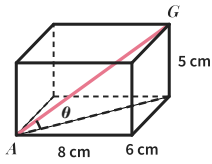


Pythagoras and trigonometry in 3D

ANSWERS 

1

Find the angle θ between the diagonal AG and the base $ABCD$. Give your answer to 1 decimal place.



$$AC^2 = 8^2 + 6^2 = 100$$

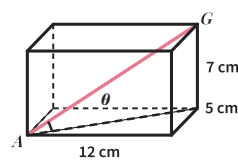
$$AC = 10 \text{ cm}$$

$$\tan \theta = 5 \div 10 \quad \theta = 26.6^\circ$$

Answer _____

2

Find the angle θ between the diagonal AG and the base $ABCD$. Give your answer to 1 decimal place.



$$AC^2 = 12^2 + 5^2 = 169$$

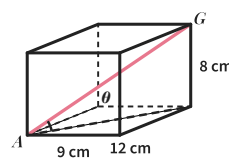
$$AC = 13 \text{ cm}$$

$$\tan \theta = 7 \div 13 \quad \theta = 28.3^\circ$$

Answer _____

3

Find the angle θ between the diagonal AG and the base $ABCD$. Give your answer to 1 decimal place.



$$AC^2 = 9^2 + 12^2 = 225$$

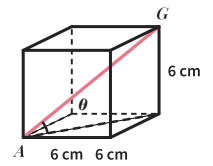
$$AC = 15 \text{ cm}$$

$$\tan \theta = 8 \div 15 \quad \theta = 28.1^\circ$$

Answer _____

4

Find the angle θ in this cube between the diagonal AG and the base $ABCD$. Give your answer to 1 decimal place.

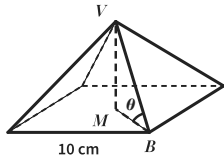


$$\tan \theta = 6 \div 8.5 \quad \theta = 35.3^\circ$$

Answer _____

5

A pyramid has a square base of side 10 cm. Its top is 9 cm above the centre of the base. Find the angle θ between the edge BV and the base.



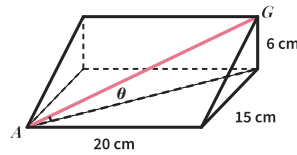
$$BM \text{ is half the diagonal: } \sqrt{50} = 7.07, \quad \tan \theta = 9 \div 7.07$$

$$\theta = 51.8^\circ$$

Answer _____

6

A ramp has a rectangular base 20 cm by 15 cm. The back edge is 6 cm high. Find the angle θ between AG and the base.



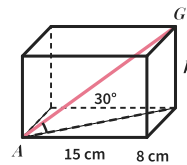
$$AC = 25, \tan \theta = 6 \div 25$$

$$\theta = 13.5^\circ$$

Answer _____

7

The diagonal AG makes an angle of 30° with the base. Find the height h .



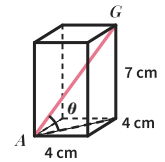
$$AC = 17, h = 17 \tan 30^\circ$$

$$h = 9.8 \text{ cm}$$

Answer _____

8

Find the length of AG and the angle θ it makes with the base.



$$AC = \sqrt{32}, AG = \sqrt{(32 + 49)} = 9, \sin \theta = 7 \div 9$$

$$\theta = 51.1^\circ$$

Answer _____

Pythagoras and trigonometry in 3D further practice

ANSWERS 

9

A crate is 50 cm long, 40 cm wide and 30 cm tall. A pole rests from one bottom corner to the opposite top corner. Find the angle the pole makes with the floor of the crate.

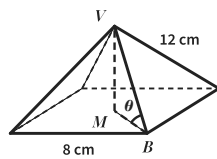
$$\text{the floor diagonal is } \sqrt{4100} = 64.0, \tan \theta = 30 \div 64.0$$

$$\theta = 25.1^\circ$$

Answer _____

10

A pyramid has a square base of side 8 cm. Each sloping edge is 12 cm. Find the angle θ between an edge and the base.



$$\text{half the diagonal is } \sqrt{32} = 5.66, \cos \theta = 5.66 \div 12$$

$$\theta = 61.9^\circ$$

Answer _____

11

A box has a square base of side 10 cm. Its diagonal AG makes an angle of 40° with the base. How tall is the box?

$$AC = \sqrt{200} = 14.14, \text{ height} = 14.14 \tan 40^\circ$$

$$\text{height} = 11.9 \text{ cm}$$

Answer _____

12

A tent is a square based pyramid. The base has sides of 6 m. Each sloping edge makes an angle of 65° with the ground. How tall is the tent?

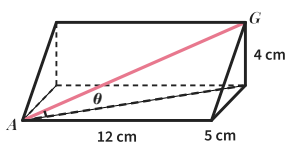
$$\text{half the diagonal is } \sqrt{18} = 4.24, \text{ height} = 4.24 \tan 65^\circ$$

$$\text{height} = 9.1 \text{ m}$$

Answer _____

13

Find the angle θ between AG and the base of this ramp.



$$AC = 13, \tan \theta = 4 \div 13$$

$$\theta = 17.1^\circ$$

Answer _____

14

A field is a rectangle 40 m by 30 m. A 15 m mast stands upright at one corner. Find the angle of elevation of the top of the mast from the opposite corner.

$$\text{the diagonal of the field is } 50 \text{ m, } \tan \theta = 15 \div 50$$

$$\theta = 16.7^\circ$$

Answer _____

15

A box has a square base. Its diagonal AG is 20 cm and makes an angle of 35° with the base. Find the length of a side of the base.

$$AC = 20 \cos 35^\circ = 16.38, \text{ side} = 16.38 \div \sqrt{2}$$

$$\text{side} = 11.6 \text{ cm}$$

Answer _____

16

A cuboid is 3 cm by 4 cm by 12 cm tall. Ali says the angle between AG and the base is $\tan^{-1}(12 \div 4) = 71.6^\circ$. Explain his mistake and find the angle.

$$\text{he used an edge, not the diagonal of the base: } AC = 5, \tan \theta = 12 \div 5$$

$$\theta = 67.4^\circ$$

Answer _____