

Grade 8 · The Pythagorean Theorem · Worksheet Answer Key

Common Core 8.G.B.6, 8.G.B.7 · mathovore.fr

Every solution shows the equation, the squaring step and the square root. Rounded answers are written to the nearest tenth. If a result differs, recompute the squares first, because most errors come from squaring or from choosing the wrong side as the hypotenuse.

Grade 8 Common Core: 8.G.B.6 · 8.G.B.7

Problem 1: Hypotenuse of a 6-8 triangle

$6^2 + 8^2 = c^2$, so $36 + 64 = 100$ and $c = \sqrt{100} = 10$. The hypotenuse is **10 in.**

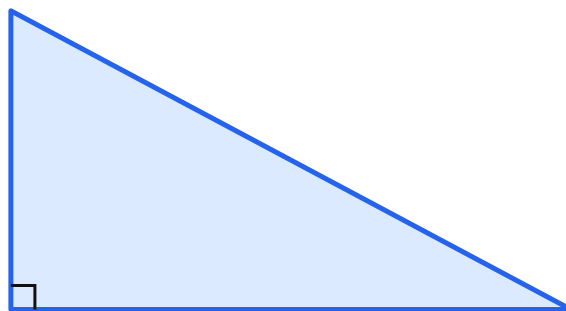
Problem 2: Hypotenuse of a 5-12 triangle

$5^2 + 12^2 = 25 + 144 = 169$, so $c = \sqrt{169} = 13$. The hypotenuse is **13 ft.**

Problem 3: Find the missing leg

The hypotenuse is 17, so $x^2 + 8^2 = 17^2$. Then $x^2 = 289 - 64 = 225$ and $x = 15$.

The missing leg is **15 yd.**



Check: $15^2 + 8^2 = 225 + 64 = 289 = 17^2$.

Problem 4: Missing leg of a 7-25 triangle

$7^2 + b^2 = 25^2$, so $b^2 = 625 - 49 = 576$ and $b = 24$. The other leg is **24 in.**

Problem 5: Legs 9 and 12

$9^2 + 12^2 = 81 + 144 = 225$, so $c = 15$. The hypotenuse is **15 in**.

Problem 6: Hypotenuse that is not whole

$4^2 + 7^2 = 16 + 49 = 65$, so $c = \sqrt{65}$. Since $8^2 = 64$ and $9^2 = 81$, the value is a little more than 8.

$c = \sqrt{65} \approx 8.06$, so the hypotenuse is about **8.1 ft**.

Problem 7: Leg that is not whole

$9^2 + b^2 = 13^2$, so $b^2 = 169 - 81 = 88$. Then $b = \sqrt{88} \approx 9.38$.

The other leg is about **9.4 in**.

Problem 8: Squares on the sides

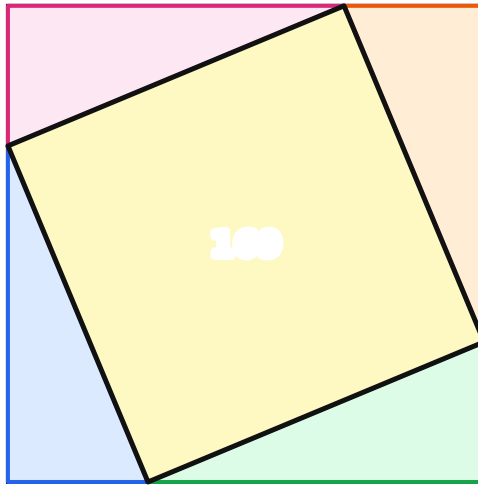
Each square has area equal to its side squared, so $a^2 = 36$ and $b^2 = 64$. By the theorem, $c^2 = 36 + 64 = 100$.

The square on the hypotenuse has area **100 square units**, and the hypotenuse is $\sqrt{100} = \mathbf{10}$ units.

Problem 9: Area proof with numbers

- a. $17^2 = 289$ square inches.
- b. Each triangle has area $\frac{1}{2} \cdot 5 \cdot 12 = 30$, so four triangles have area $4 \cdot 30 = 120$.
- c. $289 - 120 = 169$ square inches.
- d. $\sqrt{169} = 13$ in.

The tilted square has side **13 in**, which is the hypotenuse of the 5-12 triangle.



The middle square has area 169, so each side is 13.

Problem 10: Explain the proof

The large square has area $(a+b)^2 = a^2 + 2ab + b^2$.

It is also made of four triangles with area $\frac{1}{2}ab$ each, which total $2ab$, plus the tilted square with area c^2 . So the area is $2ab + c^2$.

