Dr Oliver Mathematics
GCSE Mathematics
2024 November Paper 1H: Non-Calculator
1 hour 30 minutes

The total number of marks available is 80.
You must write down all the stages in your working.

1. Work out (3)

$$818.4 \div 1.2.$$

2. The table shows the probabilities that a biased dice will land on 3, on 4, on 5, and on 6.

Number on dice	1	2	3	4	5	6
Probability			0.10	0.30	0.05	0.25

Karim assumes that the probabilities that the dice will land on 1 and on 2 are the same.

Karim rolls the biased dice 500 times.

(a) Assuming Karim is right, work out an estimate for the number of times the dice will land on 2. (3)

Karim is wrong.

The probability that the dice will land on 2 is greater than the probability that the dice will land on 1.

(b) How does this information affect your answer to part (a)? (1)

3. (a) Work out (2)

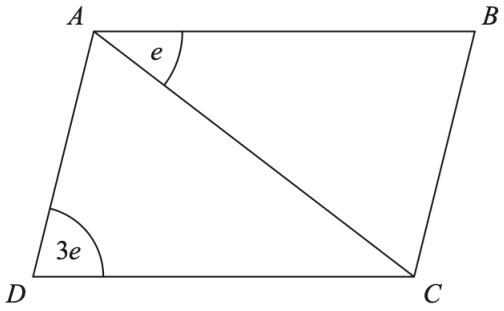
$$3\tfrac{1}{2} - 1\tfrac{1}{6}.$$

Give your answer as a mixed number.

(b) Show that (3)

$$5\tfrac{1}{4} \div 2\tfrac{1}{3} = 2\tfrac{1}{4}.$$

4. $ABCD$ is a parallelogram. (3)



All angles are measured in degrees.

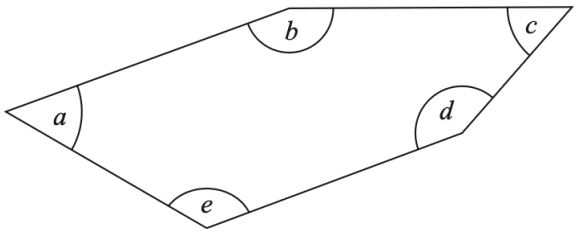
Find an expression, in terms of e, for the size of angle CAD.
Give a reason for each stage of your working.

5. A car travelled 4.96 miles at an average speed of 30.4 miles per hour.

   (a) Work out an estimate for the time taken by the car. (3)
   Give your answer in minutes.

   (b) Is your answer to part (a) an underestimate or an overestimate? (1)
   Give a reason for your answer.

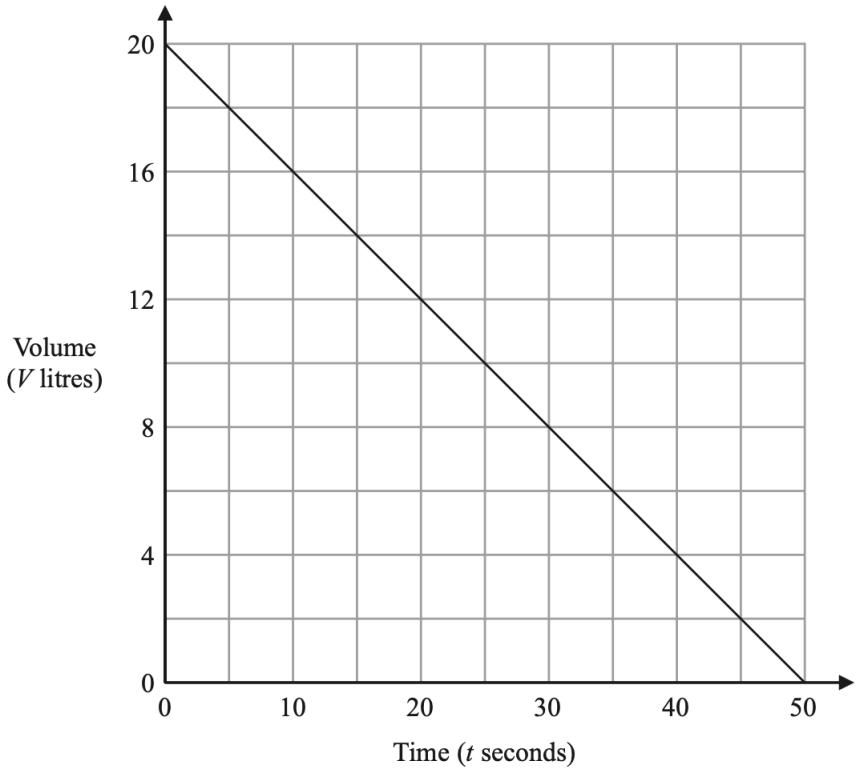
6. Here is a pentagon. (4)



