Pythagoras: identify the sides and calculate lengths — Teacher answers

Year 8, lower volume • text pp. 13–18 • textbook lessons 7–9

Use the two prerequisite checks to choose support. Project the worked and guided tasks, then collect the eight paper core questions. Follow-ups and extensions are optional; accept other complete valid methods. This page does not save learners' paper answers.

Ordinary route: prerequisites 4, short inquiry 5, worked/guided 8, independent 15, correction 5, exit 3 minutes. Advanced route: inquiry 18, organise 4, selected practice 13, exit 5 minutes.

Prerequisites: Squares, roots, perpendicular lines and units of length.

Ordinary route: use the first fixed case for the five-minute demonstration. Advanced route: complete the full investigation.

1. 3′ Predict how the hypotenuse and its square change when both legs double. Name the hypotenuse first.
2. 8′ In the existing Pythagoras inquiry, record legs (3,4) then (6,8): c=5,10 and c^2=25,100. Next change only the first leg from 3 to 6 while the second stays 4; keep exact square relations separate from decimal readouts.
3. 5′ Explain the length factor 2 and square factor 4 using the theorem. Why does changing only one leg fail to produce the same scale factor?
4. 2′ Individually find the hypotenuse for legs 9 and 12, stating the right-angle condition and units.

Worked example 1

A right triangle has legs 5 cm and 12 cm. Find its hypotenuse.



Geometry diagram; not drawn to scale except for construction tasks.

Reference answer

13 cm.

$$13$$

1. The right angle is given; add the two leg squares to find the hypotenuse square.
2. The required square is $5^2 + 12^2$; take the positive square root.

- Use the stated conditions and justify the relation before calculating.
- Give an exact answer where possible, with units and any domain restrictions.

Guided attempt 2

A right triangle has hypotenuse 10 cm and one leg 6 cm. Find the other leg.

1. Let the missing leg be b: $b^2 + 6^2 = 10^2$.
2. $b^2 = 100 - 36 = \square$.
3. Positive length: $b = \sqrt{\square} = \square$ cm.

Reference answer

8 cm.

$$8$$

1. The hypotenuse is known; subtract the square of the known leg from its square.
2. The required square is $10^2 - 6^2$; take the positive square root.

- Use the stated conditions and justify the relation before calculating.
- Give an exact answer where possible, with units and any domain restrictions.

Prerequisite 3

Calculate $3^2 + 4^2$.

$$3^2 + 4^2$$

Reference answer

25

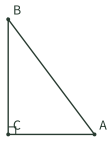
$$25$$

1. Square before adding: 9+16=25.

- Use the stated conditions and justify the relation before calculating.
- Give an exact answer where possible, with units and any domain restrictions.

Prerequisite 4

In the diagram, $\angle C$ is a right angle. Which side is the hypotenuse?



Geometry diagram; not drawn to scale except for construction tasks.

Reference answer

AB, the side opposite the right angle.

1. Locate C, then choose the side not touching C.

- Use the stated conditions and justify the relation before calculating.
- Give an exact answer where possible, with units and any domain restrictions.

Independent practice 5

A right triangle has legs 7 cm and 24 cm. Find its hypotenuse.



Geometry diagram; not drawn to scale except for construction tasks.

Reference answer

25 cm.

$$25$$

1. The right angle is given; add the two leg squares to find the hypotenuse square.
2. The required square is $7^2 + 24^2$; take the positive square root.

- Use the stated conditions and justify the relation before calculating.
- Give an exact answer where possible, with units and any domain restrictions.

Independent practice 6

A right triangle has hypotenuse 17 cm and one leg 8 cm. Find the other leg.

Reference answer

15 cm.

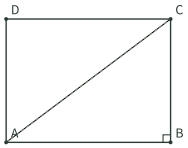
$$15$$

1. The hypotenuse is known; subtract the square of the known leg from its square.
2. The required square is $17^2 - 8^2$; take the positive square root.

- Use the stated conditions and justify the relation before calculating.
- Give an exact answer where possible, with units and any domain restrictions.

Independent practice 7

A rectangle has adjacent sides 6 cm and 8 cm. Find its diagonal, naming the right triangle used.



Geometry diagram; not drawn to scale except for construction tasks.

Reference answer

10 cm.

$$10$$

1. The right angle is given; add the two leg squares to find the hypotenuse square.
2. The required square is $6^2 + 8^2$; take the positive square root.

- Use the stated conditions and justify the relation before calculating.
- Give an exact answer where possible, with units and any domain restrictions.

Independent practice 8

A 13 m ladder leans against a vertical wall. Its foot is 5 m from the wall on level ground. Find the height reached.

Reference answer

12 m.

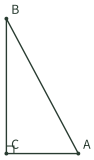
$$12$$

1. The hypotenuse is known; subtract the square of the known leg from its square.
2. The required square is $13^2 - 5^2$; take the positive square root.

- Use the stated conditions and justify the relation before calculating.
- Give an exact answer where possible, with units and any domain restrictions.

