



Cambridge O Level

CANDIDATE
NAME

CENTRE
NUMBER

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CANDIDATE
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MATHEMATICS (SYLLABUS D)

4024/11

Paper 1

October/November 2022

2 hours

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- Calculators must **not** be used in this paper.
- You may use tracing paper.
- You must show all necessary working clearly.

INFORMATION

- The total mark for this paper is 80.
- The number of marks for each question or part question is shown in brackets [].

This document has **20** pages. Any blank pages are indicated.

ELECTRONIC CALCULATORS MUST NOT BE USED IN THIS PAPER

- 1 (a) The temperature was -2°C .
The temperature decreases by 8°C .

Find the temperature after this change.

..... $^{\circ}\text{C}$ [1]

- (b) On another day, the temperature increases from -5°C to 3°C .

Work out the increase in temperature.

..... $^{\circ}\text{C}$ [1]

- 2 Find 45% of \$1.20 .

\$ [2]

- 3 Write these fractions in order of size, starting with the smallest.

$$\frac{11}{12}$$

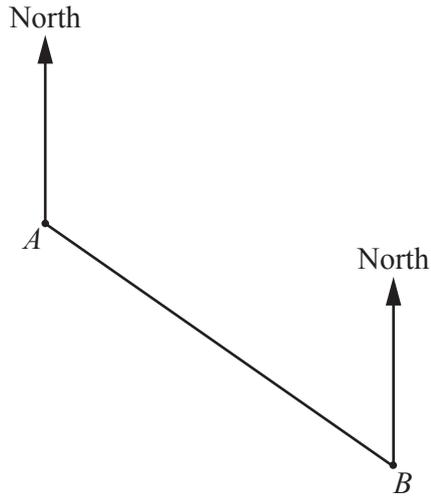
$$\frac{4}{5}$$

$$\frac{27}{30}$$

$$\frac{13}{15}$$

..... , , , [2]
smallest

4



Scale: 1 cm to 30 m

The diagram shows the position of two ships, *A* and *B*.
On the diagram 1 cm represents 30 m.

(a) Find, by measurement, the actual distance of *B* from *A*.

..... m [2]

(b) Measure the bearing of *B* from *A*.

..... [1]

(c) A third ship is positioned at *C*.
C is on a bearing of 164° from *A* and on a bearing of 252° from *B*.

Find and label the position of *C* on the diagram. [2]

5 (a) Write 306.248

(i) correct to 2 decimal places,

..... [1]

(ii) correct to 2 significant figures.

..... [1]

(b) By writing each number correct to 1 significant figure, estimate the value of

$$9.37^2 - \sqrt[3]{1046} .$$

..... [2]

6 (a) Write $4 \times 4 \times 4 \times 4 \times 4$ as a power of 4.

..... [1]

(b) Simplify $(\sqrt{5})^2$.

..... [1]

(c) Simplify $(2x^3)^4$.

..... [1]

7 (a) Work out $\frac{7}{8} - \frac{3}{4}$.

..... [1]

(b) Work out $1\frac{3}{5} \div \frac{4}{7}$.

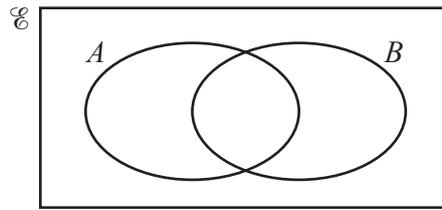
Give your answer as a mixed number in its lowest terms.

..... [2]

8 Factorise $3a^2 + 12a$.

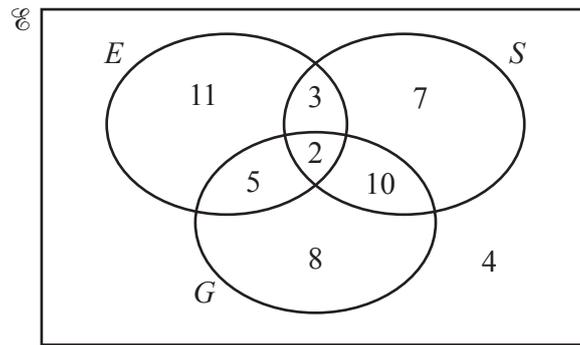
..... [2]

- 9 (a) In the Venn diagram, shade the region represented by $A \cap B$.