- Angle a = angle c.
- Angle $b = 155°$.
- Angle d is three times the size of angle c.
- Angle e is two times the size of angle c.

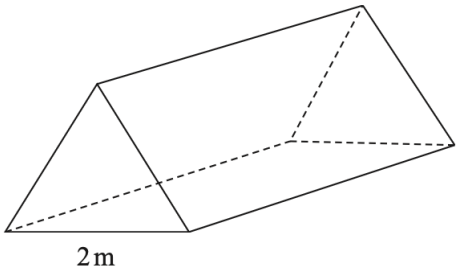
Work out the size of angle a.

7. The graph shows the volume of water, V litres, in a tank at time t seconds. (1)



What does the gradient of this graph represent?

8. The diagram shows a solid triangular prism on a horizontal floor. (3)

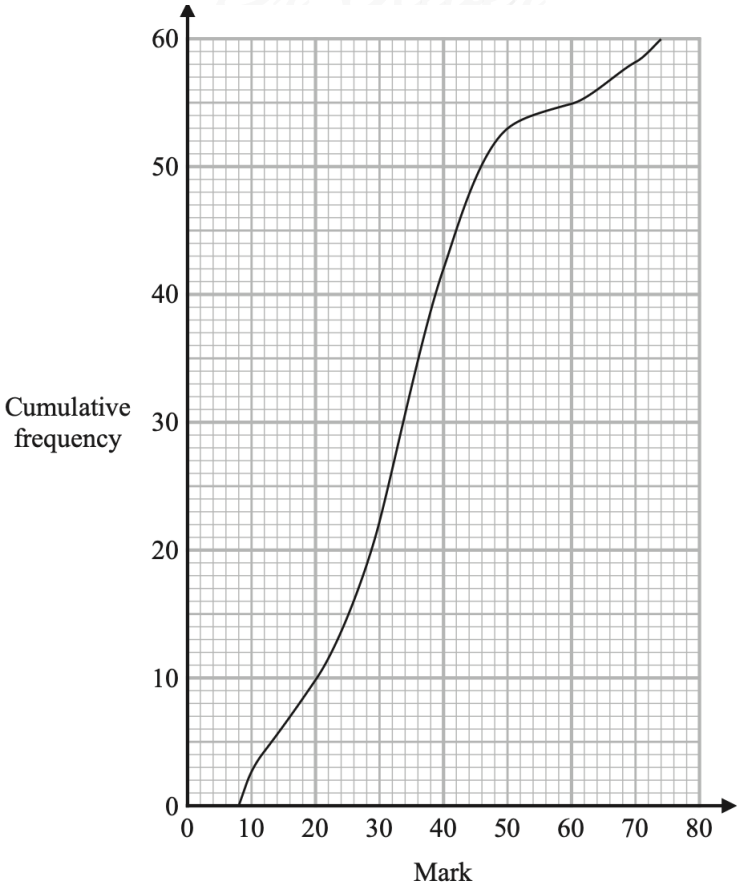


$$\text{pressure} = \frac{\text{force}}{\text{area}}$$

- The face in contact with the floor is a rectangle of width 2 m.
- The pressure on the floor due to the prism is 80 newtons/m^2.
- The force exerted by the prism on the floor is 720 newtons.

