Cambridge Assessment International Education

# Cambridge O Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

*0463049118*

**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.


© UCLES 2022

**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.

..... °C [1]

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

Work out the increase in temperature.

..... °C [1]

**2** Find 45% of \$1.20 .

\$ ..... [2]

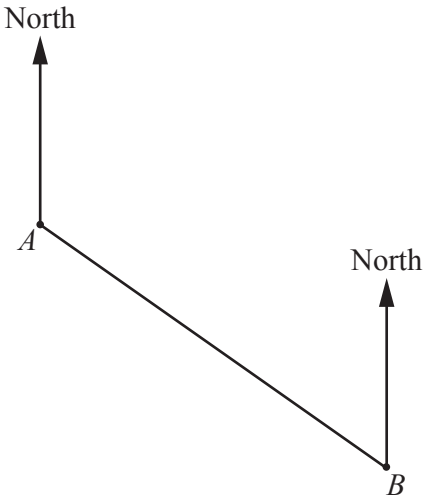
**3** Write these fractions in order of size, starting with the smallest.

$$\frac{11}{12} \qquad \frac{4}{5} \qquad \frac{27}{30} \qquad \frac{13}{15}$$

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

© UCLES 2022

**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 $\left(\sqrt{5}\right)^2$ .

..... [1]

**(c)** Simplify $\left(2x^3\right)^4$ .

..... [1]

© UCLES 2022

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

..... [1]

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

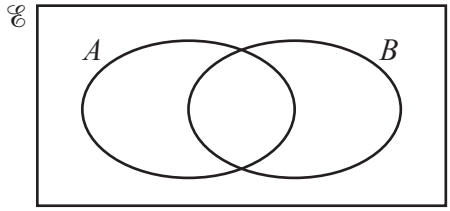
Give your answer as a mixed number in its lowest terms.

..... [2]

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

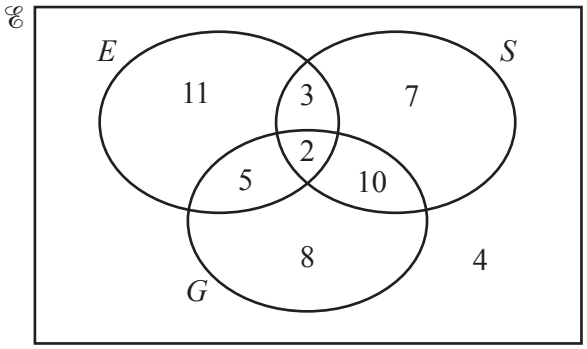
..... [2]

**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 $\mathrm{n}(G \cup S)'$ .

..... [1]

© UCLES 2022

**10** **(a)** Write the number $320\,000\,000$ in standard form.

..... [1]

**(b)** Evaluate $\dfrac{2\times10^{-3}}{4\times10^{9}}$.

Give your answer in standard form.

..... [2]

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

..... [2]

**(b)** $315 = 3^2\times5\times7$

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.

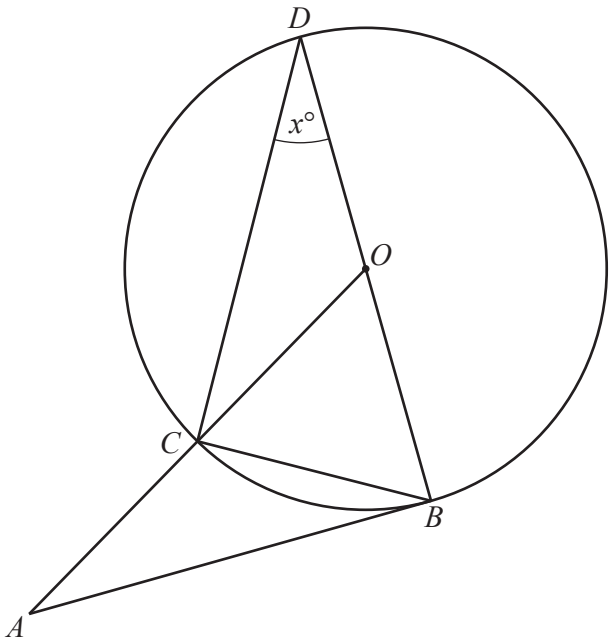
1 3 9 27 81

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

..... [2]

© UCLES 2022

**14**




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.
$C\hat{D}B = x°$ .