Exit question 9

A right triangle has legs 8 cm and 15 cm. Find its hypotenuse.



Geometry diagram; not drawn to scale except for construction tasks.

Reference answer

17 cm.

$$17$$

1. The right angle is given; add the two leg squares to find the hypotenuse square.
2. The required square is $8^2 + 15^2$; take the positive square root.

- Use the stated conditions and justify the relation before calculating.
- Give an exact answer where possible, with units and any domain restrictions.

Exit question 10

A right triangle has hypotenuse 25 cm and one leg 7 cm. Find the other leg.

Reference answer

24 cm.

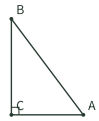
$$24$$

1. The hypotenuse is known; subtract the square of the known leg from its square.
2. The required square is $25^2 - 7^2$; take the positive square root.

- Use the stated conditions and justify the relation before calculating.
- Give an exact answer where possible, with units and any domain restrictions.

Further practice 11

A right triangle has legs 1.5 cm and 2 cm. Find its hypotenuse.



Geometry diagram; not drawn to scale except for construction tasks.

Reference answer

2.5 cm.

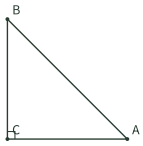
$$2.5$$

1. The right angle is given; add the two leg squares to find the hypotenuse square.
2. The required square is $1.5^2 + 2^2$; take the positive square root.

- Use the stated conditions and justify the relation before calculating.
- Give an exact answer where possible, with units and any domain restrictions.

Further practice 12

A square has side 5 cm. Find its diagonal exactly.



Geometry diagram; not drawn to scale except for construction tasks.

Reference answer

$5\sqrt{2}$ cm.

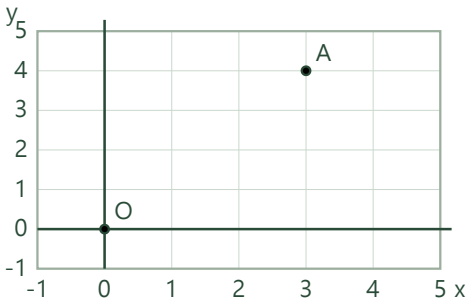
$$5\sqrt{2}$$

1. The right angle is given; add the two leg squares to find the hypotenuse square.
2. The required square is $5^2 + 5^2$; take the positive square root.

- Use the stated conditions and justify the relation before calculating.
- Give an exact answer where possible, with units and any domain restrictions.

Further practice 13

Find the distance from $(0, 0)$ to $(3, 4)$ by completing a right triangle.



Use the stated conditions and the labelled scales.

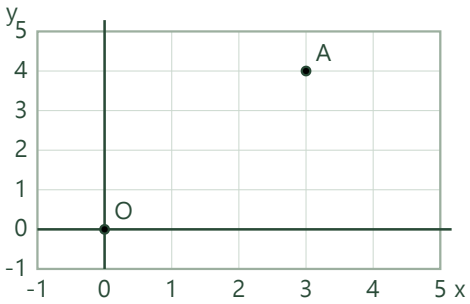
Reference answer

5 units.

$$5$$

1. The right angle is given; add the two leg squares to find the hypotenuse square.
2. The required square is $3^2 + 4^2$; take the positive square root.

- Use the stated conditions and justify the relation before calculating.
- Give an exact answer where possible, with units and any domain restrictions.



Use the stated conditions and the labelled scales.

Further practice 14

A right triangle has hypotenuse 29 cm and one leg 20 cm. Find the other leg.

Reference answer

21 cm.

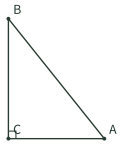
$$21$$

1. The hypotenuse is known; subtract the square of the known leg from its square.
2. The required square is $29^2 - 20^2$; take the positive square root.

- Use the stated conditions and justify the relation before calculating.
- Give an exact answer where possible, with units and any domain restrictions.

Extension 15

A right triangle has legs 4 cm and 5 cm. Find the exact hypotenuse and explain why 9 cm is impossible.



Geometry diagram; not drawn to scale except for construction tasks.

Reference answer

$\sqrt{41}$ cm.

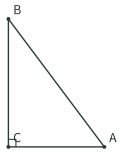
$$\sqrt{41}$$

1. The square is $4^2 + 5^2 = 41$, so the length is $\sqrt{41}$ cm.
2. The sum 9 is not the square-root calculation; equality with the two-leg sum would be degenerate.

- Use the stated conditions and justify the relation before calculating.
- Give an exact answer where possible, with units and any domain restrictions.

Extension 16

A right triangle with legs 3 cm and 4 cm is enlarged by scale factor 2. Find its new hypotenuse and explain why it doubles.



Geometry diagram; not drawn to scale except for construction tasks.

Reference answer

10 cm.

$$10$$

1. New legs are 6 cm and 8 cm. Their squares total 100, so the hypotenuse is 10 cm.
2. Scaling each leg by 2 multiplies the sum of squares by 4; its positive square root scales by 2.

- Use the stated conditions and justify the relation before calculating.
- Give an exact answer where possible, with units and any domain restrictions.