

Chapter 1 Pythagorean Theorem I The Meaning

Teacher Guide and Diagnostic Answer Key

Teacher Guide

Teacher Chapter-at-a-Glance

Square-grid paper is optional
Pacing
Talk Prompt

Mastery Decision Guide

A missed Tripwire does not automatically mean “redo the chapter.” Confirm the likely misconception, reteach the smallest prerequisite or representation that addresses it, and then use a fresh item before moving on.

Missed Tripwire #1 → The student stopped at the squared quantity instead of taking the square root. Next move: Label the last line $c^2=1681$, then ask what positive length squared gives 1681.

Diagram Production Notes — Chapter 1

Use the diagram master IDs:

Ch12-D01 — Parts of a Right Triangle

Ch12-D02 — 3-4-5 Triangle with Squares

Ch12-D03 — Hypotenuse Must Be Across Right Angle

Ch12-D04 — Squaring vs Doubling

Ch12-D05 — Square Root Table

Ch12-D06 — Finding the Hypotenuse

The right-angle marker must be clear. The hypotenuse label must sit across from the right angle, not near the legs. The square-area model should show the side squares clearly without label overlap. Use large labels for a , b , and c .

Confirmation and Fresh Recheck

Likely evidence: 1681 cm.

Possible interpretation: The student stopped at the squared quantity instead of taking the square root.

Confirm with: Ask the student to mark the right angle, circle the hypotenuse, and explain what c^2 means before taking a square root.

Targeted repair: Label the last line $c^2=1681$, then ask what positive length squared gives 1681.

Fresh recheck: Use a right triangle with legs 7 and 24; require $c = 25$, not $c^2 = 625$.

Ready to Learn Check

Quick check before starting. A wrong response below points to a prerequisite worth confirming before the chapter builds on it.

1. What is 8^2 ?

Correct answer: 64

Likely wrong answer: 16

Possible misconception: Squaring is being confused with doubling.

Next move: Expand 8^2 as 8×8 .

2. What is $\sqrt{81}$?

Correct answer: 9

Likely wrong answer: 81 or 40.5

Possible misconception: Square root is not being understood as the inverse of squaring.

Next move: Ask what number multiplied by itself gives 81.

3. In a right triangle, which side is opposite the right angle?

Correct answer: The hypotenuse.

Likely wrong answer: A leg or the longest-looking side by position

Possible misconception: The side opposite the right angle is not being identified.

Next move: Mark the right angle first, then trace directly across to the hypotenuse.

Ready-to-Learn item 1

Correct answer: 64

Likely wrong answer: 16

Misconception: Squaring is being confused with doubling.

Next move: Expand 8^2 as 8×8 .

Ready-to-Learn item 2

Correct answer: 9

Likely wrong answer: 81 or 40.5

Misconception: Square root is not being understood as the inverse of squaring.

Next move: Ask what number multiplied by itself gives 81.

Ready-to-Learn item 3

Correct answer: The hypotenuse.

Likely wrong answer: A leg or the longest-looking side by position

Misconception: The side opposite the right angle is not being identified.

Next move: Mark the right angle first, then trace directly across to the hypotenuse.

Practice

Assign the full set or select items for targeted review. Teacher solutions follow each question.

1. 4^2

Solution: 1. 16

2. 7^2

Solution: 2. 49

3. 10^2

Solution: 3. 100

4. 12^2

Solution: 4. 144

5. $\sqrt{25}$

Solution: 5. 5

6. $\sqrt{64}$

Solution: 6. 8

7. $\sqrt{121}$

Solution: 7. 11

8. $\sqrt{144}$ For each description, identify the hypotenuse.

Solution: 8. 12

9. A right triangle has a right angle between sides a and b. Which side is the hypotenuse?

Solution: 9. Side c is the hypotenuse.

10. A right triangle has side lengths 5 cm, 12 cm, and 13 cm. Which side is the hypotenuse?

Solution: 10. 13 cm is the hypotenuse because it is the longest side.

11. A right triangle has a side across from the right angle labelled x. Which side is the hypotenuse? Find the hypotenuse of each right triangle.

Solution: 11. Side x is the hypotenuse because it is across from the right angle.

12. legs 3 cm and 4 cm

Solution: 12. $3^2 + 4^2 = c^2$ $9 + 16 = c^2$ $25 = c^2$ $c = \sqrt{25}$ $c = 5$ The hypotenuse is 5 cm.

13. legs 5 m and 12 m

Solution: 13. $5^2 + 12^2 = c^2$ $25 + 144 = c^2$ $169 = c^2$ $c = \sqrt{169}$ $c = 13$ The hypotenuse is 13 m.

14. legs 8 cm and 15 cm

Solution: 14. $8^2 + 15^2 = c^2$ $64 + 225 = c^2$ $289 = c^2$ $c = \sqrt{289}$ $c = 17$ The hypotenuse is 17 cm.

15. legs 7 km and 24 km Use the longest side as c.

Solution: 15. $7^2 + 24^2 = c^2$ $49 + 576 = c^2$ $625 = c^2$ $c = \sqrt{625}$ $c = 25$ The hypotenuse is 25 km.

16. 3, 4, 5

Solution: 16. $3^2 + 4^2 = 9 + 16 = 25$ $5^2 = 25$ Since both sides match, it is a right triangle.