[1]

- (b) This Venn diagram shows information about the number of students who study English (E), Spanish (S) and German (G).



- (i) Find the number of students who study English and German but not Spanish.

..... [1]

- (ii) Find $n(G \cup S)'$.

..... [1]

10 (a) Write the number 320 000 000 in standard form.

..... [1]

(b) Evaluate $\frac{2 \times 10^{-3}}{4 \times 10^9}$.

Give your answer in standard form.

..... [2]

11 (a) Write 120 as a product of its prime factors.

..... [2]

(b) $315 = 3^2 \times 5 \times 7$

Use this information to find the smallest integer value of n , such that $315n$ is a square number.

..... [1]

12 Expand and simplify.

(a) $3(2x + 1) - 2(4x + 3)$

..... [2]

(b) $(x + 5)(x - 3)$

..... [2]

13 (a) The n th term of a sequence is $3n^2 - 1$.

Find the first three terms of the sequence.

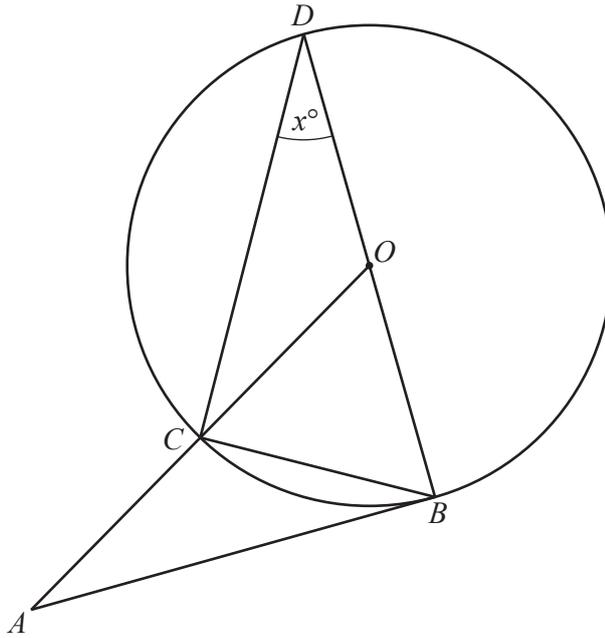
.....,, [2]

(b) These are the first five terms of a different sequence.

1 3 9 27 81

Find an expression, in terms of n , for the n th term of this sequence.

..... [2]



NOT TO SCALE

B , C and D are points on the circumference of a circle, centre O .
 AB is a tangent to the circle at B .
 BD is a diameter and OCA is a straight line.
 $\widehat{CDB} = x^\circ$.

Find an expression, in terms of x , for each of the following.
 Write each expression in its simplest form.

(a) \widehat{COB}

$\widehat{COB} = \dots\dots\dots$ [1]

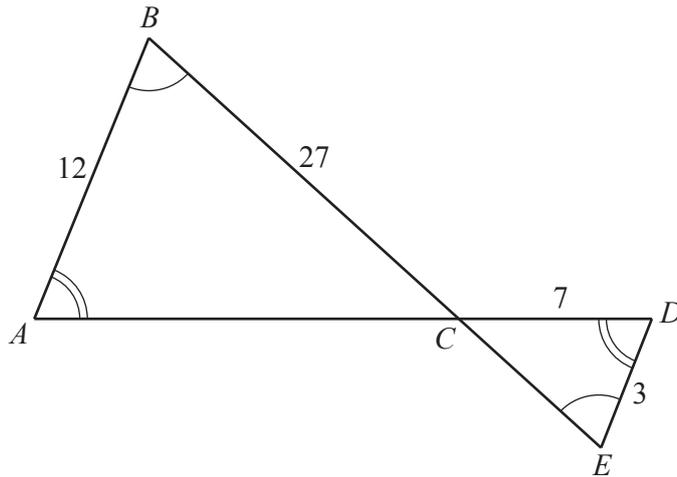
(b) \widehat{OAB}

$\widehat{OAB} = \dots\dots\dots$ [2]

(c) \widehat{CBO}

$\widehat{CBO} = \dots\dots\dots$ [2]

15



NOT TO SCALE

Triangle ABC is mathematically similar to triangle DEC .
 $AB = 12$ cm, $BC = 27$ cm, $CD = 7$ cm and $DE = 3$ cm.

