

Push Tasks — Answers



Find x exactly and to 1 d.p. Show all steps.

1.



Solution

$$h = \sqrt{37^2 - 12^2} = 35$$

$$\begin{aligned} x &= \sqrt{35^2 + 20^2} = \\ &= \sqrt{1625} \\ &= 5\sqrt{65} \approx 40.3 \text{ cm} \end{aligned}$$

2.



Solution

$$d = \sqrt{20^2 + 21^2} = 29$$

$$\begin{aligned} x &= \sqrt{29^2 + 72^2} = \\ &= \sqrt{6025} \\ &= 5\sqrt{241} \approx 77.6 \text{ m} \end{aligned}$$

3.



Solution

$$d_1 = \sqrt{7^2 + 24^2} = 25$$

$$\begin{aligned} d_2 &= \sqrt{25^2 + 60^2} = \\ &= 65 \end{aligned}$$

$$\begin{aligned} x &= \sqrt{65^2 + 72^2} = \\ &= 97 \text{ cm} \end{aligned}$$

4.



Solution

$$h = \sqrt{41^2 - 9^2} = 40$$

$$\begin{aligned} x &= \sqrt{40^2 + 42^2} = \\ &= 58 \text{ cm} \end{aligned}$$

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Find x . Keep intermediate values exact.

5.



Solution

$$d = \sqrt{16^2 + 30^2} = 34$$

$$x = \sqrt{34^2 + 63^2} =$$

$$\sqrt{5125}$$

$$= 5\sqrt{205} \approx 71.6 \text{ cm}$$

6.



Solution

$$d_1 = \sqrt{8^2 + 15^2} = 17$$

$$d_2 = \sqrt{17^2 + 144^2} =$$

$$145$$

$$x = \sqrt{145^2 + 408^2} =$$

$$433 \text{ m}$$

7.



Solution

$$h = \sqrt{29^2 - 20^2} = 21$$

$$x = \sqrt{21^2 + 28^2} =$$

$$35 \text{ m}$$

8.



Solution

$$d = \sqrt{33^2 + 56^2} = 65$$

$$x = \sqrt{65^2 + 72^2} =$$

$$97 \text{ cm}$$

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Find x . Do not round along the way.

9.



Solution

$$d_1 = \sqrt{11^2 + 60^2} = 61$$

$$d_2 = \sqrt{61^2 + 60^2} = \sqrt{7321}$$

$$x = \sqrt{7321 + 20^2} = \sqrt{7721} \approx 87.9 \text{ cm}$$

11. A square has area 200 m^2 . Find the side, then the diagonal to 1 decimal place.

Solution

$$\text{Side} = \sqrt{200} = 10\sqrt{2} \approx 14.1$$

$$\text{Diagonal} = \sqrt{2} \cdot 10\sqrt{2} = 20.0 \text{ m}$$

10. An isosceles triangle has equal sides 29 cm and height 21 cm. Find the base, then the area.

Solution

$$\text{Half base} = \sqrt{29^2 - 21^2} = 20, \text{ base} = 40$$

$$\text{Area} = \frac{1}{2}(40)(21) = 420 \text{ cm}^2$$

12. A rectangle is 24 m by 7 m. Compare the diagonal route with walking along two sides.

Solution

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

$$\text{Two sides} = 31; \text{ diagonal saves } 6 \text{ m}$$

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Solve multi-step problems: find intermediate values exactly.

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

Solution

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

$$\text{Area} \approx 19.8 \text{ m}^2, \text{ Perimeter} = 20.4 \text{ m}$$

15. A right triangle has hypotenuse 65 cm and one short side 16 cm. Find the other short side, then the area.

Solution

$$\text{Other side} = \sqrt{65^2 - 16^2} = 63$$

$$\text{Area} = \frac{1}{2}(16)(63) = 504 \text{ cm}^2$$

14. A rectangle has diagonal 20 cm and length 4 cm longer than its width. Find the dimensions.

Solution

$$w^2 + (w + 4)^2 = 400 \Rightarrow w = 12$$

$$12 \text{ cm by } 16 \text{ cm}$$

16. A boat sails 80 km east and 110 km south. Find the direct distance, then round to 1 decimal place and compare with 136 km.

Solution

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

$$\approx 136.0 \text{ km, about equal to } 136 \text{ km}$$

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Complete both steps: find the hidden length, then reason about the result.

17. A screen is 48 cm wide and 36 cm high. Find the diagonal, then explain why it is a scaled triple.

Solution

$$\begin{aligned}\text{Diagonal} &= \sqrt{48^2 + 36^2} = 60 \\ (36, 48, 60) &= 12 \times (3, 4, 5)\end{aligned}$$

18. A square has diagonal 14 cm. Find the side to 1 decimal place, then the perimeter to 1 decimal place.

Solution

$$\begin{aligned}\text{Side} &= \frac{14}{\sqrt{2}} = 7\sqrt{2} \approx 9.9 \\ \text{Perimeter} &= 28\sqrt{2} \approx 39.6 \text{ cm}\end{aligned}$$

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

Solution

$$\begin{aligned}\text{Each side} &= \sqrt{5^2 + 8^2} = \sqrt{89} \\ \text{Perimeter} &= 10 + 2\sqrt{89} \approx 28.9 \text{ cm}\end{aligned}$$

20. A rectangle is 11 cm by 60 cm. Find its diagonal exactly, then explain why 61 cm is special.

Solution

$$\begin{aligned}\text{Diagonal} &= \sqrt{11^2 + 60^2} = 61 \\ \text{Since } 11^2 + 60^2 &= 61^2 \text{ (a triple)}\end{aligned}$$

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Multi-step: use Pythagoras, then complete the calculation.

21. A regular hexagon has side 8 cm. Find its total area exactly in surd form or to 1 decimal place.

Solution

Six equilateral triangles, height $= 4\sqrt{3}$
Area $= 96\sqrt{3} \approx 166.3 \text{ cm}^2$

23. The distance from (1, 1) to (13, 6) is used as the hypotenuse of another right triangle with one short side 5. Find the other short side exactly.

Solution

Distance $= \sqrt{12^2 + 5^2} = 13$
Other side $= \sqrt{13^2 - 5^2} = 12$

22. A rectangle has diagonal 13 cm and is 7 cm longer than it is wide. Find the width, length, and area.

Solution

$w^2 + (w + 7)^2 = 169 \Rightarrow w = 5$
5 cm by 12 cm, Area $= 60 \text{ cm}^2$

24. A square patio has side 7 m. Find the diagonal, then say if a 10 m cover strip is enough.

Solution

Diagonal $= 7\sqrt{2} \approx 9.9 \text{ m}$
Yes: $9.9 < 10$, the strip is enough

Push Tasks — Answers



Solve and explain: two steps including reasoning about your answer.

25. A right triangle has short sides 9 cm and 12 cm. Find the hypotenuse, then compare it with 15 cm.

Solution

Hypotenuse = $\sqrt{9^2 + 12^2} = 15$
Exactly equal to 15 cm

27. Write your own two-step Pythagoras question where the first answer is used to find an area or perimeter.

Solution

Answers vary, e.g. a 6×8 rectangle:
diagonal = 10, then perimeter = 24 cm.

26. Why is 'find the hidden height first' such a common move in multi-step Pythagoras questions?

Solution

The final target needs a length not given at the start; Pythagoras supplies it for the second step.