Work out the length of the prism.

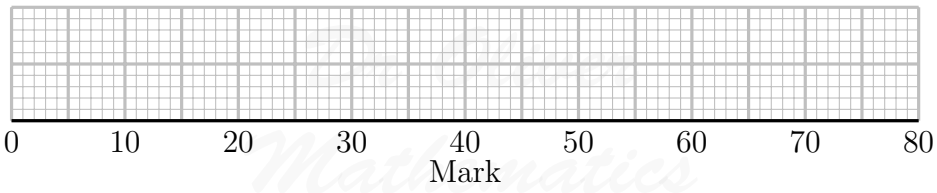
9. The cumulative frequency graph gives information about the marks that 60 students got in a test.



For these 60 students

- the highest mark was 74 and
- the lowest mark was 8.

(a) On the grid below, draw a box plot. (3)



The pass mark for the test was 40.

Sian says, "30% of the 60 students passed the test."

(b) Is Sian correct? (3)
You must show how you get your answer.

10. (a) Work out (2)

$$25^{\frac{1}{2}} \times 8^{\frac{1}{3}}.$$

(b) Find the value of (2)

$$\left(\tfrac{1}{32}\right)^{\frac{3}{5}}.$$

11. Kate was asked to factorise

$$x^2 + 5x + 6$$

in the form

$$(x + a)(x + b).$$

Kate says, "The sum of a and b must be 6 and the product of a and b must be 5."

(a) Explain what is wrong with Kate's statement. (1)

(b) Factorise fully (2)

$$2m^2 - 2.$$

(c) Factorise fully (2)

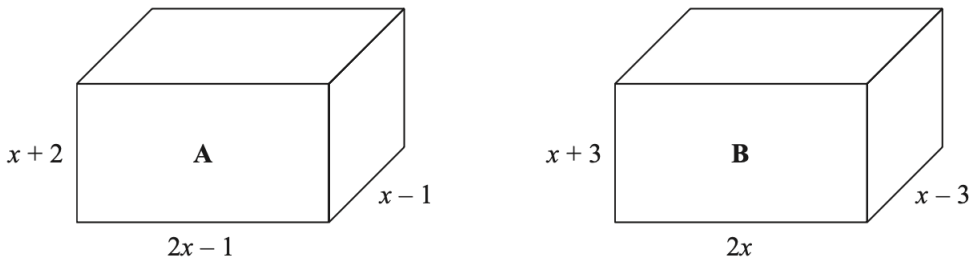
$$ax + bx - ay - by.$$

12. **A**, **B**, and **C** are three solid spheres. (4)

- Sphere **A** has a volume of 64 cm^3.
- Sphere **B** has a volume of 125 cm^3.
- The radius of sphere **C** is 50% of the radius of sphere **B**.

Work out the ratio of the surface area of sphere **A** to the surface area of sphere **C**.
Give your answer in the form $a : b$ where a and b are integers.

13. Here are two cuboids. (5)

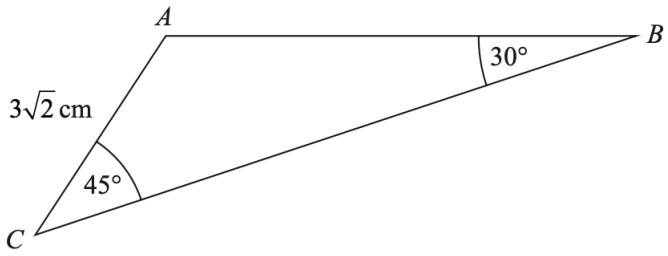


All lengths are measured in centimetres.

The volume of cuboid **A** is 142 cm^3 greater than the volume of cuboid **B**.

