

Further 2D and 3D problems

About 50 minutes Calculator allowed 41 marks

Hints online, answers free with an account:
mathswariz.uk/worksheets/gcse-further-2d-and-3d-problems/

Date _____

A Do Now

The first question is what today's lesson needs. The others bring back earlier topics.

- A1** Needed today [2 marks] **A2** From chapter 19 [2 marks]
- A cuboid is 8 cm by 8 cm by 14 cm. Find the length of its longest diagonal.
- A bag holds 7 red and 8 blue counters. Two counters are taken at random without replacement. Find the probability that they are the same colour.

Answer

Answer

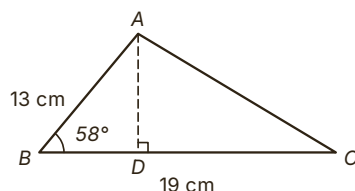
- A3** From chapter 7 [2 marks] **A4** From chapter 12 [2 marks]
- Triangles ABC and PQR are congruent, with A matching P , B matching Q and C matching R . $BC = (2x + 9)$ cm and $QR = (5x - 27)$ cm. Find the length of BC .
- Two triangles are similar. A side of the smaller triangle is x cm and the matching side of the larger triangle is $(x + 6)$ cm. Another pair of matching sides are 2 cm and 5 cm. Find x .

Answer

Answer

B Example, then your turn

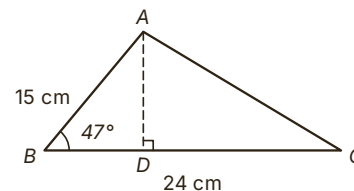
Your teacher works through each example with you. Then try the one beside it.

EXAMPLE 1Find AC . Give your answer to 1 d.p.

Not drawn accurately

Hint The perpendicular AD makes two right-angled triangles.

- B1**
- Find
- AC
- . Give your answer to 1 d.p. [4 marks]

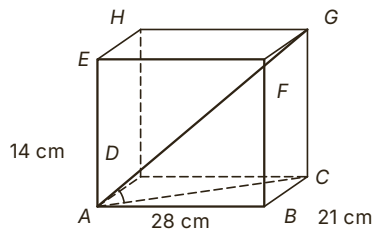


Not drawn accurately

Answer

EXAMPLE 2

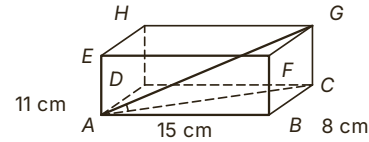
Find the angle between AG and the base $ABCD$, to 1 d.p.



Not drawn accurately

Hint The angle is between AG and AC .

B2 Find the angle between AG and the base $ABCD$, to 1 d.p. [3 marks]

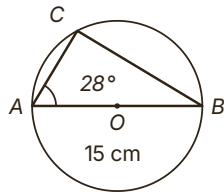


Not drawn accurately

Answer

c Practice

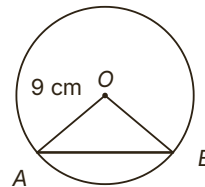
C1 AB is a diameter. Find BC to 3 s.f. [2 marks]



Not drawn accurately

Answer

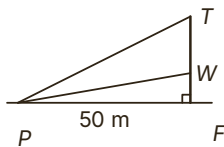
C2 AB is a side of a regular pentagon in the circle. Find AB to 3 s.f. [3 marks]



Not drawn accurately

Answer

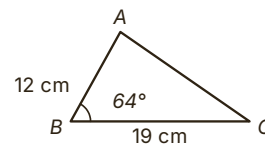
C3 From P the angles of elevation of T and W are 38° and 21° . Find TW to 1 d.p. [3 marks]



Not drawn accurately

Answer

C4 Find the area of triangle ABC to 3 s.f. [3 marks]

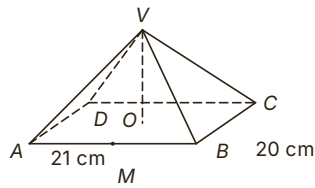


Not drawn accurately

Answer

D Exam-style questions

- D1** $VABCD$ is a pyramid on a rectangular base with $AB = 21$ cm and $BC = 20$ cm. V is 18 cm directly above O , the centre of the base. M is the midpoint of AB .



Not drawn accurately

- (a) Work out the angle between the edge VA and the base, to 1 d.p. [3 marks]

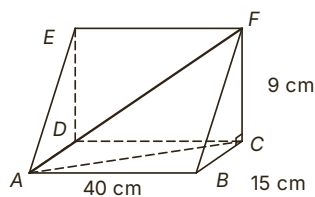
Answer

- (b) Work out the angle between the face VAB and the base, to 1 d.p. [2 marks]

Answer

Total for D1: 5 marks

- D2** A wedge has a horizontal rectangular base $ABCD$ and a vertical face $DCFE$. Tom says, "The angle between AF and the base is $\tan^{-1}(9 \div 40) = 12.7^\circ$."



Not drawn accurately

- (a) Explain why Tom is wrong, and work out the correct angle to 1 d.p. [3 marks]

Answer

- (b) Work out the angle between AF and the edge AB , to 1 d.p. [3 marks]

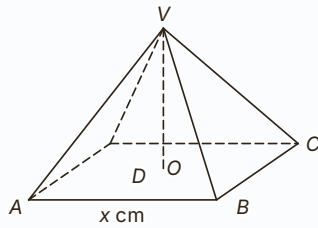
Answer

Total for D2: 6 marks

E Extension

No route is given. The hints are at the end of the sheet. Use one at a time.

- E1** The top V of the pyramid is 12 cm above the centre O of the square base. Each sloping edge makes 40° with the base. Find x to 3 s.f. [4 marks]



Not drawn accurately

Answer

Extension hints

Cover these with paper. Uncover one at a time.

- E1** **Hint 1** Use triangle VAO : you know VO and the angle at A .
Hint 2 $AO = 12 \div \tan 40^\circ = 14.30$
Hint 3 AO is half the diagonal of the square, so the diagonal is 28.60; then use Pythagoras on the square.

How did it go?

Colour one circle on each line: not yet, nearly, yes.

- I can draw a right angle inside a harder shape. ☐ ☐ ☐
- I can find the angle between a line and a plane. ☐ ☐ ☐
- I can work in a cuboid, a pyramid and a wedge. ☐ ☐ ☐