

Multi-step Pythagoras Problems



Find a hidden dimension first, then use Pythagoras' theorem again to find the final answer.

Name _____

Date _____

Show both steps

Write both Pythagoras equations clearly. Find the hidden side first, then use it to find x .

Worked example Find x .



Step 1: Find the hidden side.

$$3^2 + \text{hidden}^2 = 5^2$$

$$9 + \text{hidden}^2 = 25$$

$$\text{hidden} = 4$$

Step 2: Find x using the hidden side.

$$4^2 + 4^2 = x^2$$

$$16 + 16 = x^2$$

$$x = \sqrt{32} \approx 5.7$$

1. Find x .



2. Find x .



3. Find x .



Solution: Step 1: $4^2 + h^2 = 5^2 \Rightarrow h = 3$. Step 2: $7^2 + 3^2 = x^2 \Rightarrow x = \sqrt{58} \approx 7.6$

Solution: Step 1: $3^2 + 4^2 = h^2 \Rightarrow h = 5$. Step 2: $5^2 + 10^2 = x^2 \Rightarrow x = \sqrt{125} \approx 11.2$

Solution: Step 1: $5^2 + h^2 = 13^2 \Rightarrow h = 12$. Step 2: $12^2 + 8^2 = x^2 \Rightarrow x = \sqrt{208} \approx 14.4$

4. Find x .



5. Find x .



6. Find x .



Solution: Step 1: $6^2 + 8^2 = h^2 \Rightarrow h = 10$. Step 2: $10^2 + 20^2 = x^2 \Rightarrow x = \sqrt{500} \approx 22.4$

Solution: Step 1: $6^2 + h^2 = 10^2 \Rightarrow h = 8$. Step 2: $8^2 + 15^2 = x^2 \Rightarrow x = \sqrt{289} = 17$

Solution: Stage 1: $3^2 + 4^2 = 5^2 = 25$. Stage 2: $5^2 + 12^2 = 13^2 = 169$. Stage 3: $13^2 + 84^2 = x^2 \Rightarrow x = \sqrt{7225} = 85$

7. Find x .



Solution: Step 1: $5^2 + 12^2 = h^2 \Rightarrow h = 13$. Step 2: $13^2 + 9^2 = x^2 \Rightarrow x = \sqrt{250} \approx 15.8$

8. Find x .



Solution: Step 1: $8^2 + h^2 = 17^2 \Rightarrow h = 15$. Step 2: $15^2 + 20^2 = x^2 \Rightarrow x = \sqrt{625} = 25$

9. Find x .



Solution: Step 1: $9^2 + 12^2 = h^2 \Rightarrow h = 15$. Step 2: $15^2 + 8^2 = x^2 \Rightarrow x = \sqrt{289} = 17$

10. Find x .



Solution: Step 1: $7^2 + h^2 = 25^2 \Rightarrow h = 24$. Step 2: $24^2 + 15^2 = x^2 \Rightarrow x = \sqrt{801} \approx 28.3$

11. A square has area 49 cm^2 . Find the side, then the diagonal.

Solution: Step 1: Side = $\sqrt{49} = 7$ cm. Step 2: Diagonal = $7\sqrt{2} \approx 9.9$ cm

12. A rectangle is 5 cm by 12 cm. Find the diagonal, then the perimeter.

Solution: Step 1: $5^2 + 12^2 = d^2 \Rightarrow d = 13$ cm. Step 2: Perimeter = $2(5 + 12) = 34$ cm

13. Find x .



Solution: Stage 1: $6^2 + 8^2 = 10^2 = 100$. Stage 2: $10^2 + 24^2 = 26^2 = 676$. Stage 3: $26^2 + 10^2 = x^2 \Rightarrow x = \sqrt{776} \approx 27.9$

14. Find x .



Solution: Step 1: $12^2 + h^2 = 37^2 \Rightarrow h = 35$. Step 2: $35^2 + 20^2 = x^2 \Rightarrow x = \sqrt{1625} \approx 40.3$

15. Find x .



Solution: Step 1: $12^2 + 16^2 = h^2 \Rightarrow h = 20$. Step 2: $20^2 + 15^2 = x^2 \Rightarrow x = \sqrt{625} = 25$

16. An isosceles triangle has equal sides 13 cm and base 24 cm. Find the height, then the area.

Solution: Step 1: Height = $\sqrt{13^2 - 12^2} = \sqrt{25} = 5$ cm. Step 2: Area = $\frac{1}{2} \times 24 \times 5 = 60$ cm²

17. A right-angled triangle has legs 7 m and 24 m. Find the hypotenuse, then the area.

Solution: Step 1: Hypotenuse = $\sqrt{7^2 + 24^2} = \sqrt{625} = 25$ m. Step 2: Area = $\frac{1}{2} \times 7 \times 24 = 84$ m²

18. A square has diagonal 10 m. Find the side length, then the area to 1 d.p.

Solution: Step 1: Side = $\frac{10}{\sqrt{2}} = 5\sqrt{2} \approx 7.07$ m. Step 2: Area = $(5\sqrt{2})^2 = 50$ m²