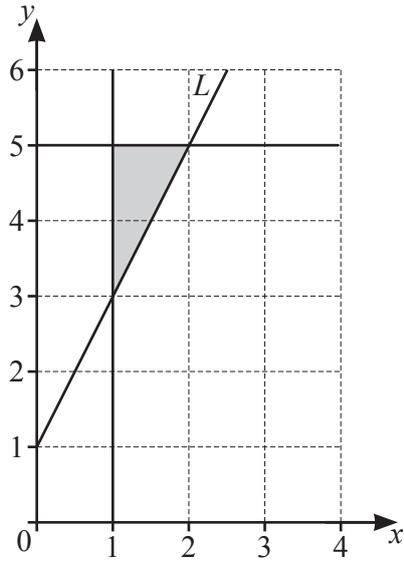
(a) Calculate AC .

..... cm [2]

(b) Given that the area of triangle ABC is 160 cm², calculate the area of triangle DEC .

..... cm² [2]

16



(a) Find the gradient of the line L .

..... [1]

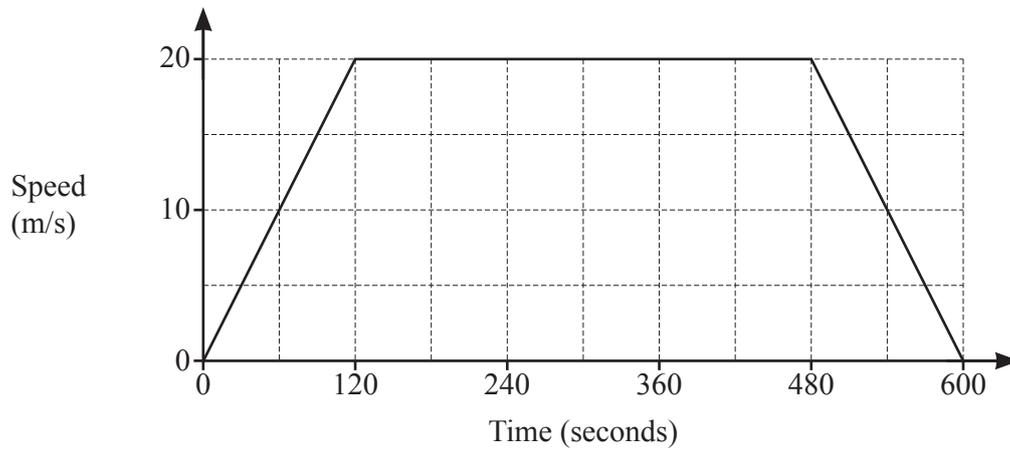
(b) The shaded region on the diagram is defined by three inequalities.

Write down these three inequalities.

.....

 [3]

17 The diagram shows the speed–time graph of Sam’s journey from home to work.



(a) Calculate the acceleration, in m/s^2 , for the first 2 minutes of Sam’s journey.

..... m/s^2 [1]

(b) Calculate Sam’s average speed, in m/s , for the whole journey.

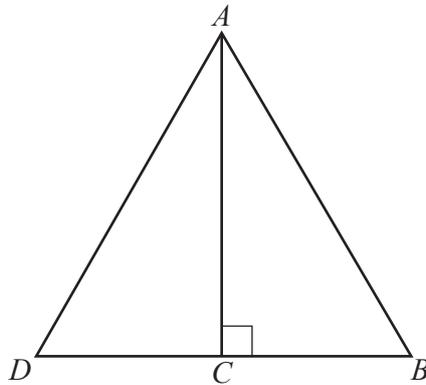
..... m/s [3]

- 18 b is directly proportional to the square of a .
When $a = 3$, $b = 18$.

Find b when $a = 5$.

$b = \dots\dots\dots$ [2]

- 19



ABD is an equilateral triangle.
 C lies on DB and AC is perpendicular to DB .

