

Pythagoras and Trigonometry in 3D Shapes



Find the required 3D diagonal first, then use the labelled right triangle for trigonometry.

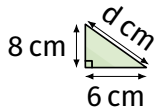
Name _____

Date _____

Diagram first

Use the right-angle mark to identify the hypotenuse. Show the equation, substitution, and conclusion with units where needed.

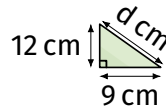
1. Find the base diagonal from base 6 by 8 cm.



Solution

$$d = \sqrt{6^2 + 8^2} = 10 \text{ cm}$$

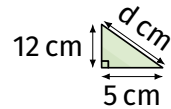
2. Find the base diagonal from base 9 m by 12 m.



Solution

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

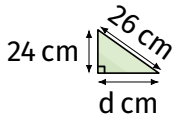
3. Find the base diagonal from base 5 cm by 12 cm.



Solution

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

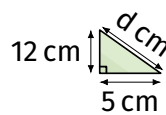
4. Space diagonal 26 cm, height 24 cm. Find the base diagonal.



Solution

$$d = \sqrt{26^2 - 24^2} = 10 \text{ cm}$$

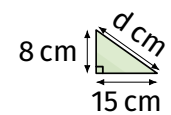
5. Base 3 by 4 cm, height 12 cm. Find the space diagonal.



Solution

$$\begin{aligned} \text{Base diag} &= 5 \text{ cm} \\ d &= \sqrt{5^2 + 12^2} = 13 \text{ cm} \end{aligned}$$

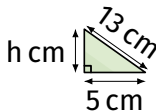
6. Base diagonal 15 m, height 8 m. Find the space diagonal.



Solution

$$d = \sqrt{15^2 + 8^2} = 17 \text{ m}$$

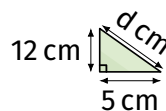
7. Find angle θ where $\sin(\theta) = 5/13$ and hypotenuse is 13 cm.



Solution

$$\theta = \arcsin(5/13) \approx 22.6^\circ$$

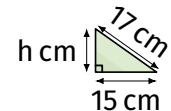
8. Find angle θ where $\tan(\theta) = 12/5$.



Solution

$$\theta = \arctan(12/5) \approx 67.4^\circ$$

9. Find angle θ where $\cos(\theta) = 15/17$ and hypotenuse is 17 cm.



Solution

$$\theta = \arccos(15/17) \approx 28.1^\circ$$

Pythagoras and Trigonometry in 3D Shapes



Find the required 3D diagonal first, then use the labelled right triangle for trigonometry.

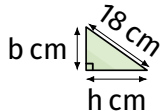
Name _____

Date _____

Diagram first

Use the right-angle mark to identify the hypotenuse. Show the equation, substitution, and conclusion with units where needed.

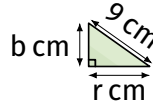
- 10.** Sloping line 18 cm makes angle 50° with base. Find vertical height.



Solution

$$h = 18 \sin 50^\circ \approx 13.8 \text{ cm}$$

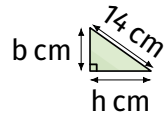
- 11.** Ladder 9 m long makes angle 42° with floor. Find the rise.



Solution

$$r = 9 \sin 42^\circ \approx 6.0 \text{ m}$$

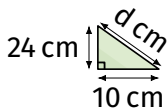
- 12.** Support 14 cm makes angle 30° with base. Find height reached.



Solution

$$h = 14 \sin 30^\circ = 7 \text{ cm}$$

- 13.** Cuboid 8 by 6 by 24 cm. Find space diagonal to 1 d.p.

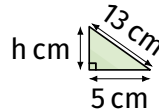


Solution

Base diag = 10 cm

$$d = \sqrt{10^2 + 24^2} = 26 \text{ cm}$$

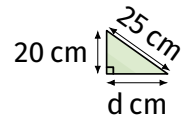
- 14.** Space diagonal 13 cm, base diagonal 5 cm. Find height.



Solution

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

- 15.** Height 20 cm, space diagonal 25 cm, one leg 9 cm. Find other base leg.

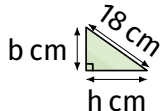


Solution

Base diag = 15 cm

$$\text{other leg} = \sqrt{25^2 - 20^2} = 15 \text{ cm}$$

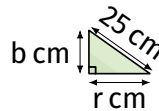
- 16.** Line inside box 18 cm, angle 41° to base. Find vertical height.



Solution

$$h = 18 \sin 41^\circ \approx 11.8 \text{ cm}$$

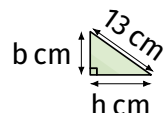
- 17.** Support line 25 m, angle 28° to horizontal. Find rise to 1 d.p.



Solution

$$r = 25 \sin 28^\circ \approx 11.7 \text{ m}$$

- 18.** Line across face 13 cm, angle 40° to bottom edge. Find height on that face.



Solution

$$h = 13 \sin 40^\circ \approx 8.4 \text{ cm}$$