

Dr Oliver Mathematics
Mathematics: National Qualifications N5
2023 Paper 2: Calculator
1 hour 30 minutes

The total number of marks available is 50.

You must write down all the stages in your working.

1. A caravan was bought for £20 000. (3)

It depreciated by 11% in the first year.

It then depreciated by a further 6% each year over the next two years.

Calculate the value of the caravan three years after it was bought.

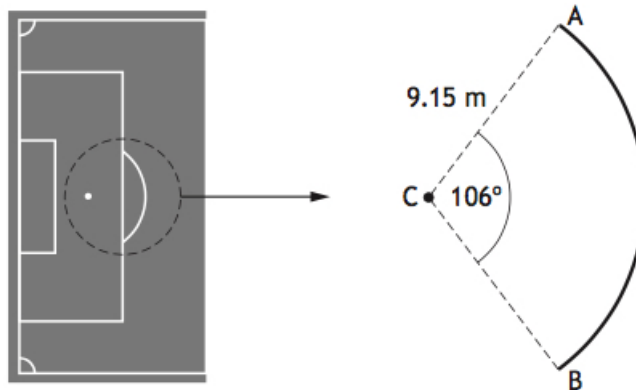
2. The mass of a helium atom is 6.64×10^{-24} grams. (3)

A flask contains 300 grams of helium.

Calculate the number of helium atoms in this flask.

Give your answer in scientific notation, correct to 3 significant figures.

3. The diagram shows part of a football pitch. (3)



The penalty spot is marked at point C .

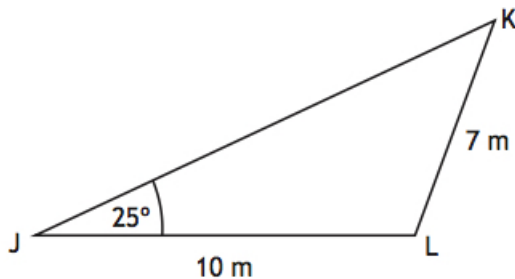
AB is an arc of a circle, centre C , radius 9.15 metres.

Calculate the length of the arc AB .

4. The diagram shows triangle JKL .

(3)

- Angle $KJL = 25^\circ$.
- $JL = 10$ metres.
- $KL = 7$ metres.

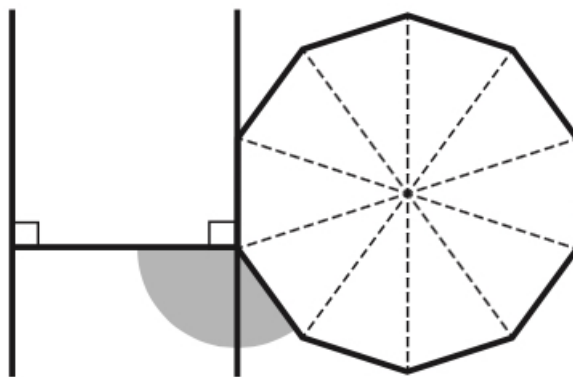


Calculate the size of angle JKL .

5. A logo consists of an H-shape and a regular decagon.

(2)

The diagram represents the logo.



Calculate the size of the shaded angle.

6. Nadim bought a flat last year.

(3)

The value of the flat has increased by 8% and it is now worth £94 500.

Calculate how much Nadim paid for the flat.

7. Change the subject of the formula

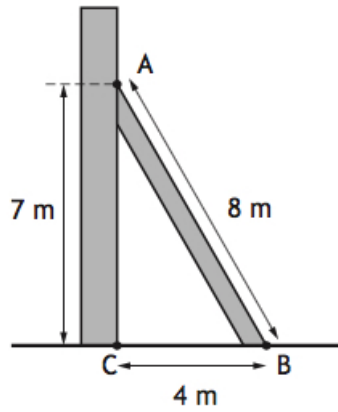
(3)

$$P = \frac{1}{3}mn - r$$

to m .