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

**(a)** $C\hat{O}B$

$C\hat{O}B =$ ..... [1]

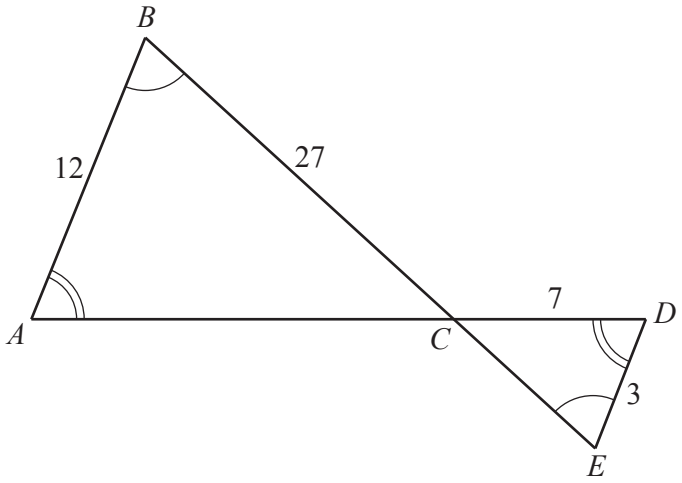
**(b)** $O\hat{A}B$

$O\hat{A}B =$ ..... [2]

**(c)** $C\hat{B}O$

$C\hat{B}O =$ ..... [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 $AC$.

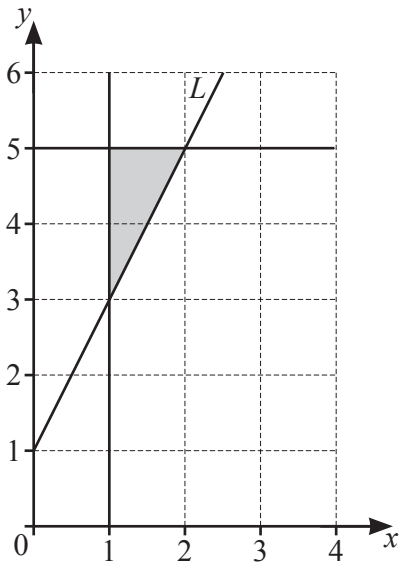
..... cm [2]

**(b)** Given that the area of triangle $ABC$ is 160 $cm^2$, calculate the area of triangle $DEC$.

..... $cm^2$ [2]

© UCLES 2022

**16**




**(a)** Find the gradient of the line $L$.

..... [1]

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

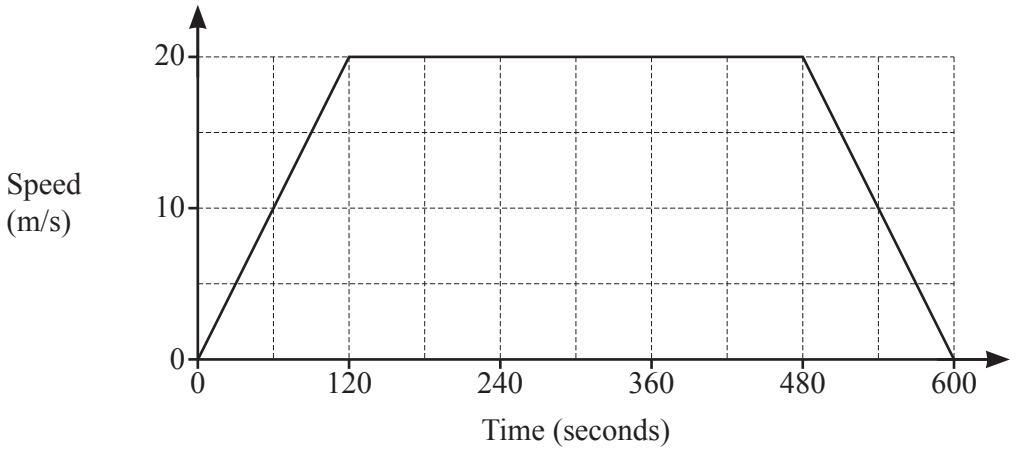
Write down these three inequalities.