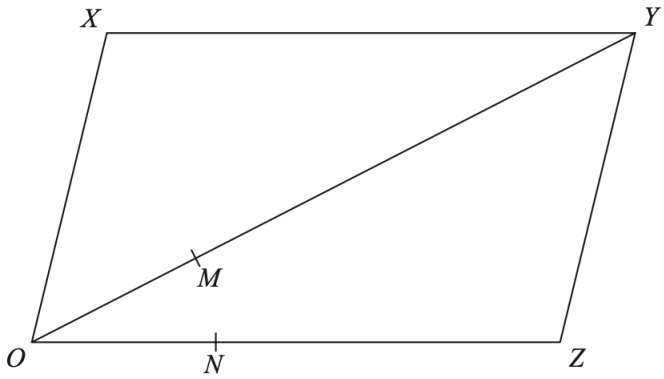
Work out the value of x.

14. ABC is a triangle. (3)



Work out the length of AB.

15. $OXYZ$ is a parallelogram. (4)



- $\overrightarrow{OY} = \mathbf{a}$.
- $\overrightarrow{OZ} = \mathbf{b}$.
- M is the point on OY such that

$$OM : MY = 1 : 3.$$

- N is the point on OZ such that

$$ON : NZ = 1 : 2.$$

Work out the ratio

$$XN : MN.$$

You must show all your working.

16. (a) Rationalise the denominator of (2)

$$\frac{15}{\sqrt{5}}.$$

Give your answer in its simplest form.

(b) Write (4)

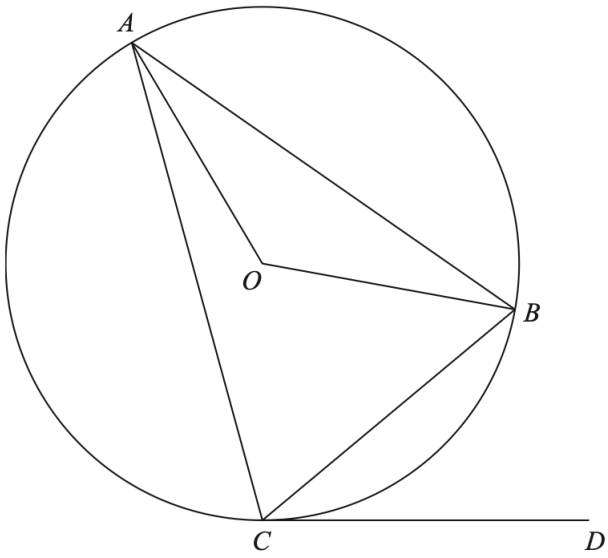
$$\frac{\sqrt{75}-2}{1+2\sqrt{3}}$$

in the form

$$\frac{a-b\sqrt{3}}{c},$$

where a, b, and c are integers.

17. A, B, and C are points on a circle, centre O. (4)



- CD is a tangent to the circle.
- Angle $BCD = 40°$.
- Angle $OAB = 3 \times$ angle OAC.

Work out the size of angle ACD.
Write down any circle theorems that you use.

18.

$$\mathrm{f}(x) = \frac{5x-3}{4}.$$

(a) Find $\mathrm{f}^{-1}(x)$. (2)

For all values of x,

$$\mathrm{g}(x) = (x-1)^2 \text{ and } \mathrm{h}(x) = 1-2x.$$

(b) Work out the value of $\mathrm{g\,h}(5)$. (2)

19. In the semi-finals of a chess tournament, (4)

- player **A** will play player **B** and
- player **C** will play player **D**.

The two winners will then play each other in the final.

- The probability that player **A** will win against player **B** is 0.6.
- The probability that player **A** will win against player **C** is 0.5.
- The probability that player **A** will win against player **D** is 0.3.
- The probability that player **C** will win against player **D** is 0.2.

Work out the probability that player **A** will win the chess tournament.

20. **C** is the circle with equation (4)

$$x^2 + y^2 = 4.$$

Find an equation of the tangent to **C** at the point $(p, 1)$ where $p > 0$.

Give your answer in the form

$$y + x\sqrt{a} = b,$$

where a and b are integers.