8. A wooden beam is used to support a wall built on horizontal ground as shown in the diagram.

(4)

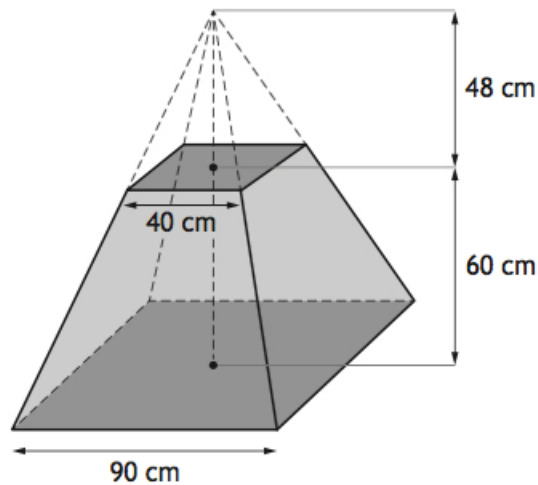


- The edge of the beam, AB , is 8 metres long.
- C is at the foot of the wall.
- A is 7 metres from C .
- B is 4 metres from C .

Determine whether the wall is perpendicular to the ground.
Justify your answer.

9. A concrete block is in the shape of a large pyramid with a small pyramid removed.

(4)



The large pyramid has a square base of length 90 centimetres.

The small pyramid has a square base of length 40 centimetres and a height of 48 centimetres.

The block has height 60 centimetres.

Calculate the volume of the block.

10. Express

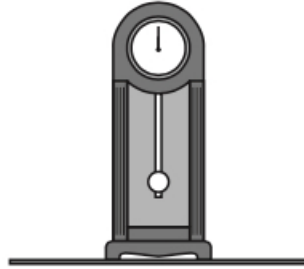
$$\frac{7}{x-3} - \frac{2}{x}, \quad x \neq 3, \quad x \neq 0,$$

(3)

as a single fraction in its simplest form.

11. Anna has a grandfather clock in her house.

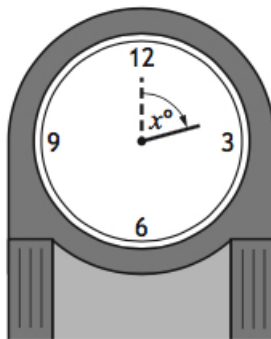
(4)



The height of the tip of the hour hand above the floor, in centimetres, is given by

$$h = 20 \cos x^\circ + 147,$$

where x° is the angle the hour hand has rotated through since 12 o'clock.



Calculate the first two values of x for which the tip of the hour hand is 150 centimetres above the floor.

12. Simplify

(3)

$$\frac{x^2 - 16}{x^2 + x - 20}$$

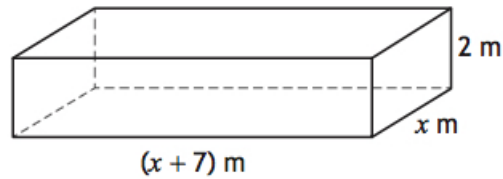
13. Simplify

(2)

$$2 \sin^2 x^\circ + 2 \cos^2 x^\circ$$

Show your working.

14. A storage unit, built in the shape of a cuboid, is shown.



It has length $(x + 7)$ metres, breadth x metres, and height 2 metres.
The volume of this unit is 45 cubic metres.

(a) Show that

(2)

$$2x^2 + 14x - 45 = 0.$$

(b) Calculate x , the breadth of the storage unit.

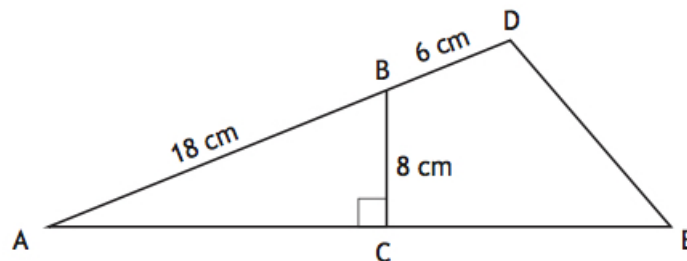
(4)

Give your answer correct to 1 decimal place.

15. In the diagram:

(4)

- AC is perpendicular to BC ,
- $AB = 18$ centimetres,
- $BD = 6$ centimetres, and
- $BC = 8$ centimetres.



The **area** of triangle ADE is 160 square centimetres.

Calculate the length of AE .