.....

.....

..... [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.

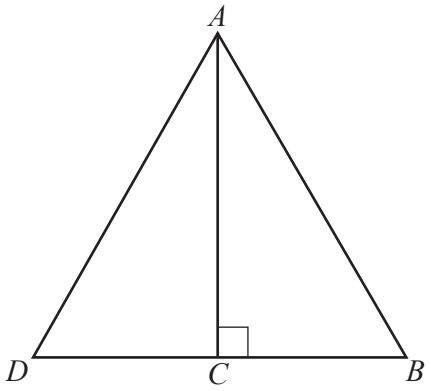
..... m/s [3]

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

Find $b$ when $a = 5$.

$b =$ ..... [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.

.....

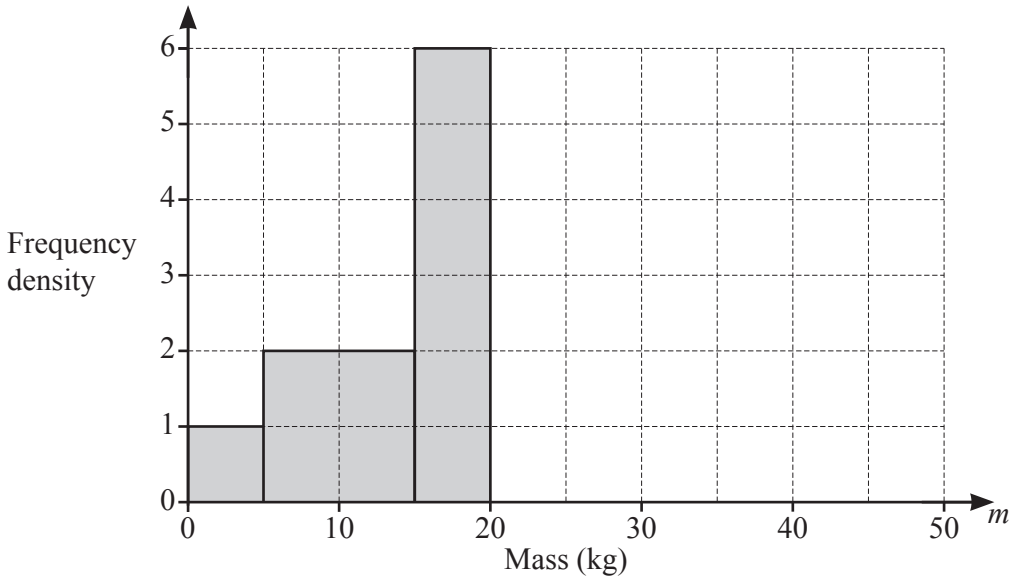
.....

.....

..... [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) | $0 < m \leqslant 5$ | $5 < m \leqslant 15$ | $15 < m \leqslant 20$ | $20 < m \leqslant 30$ | $30 < m \leqslant 50$ |
|---|---|---|---|---|---|
| Frequency | 5 | 20 | $a$ | 40 | 20 |




**(a)** Use the histogram to find the value of $a$.

$a =$ ..... [1]

**(b)** Complete the histogram. [2]

© UCLES 2022

**21** $\mathbf{A} = \begin{pmatrix} 3 & 1 \\ -4 & 2 \end{pmatrix}$ $\mathbf{A} + 2\mathbf{B} = \begin{pmatrix} 1 & 5 \\ 10 & 12 \end{pmatrix}$

**(a)** Find $\mathbf{B}$.

$\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

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

$\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

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

Find the value of $a$ and the value of $b$.

$a =$ .....

$b =$ ..... [2]

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

$x =$ ..... or $x =$ ..... [2]

© UCLES 2022

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

**[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.

..... $\text{cm}^3$ [4]

© UCLES 2022

**BLANK PAGE**

© UCLES 2022

**BLANK PAGE**

© UCLES 2022

**BLANK PAGE**

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge Assessment International Education Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cambridgeinternational.org after the live examination series.

Cambridge Assessment International Education is part of Cambridge Assessment. Cambridge Assessment is the brand name of the University of Cambridge Local Examinations Syndicate (UCLES), which is a department of the University of Cambridge.

© UCLES 2022