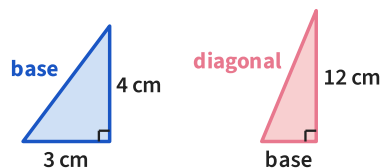
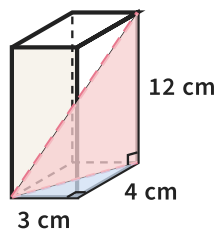


Pythagoras in 3D

1

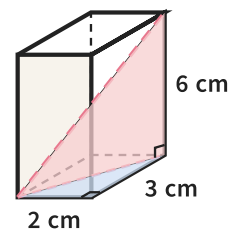
Find the length of the diagonal of the cuboid.



$$\begin{aligned} \text{base}^2 &= 3^2 + 4^2 \\ \text{base}^2 &= 25 \\ \text{diagonal}^2 &= 25 + 12^2 \\ \text{diagonal}^2 &= 169 \\ \text{diagonal} &= \sqrt{169} = 13 \text{ cm} \end{aligned}$$

2

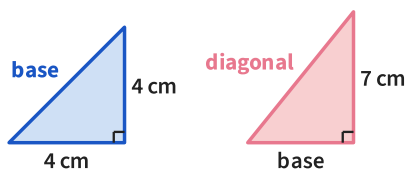
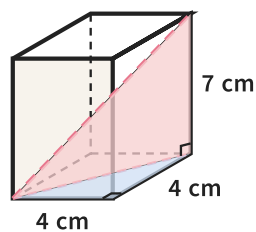
Find the length of the diagonal of the cuboid.



$$\begin{aligned} \text{base}^2 &= 2^2 + 3^2 \\ \text{base}^2 &= 13 \\ \text{diagonal}^2 &= 13 + 6^2 \\ \text{diagonal}^2 &= 49 \\ \text{diagonal} &= \sqrt{49} = 7 \text{ cm} \end{aligned}$$

3

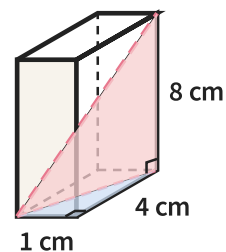
Find the length of the diagonal of the cuboid.



$$\begin{aligned} \text{base}^2 &= 4^2 + 4^2 \\ \text{base}^2 &= 32 \\ \text{diagonal}^2 &= 32 + 7^2 \\ \text{diagonal}^2 &= 81 \\ \text{diagonal} &= \sqrt{81} = 9 \text{ cm} \end{aligned}$$

4

Find the length of the diagonal of the cuboid.

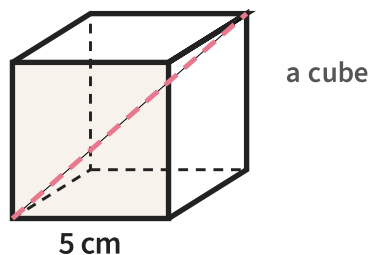


$$\begin{aligned} \text{base}^2 &= 1^2 + 4^2 \\ \text{base}^2 &= 17 \\ \text{diagonal}^2 &= 17 + 8^2 \\ \text{diagonal}^2 &= 81 \\ \text{diagonal} &= \sqrt{81} = 9 \text{ cm} \end{aligned}$$

Pythagoras in 3D

5

Find the length of the diagonal of the cube to 1 decimal place.

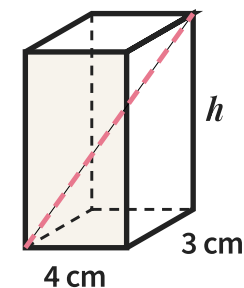


$$\begin{aligned} \text{base}^2 &= 5^2 + 5^2 \\ \text{diagonal}^2 &= 50 + 5^2 \\ &= 8.7 \text{ cm} \end{aligned}$$

Answer _____

6

The diagonal of the cuboid is 13 cm. Find the height h .

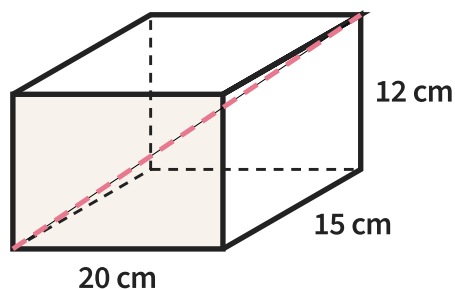


$$\sqrt{13^2 - 4^2 - 3^2}$$

Answer _____ 12 cm

7

A box is 20 cm by 15 cm by 12 cm. Will a 30 cm pencil fit inside?