Both expressions describe the same area: $a^2 + 2ab + b^2 = 2ab + c^2$. Subtracting $2ab$ from both sides gives $a^2 + b^2 = c^2$.

Problem 11: Converse: 9, 12, 15

The longest side is 15. Check: $9^2 + 12^2 = 81 + 144 = 225$ and $15^2 = 225$.

The sums are equal, so by the converse the triangle **is a right triangle**.

Problem 12: Converse: 7, 10, 12

The longest side is 12. Check: $7^2 + 10^2 = 49 + 100 = 149$, but $12^2 = 144$.

Since $149 \neq 144$, the triangle is **not a right triangle**.

Problem 13: Which sets are right triangles?

- a. $64 + 225 = 289 = 17^2$. **Right triangle.**
- b. $36 + 49 = 85$, but $10^2 = 100$. **Not right.**
- c. $400 + 441 = 841 = 29^2$. **Right triangle.**
- d. $121 + 144 = 265$, but $18^2 = 324$. **Not right.**

Parts (a) and (c) form right triangles.

Problem 14: Perimeter and area

Hypotenuse: $10^2 + 24^2 = 100 + 576 = 676$, so $c = 26$.

Perimeter: $10 + 24 + 26 = \mathbf{60 \text{ in}}$. Area: $\frac{1}{2} \cdot 10 \cdot 24 = \mathbf{120 \text{ square inches}}$.

Problem 15: Diagonal of a square

The diagonal is the hypotenuse of a right triangle with both legs 9: $d^2 = 9^2 + 9^2 = 81 + 81 = 162$.

$d = \sqrt{162} \approx 12.73$, so the diagonal is about **12.7 in**.

Problem 16: Height of an isosceles triangle

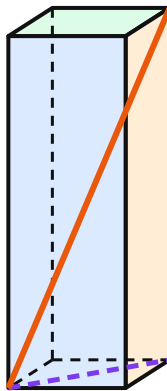
The height meets the base at its midpoint, so each half of the base is 6 in. Then $6^2 + h^2 = 10^2$, so $h^2 = 100 - 36 = 64$ and $h = 8$.

Height: **8 in**. Area: $\frac{1}{2} \cdot 12 \cdot 8 = \mathbf{48 \text{ square inches}}$.

Problem 17: Diagonal of a prism

First find the diagonal of the base: $x^2 = 8^2 + 6^2 = 64 + 36 = 100$, so $x = 10$.

Then $d^2 = 10^2 + 24^2 = 100 + 576 = 676$, so $d = 26$. The space diagonal is **26 in**.

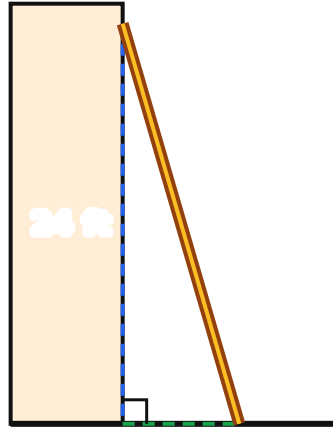


Base diagonal 10 in, space diagonal 26 in.

Problem 18: Ladder against a house

$7^2 + h^2 = 25^2$, so $h^2 = 625 - 49 = 576$ and $h = 24$.

The ladder reaches **24 ft** up the wall.



$$\text{Check: } 7^2 + 24^2 = 25^2.$$

Problem 19: TV screen diagonal

$$d^2 = 24^2 + 18^2 = 576 + 324 = 900, \text{ so } d = 30.$$

This is a **30-inch TV**.

Problem 20: Little League throw

$$\text{The throw is the diagonal of the square: } d^2 = 60^2 + 60^2 = 3600 + 3600 = 7200.$$

$$d = \sqrt{7200} \approx 84.85, \text{ so the throw is about } \mathbf{84.9 \text{ ft}}.$$

Problem 21: Is the corner square?

$$\text{Check the converse: } 60^2 + 80^2 = 3600 + 6400 = 10000 \text{ and } 100^2 = 10000.$$

The sums are equal, so the corner **is a right angle**.

Problem 22: Walk east and north

$$d^2 = 0.9^2 + 1.2^2 = 0.81 + 1.44 = 2.25, \text{ so } d = 1.5.$$

Jamal is **1.5 mi** from his start.

Problem 23: Longest rod in a box

The longest rod fits along the space diagonal. Base diagonal: $x^2 = 12^2 + 9^2 = 144 + 81 = 225$, so $x = 15$.

Space diagonal: $d^2 = 15^2 + 8^2 = 225 + 64 = 289$, so $d = 17$.

The diagonal is exactly 17 in., so the 17-in. rod **just fits** (diagonally, corner to corner).