17. 5, 6, 7

Solution: 17. $5^2 + 6^2 = 25 + 36 = 61$ $7^2 = 49$ Since $61 \neq 49$, it is not a right triangle.

18. 6, 8, 10

Solution: 18. $6^2 + 8^2 = 36 + 64 = 100$ $10^2 = 100$ Since both sides match, it is a right triangle.

19. 7, 10, 12

Solution: 19. $7^2 + 10^2 = 49 + 100 = 149$ $12^2 = 144$ Since $149 \neq 144$, it is not a right triangle.

20. A student says $9^2 = 18$. Explain the mistake.

Solution: 20. 9^2 means 9×9 , not 9×2 . So $9^2 = 81$.

21. A student gets $c^2 = 64$ and writes $c = 64$. Explain the mistake.

Solution: 21. If $c^2 = 64$, then $c = \sqrt{64} = 8$. The student forgot the square root step.

22. A student uses the Pythagorean theorem on a triangle with no right angle marked. Explain why this is not safe.

Solution: 22. The Pythagorean theorem only works for right triangles. If no right angle is marked or stated, the theorem cannot be used safely.

Chapter Answer Key

Tripwire Check

The student is not correct.

The student found c^2 , not c .

$$9^2 + 40^2 = c^2$$

$$81 + 1600 = c^2$$

$$1681 = c^2$$

Now take the square root:

$$c = \sqrt{1681}$$

$$c = 41$$

The hypotenuse is:

41 cm

not:

1681 cm

Worksheet 1: Guided Practice

1.

a. 25

b. 36

c. 81

d. 100

2.

a. 5

b. 6

c. 9

d. 10

3.

a. legs

b. hypotenuse

c. longest

4.

$c = 10$

The hypotenuse is:

10 cm

Worksheet 2: Independent Practice

1.

a.

$$3^2 + 4^2 = 25$$

$c = 5$

5 cm

b.

$$6^2 + 8^2 = 100$$

$c = 10$

10 cm

c.

$$9^2 + 12^2 = 225$$

$$c = 15$$

15 m

d.

$$5^2 + 12^2 = 169$$

$$c = 13$$

13 km

e.

$$8^2 + 15^2 = 289$$

$$c = 17$$

17 cm

2.

a. right triangle

b. right triangle

c.

$$6^2 + 7^2 = 36 + 49 = 85$$

$$8^2 = 64$$

not a right triangle

d. right triangle

e.

$$9^2 + 12^2 = 81 + 144 = 225$$

$$14^2 = 196$$

not a right triangle

3.

a.

$$6^2 = 6 \times 6 = 36$$

b.

$$c = \sqrt{(49)} = 7$$

c. c must label the hypotenuse, the side across from the right angle.

Worksheet 3: Mixed Practice & Application

1.

a. The hypotenuse is missing.

b. You can use the Pythagorean theorem because the triangle is right-angled.

c.

$$10^2 + 24^2 = c^2$$

$$100 + 576 = c^2$$

$$676 = c^2$$

$$c = \sqrt{676}$$

$$c = 26$$

The missing side is:

26 m

2.

The student doubled 7 instead of squaring it.

$$7^2 = 7 \times 7 = 49$$

not:

14

3.

a. Use 15 as c, because it is the longest side.

b.

$$9^2 + 12^2 = 81 + 144 = 225$$

$$15^2 = 225$$

c. Since both sides match, the triangle is right-angled.

4.

The theorem only works for right triangles, not every triangle.

Use the longest side as c:

$$4^2 + 5^2 = 16 + 25 = 41$$

$$6^2 = 36$$

Since $41 \neq 36$, the triangle is not right-angled.

5.

The final answer is a side length, so it uses linear units.

Correct:

13 cm

Incorrect:

13 cm²

6.

The formula means that, in a right triangle, the square on one leg plus the square on the other leg equals the square on the hypotenuse.

Diagnostic Key — High-Leverage Items

Tripwire Check

Correct answer: No. $8^2 + 6^2 = 100$ gives $c^2=100$, so $c=\sqrt{100}=10$ cm.

Likely wrong answer: 100 cm.

Misconception: The student stopped at the squared quantity instead of taking the square root.

Next move: Label the last line $c^2=100$, then ask what positive length squared gives 100.

Tripwire Diagnostic

Correct answer: No. $9^2 + 40^2 = 1681$ gives $c^2=1681$, so $c=\sqrt{1681}=41$ cm.

Likely wrong answer: 1681 cm.

Misconception: The student stopped at the squared quantity instead of taking the square root.

Next move: Label the last line $c^2=1681$, then ask what positive length squared gives 1681.

Exit Ticket Diagnostic — High-Leverage Item

Correct answer: $c=15$.

Likely wrong answer: 225

Misconception: The student stopped at c^2 instead of taking the positive square root.

Next move: Ask: what positive number squared equals 225?

Variation Lab — Expected Ideas

1. 6-8-10 is right because $36+64=100$; 6-8-9 is not because $36+64\neq81$.

2. With legs 5 and 12, the hypotenuse is 13, so it is closer to 13 than 17.

3. From $c^2=169$, take the positive square root: $c=13$.

Transfer Check — Suggested Responses

Familiar: 15 cm. Altered: 25 m. Non-routine: the theorem requires a right angle. Repair: $c=\sqrt{100}=10$.

Exit Ticket — Answers

1. 13 cm

2. 15

3. The triangle must be right-angled.