Show that triangle ADC is congruent to triangle ABC .
Give a reason for each statement you make.

.....

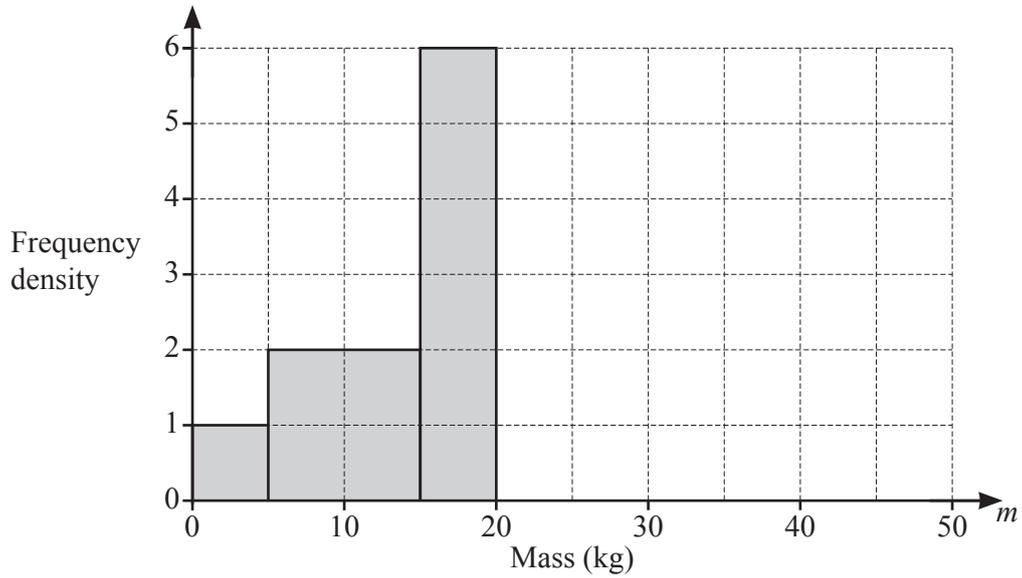
.....

.....

..... [3]

- 20 A farmer records the mass of each of his sheep.
Some of the results are summarised in the table and illustrated in the histogram.

| | | | | | |
|----------------|----------------|-----------------|------------------|------------------|------------------|
| Mass (m kg) | $0 < m \leq 5$ | $5 < m \leq 15$ | $15 < m \leq 20$ | $20 < m \leq 30$ | $30 < m \leq 50$ |
| Frequency | 5 | 20 | a | 40 | 20 |



- (a) Use the histogram to find the value of a .

$a = \dots\dots\dots$ [1]

- (b) Complete the histogram.

[2]

$$21 \quad \mathbf{A} = \begin{pmatrix} 3 & 1 \\ -4 & 2 \end{pmatrix}$$

$$\mathbf{A} + 2\mathbf{B} = \begin{pmatrix} 1 & 5 \\ 10 & 12 \end{pmatrix}$$

(a) Find \mathbf{B} .

$$\left(\begin{array}{c} \\ \end{array} \right) [2]$$

(b) Find \mathbf{A}^{-1} .

$$\left(\begin{array}{c} \\ \end{array} \right) [2]$$

22 (a) $x^2 - 6x - 7 = (x + a)^2 + b$

Find the value of a and the value of b .

$$a = \dots\dots\dots$$

$$b = \dots\dots\dots [2]$$

(b) Hence solve the equation $x^2 - 6x - 7 = 0$.
Show your working.

$$x = \dots\dots\dots \text{ or } x = \dots\dots\dots [2]$$

23 [Volume of a cone = $\frac{1}{3}\pi r^2 h$, curved surface area of a cone = $\pi r l$]

[Surface area of a sphere = $4\pi r^2$]

A solid cone has radius y cm.

The slant height of the cone is 25% larger than the radius of the cone.

A solid sphere has radius R cm.

The surface area of the sphere is equal to the **total** surface area of the cone.

(a) Show that $y = \frac{4R}{3}$.

[3]

(b) Find the volume of the cone in terms of R .
Give your answer as simply as possible.

..... cm^3 [4]

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