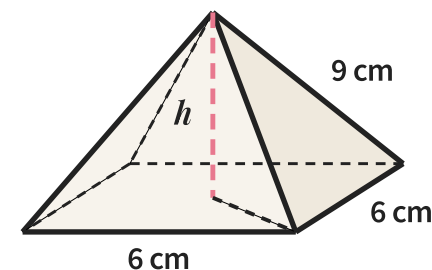


the diagonal is 27.7 cm

Answer _____ No

8

A pyramid has a square base of side 6 cm. Each sloping edge is 9 cm. Find the height h to 1 decimal place.



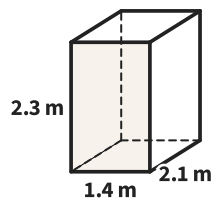
half the diagonal of the base is $\sqrt{18}$, then $\sqrt{9^2 - 18}$

Answer _____ 7.9 cm

9



The inside of a lift is 1.4 m wide, 2.1 m deep and 2.3 m tall. Will a straight 3.4 m pipe fit inside the lift? Show how you know.



the longest that fits:
 $\sqrt{(1.4^2 + 2.1^2 + 2.3^2)} = \sqrt{11.66}$

$= 3.41... \text{ m, more than } 3.4 \text{ m}$

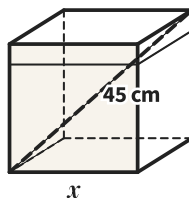
Yes: 3.41 m

Answer

10



A storage box is a cube. The longest straight rod that fits inside it is 45 cm long. How long is each edge x of the box, to 1 decimal place?



$x^2 + x^2 + x^2 = 45^2$, so $3x^2 = 2025$

$x = \sqrt{675}$

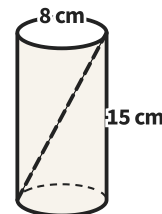
$x = 26.0 \text{ cm}$

Answer

11



A tin is a cylinder 8 cm across and 15 cm tall. What is the longest straight straw that fits inside the closed tin?



the longest is from the bottom edge to the opposite top edge

$\sqrt{(8^2 + 15^2)} = \sqrt{289}$

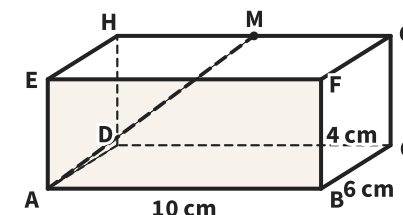
17 cm

Answer

12



M is the midpoint of the edge GH of the cuboid. Find the length AM to 1 decimal place.



A to the point below M: $\sqrt{(5^2 + 6^2)} = \sqrt{61}$

$AM = \sqrt{(61 + 4^2)} = \sqrt{77}$

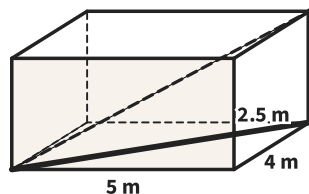
$AM = 8.8 \text{ cm}$

Answer

13



A room is 5 m by 4 m by 2.5 m high. A fly goes straight from one corner to the opposite corner (dashed). A spider walks across the floor, then up the wall (solid). How much further does the spider go, to 1 decimal place?



fly $\sqrt{(5^2 + 4^2 + 2.5^2)} = 6.87...$, spider
 $\sqrt{41 + 2.5} = 8.90...$

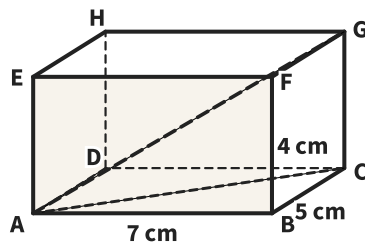
2.0 m

Answer

14



Find the angle between the diagonal AG and the base ABCD to 1 decimal place.



$AC = \sqrt{(7^2 + 5^2)} = \sqrt{74}$

$\tan \text{ of the angle} = 4 \div \sqrt{74}$

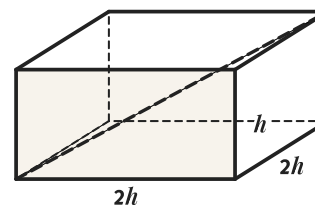
24.9°

Answer

15



A gift box is a cuboid. Its length and its width are each twice its height h . The longest pole that fits inside is 15 cm. Find the height of the box.



$(2h)^2 + (2h)^2 + h^2 = 15^2$

$5h^2 = 225$

$h = 5 \text{ cm}$

Answer

16



Ali says that if you double every edge of a cuboid, its diagonal doubles too. Is Ali right? Explain.

$\sqrt{((2a)^2 + (2b)^2 + (2c)^2)} = \sqrt{(4(a^2 + b^2 + c^2))}$

$= 2\sqrt{(a^2 + b^2 + c^2)}$

Yes

Answer