17 has square 289, so it fails.

Problem 2

1. The leg equation is $x^2 + 9^2 = 15^2$, because the hypotenuse belongs alone on one side.
2. Subtract: $x^2 = 225 - 81 = 144$, so $x = 12$ units.
3. Checking gives $12^2 + 9^2 = 144 + 81 = 225 = 15^2$. Adding the squares would produce an impossible leg longer than 15.

Problem 3

1. The longest side is 14, so it is the only possible hypotenuse. Compute $9^2 + 10^2 = 81 + 100 = 181$.
2. The longest-side square is $14^2 = 196$. The two values are 181 and 196, which are unequal.
3. Thus $9^2 + 10^2 \neq 14^2$; the converse rules out a right triangle.

Problem 4

1. The longest side is 2.5, so it is the only possible hypotenuse. Compute $1.5^2 + 2^2 = 2.25 + 4 = 6.25$.
2. The longest-side square is $2.5^2 = 6.25$. The two values are 6.25 and 6.25, which are equal.
3. Thus $1.5^2 + 2^2 = 2.5^2$; the converse confirms a right triangle.

Problem 5

1. The perpendicular legs are 5 units and 12 units, so $c^2 = 5^2 + 12^2$.
2. Evaluate the squares: $c^2 = 25 + 144 = 169$ square units. This is a squared length, not the side itself.
3. Take the positive root: $c = \sqrt{169} \approx 13.0$ units. It exceeds both legs; round only at the end.

Problem 6

1. The missing leg satisfies $x^2 + 6^2 = (\sqrt{85})^2 = 85$.
2. Subtract 36: $x^2 = 85 - 36 = 49$, so the positive length is $x = 7$.
3. The check $6^2 + 7^2 = 36 + 49 = 85$ confirms the exact answer without approximating $\sqrt{85}$ first.

Problem 7

1. The two equal legs give $x^2 + x^2 = 10^2$, so $2x^2 = 100$.
2. Divide by 2: $x^2 = 50$, hence $x = \sqrt{50} \approx 7.1$ units.
3. Using the exact value checks $50 + 50 = 100$. Do not divide the hypotenuse by 2; the equality is between squares.

Problem 8

1. The square calculation is correct: $2^2 + 7^2 = 4 + 49 = 53$, but this equals c^2.
2. Take the square root to obtain $c = \sqrt{53} \approx 7.3$ units.
3. The proposed 53 would square to 2809, not 53. The correct length is only slightly greater than the leg 7.

Problem 9

1. The first hypotenuse square is $3^2 + 8^2 = 9 + 64 = 73$.
2. The second is $5^2 + 7^2 = 25 + 49 = 74$. Since $74 > 73$, $\sqrt{74} > \sqrt{73}$.
3. The $5, 7$ triangle has the longer hypotenuse. Comparing exact squared lengths avoids a misleading early rounding tie.

Problem 10

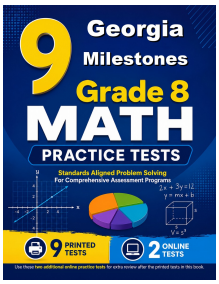
1. The hypotenuse equation gives $x^2 = 8^2 + 15^2 = 64 + 225 = 289$.
2. Thus $x = \sqrt{289} = 17$ units. The proposed 7 has square 49, not 289.
3. A hypotenuse must also exceed 15, so 7 fails both the equation and the longest-side check.

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



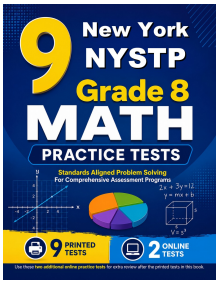
GEORGIA MILESTONES

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



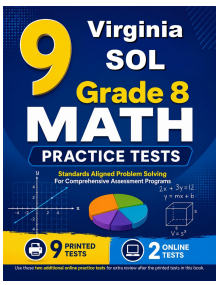
NEW YORK NYSTP

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