

Build Tasks — Answers



Find x . Show all steps clearly.

1.



Solution

$$h = \sqrt{13^2 - 5^2} = 12$$

$$x = \sqrt{12^2 + 9^2} =$$

$$15 \text{ cm}$$

2.



Solution

$$d = \sqrt{9^2 + 12^2} = 15$$

$$x = \sqrt{15^2 + 8^2} =$$

$$17 \text{ m}$$

3.



Solution

$$d_1 = \sqrt{3^2 + 4^2} = 5$$

$$d_2 = \sqrt{5^2 + 12^2} = 13$$

$$x = \sqrt{13^2 + 84^2} =$$

$$85 \text{ cm}$$

4.



Solution

$$h = \sqrt{25^2 - 7^2} = 24$$

$$x = \sqrt{24^2 + 15^2} =$$

$$\sqrt{801}$$

$$= 3\sqrt{89} \approx 28.3 \text{ cm}$$

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Find x . Label any hidden dimensions.

5.



Solution

$$d = \sqrt{5^2 + 12^2} = 13$$

$$x = \sqrt{13^2 + 9^2} =$$

$$\sqrt{250}$$

$$= 5\sqrt{10} \approx 15.8 \text{ cm}$$

6.



Solution

$$d_1 = \sqrt{6^2 + 8^2} = 10$$

$$d_2 = \sqrt{10^2 + 24^2} =$$

$$26$$

$$x = \sqrt{26^2 + 10^2} =$$

$$2\sqrt{194} \approx 27.9 \text{ m}$$

7.



Solution

$$h = \sqrt{17^2 - 8^2} = 15$$

$$x = \sqrt{15^2 + 20^2} =$$

$$25 \text{ cm}$$

8.



Solution

$$d = \sqrt{12^2 + 16^2} = 20$$

$$x = \sqrt{20^2 + 15^2} =$$

$$25 \text{ m}$$

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Find x . Do not round intermediate values.

9.



Solution

$$d_1 = \sqrt{9^2 + 12^2} = 15$$

$$d_2 = \sqrt{15^2 + 20^2} = 25$$

$$x = \sqrt{25^2 + 60^2} = 65 \text{ cm}$$

10. A rectangle is 7 cm by 24 cm. Find the diagonal, then the area and perimeter.

Solution

$$\text{Diagonal} = \sqrt{7^2 + 24^2} = 25$$

$$\text{Area} = 168 \text{ cm}^2, \text{ Perimeter} = 62 \text{ cm}$$

11. A square has diagonal 20 m. Find the side, then the area to 1 decimal place.

Solution

$$\text{Side} = \frac{20}{\sqrt{2}} = 10\sqrt{2} \approx 14.1$$

$$\text{Area} = \frac{20^2}{2} = 200.0 \text{ m}^2$$

12. An isosceles triangle has equal sides 17 cm and base 30 cm. Find the height, then the area.

Solution

$$\text{Height} = \sqrt{17^2 - 15^2} = 8$$

$$\text{Area} = \frac{1}{2}(30)(8) = 120 \text{ cm}^2$$

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Find the intermediate value, then use it for the final step.

13. A ladder is 25 m long and reaches 24 m high. Find the base distance, then the triangle area.

Solution

$$\text{Base} = \sqrt{25^2 - 24^2} = 7$$

$$\text{Area} = \frac{1}{2}(7)(24) = 84 \text{ m}^2$$

15. A square has side 9 cm. Find the diagonal exactly and to 1 decimal place, then the perimeter.

Solution

$$\text{Diagonal} = 9\sqrt{2} \approx 12.7 \text{ cm}$$

$$\text{Perimeter} = 36 \text{ cm}$$

14. A rectangle has perimeter 82 cm and diagonal 29 cm. Find its side lengths.

Solution

$$l + w = 41, \text{ so } lw = \frac{41^2 - 29^2}{2} = 420$$

Sides 20 cm and 21 cm

16. A triangle has area 40 cm^2 and base 10 cm. If it is isosceles, find the height, then each equal side.

Solution

$$\text{Height} = \frac{2(40)}{10} = 8$$

$$\text{Each side} = \sqrt{5^2 + 8^2} = \sqrt{89} \approx 9.4 \text{ cm}$$

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Solve in two steps: find a hidden length first.

17. A rectangle is 11 cm by 60 cm. Find the diagonal, then decide if a 61 cm brace fits exactly.

Solution

$$\text{Diagonal} = \sqrt{11^2 + 60^2} = 61$$

Yes, the 61 cm brace fits exactly

19. Find the distance from (1, 1) to (13, 6), then give the decimal answer to 1 decimal place.

Solution

$$\begin{aligned}\text{Distance} &= \sqrt{12^2 + 5^2} = \sqrt{169} = 13 \\ &= 13.0 \text{ (1 d.p.)}\end{aligned}$$

18. A right triangle has one short side 20 cm and hypotenuse 29 cm. Find the other short side, then the perimeter.

Solution

$$\text{Other side} = \sqrt{29^2 - 20^2} = 21$$

$$\text{Perimeter} = 20 + 21 + 29 = 70 \text{ cm}$$

20. An equilateral triangle has side 10 mm. Find its height, then the area to 1 decimal place.

Solution

$$\text{Height} = \sqrt{10^2 - 5^2} = 5\sqrt{3} \approx 8.7$$

$$\text{Area} = \frac{1}{2}(10)(5\sqrt{3}) = 25\sqrt{3} \approx 43.3 \text{ mm}^2$$

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Complete two steps: first find the hidden dimension.

21. A regular hexagon has side 8 cm. Find the height of one small triangle, then the total area.

Solution

Small-triangle height

$$= \sqrt{8^2 - 4^2} = 4\sqrt{3} \approx 6.93$$

$$\text{Total area} = 96\sqrt{3} \approx 166.3 \text{ cm}^2$$

23. A rectangle is 7 cm longer than it is wide and its diagonal is 13 cm. Find the dimensions, then the area.

Solution

$$w^2 + (w + 7)^2 = 169 \Rightarrow w = 5$$

$$5 \text{ cm by } 12 \text{ cm, Area} = 60 \text{ cm}^2$$

22. An isosceles triangle has sides 6.5 m, 6.5 m, and 7.4 m. Find the height, then the area.

Solution

$$\text{Height} = \sqrt{6.5^2 - 3.7^2} \approx 5.34$$

$$\text{Area} = \frac{1}{2}(7.4)(5.34) \approx 19.8 \text{ m}^2$$

24. A boat sails 80 km east and then 110 km south. Find how far it is from the start, then round to 1 decimal place.

Solution

$$\text{Distance} = \sqrt{80^2 + 110^2} = \sqrt{18500}$$

$$\approx 136.0 \text{ km}$$

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Use Pythagoras first, then complete the second step.

25. A football pitch is 105 m by 68 m. Find the diagonal, then compare it with 125 m.

Solution

$$\begin{aligned}\text{Diagonal} &= \sqrt{105^2 + 68^2} = \sqrt{15649} \\ &\approx 125.1 \text{ m, just over 125 m}\end{aligned}$$

27. Explain why a multi-step Pythagoras problem often starts by finding a hidden height or diagonal first.

Solution

It is a side of the right triangle you need, so find it before the final step.

26. A rectangle has width 12 cm and perimeter 58 cm. Find the diagonal.

Solution

$$\text{Length} = 29 - 12 = 17$$

Diagonal

$$= \sqrt{12^2 + 17^2} = \sqrt{433} \approx 20.8 \text{ cm}$$