Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTER NUMBER						CANDIDATE NUMBER				

4336125518

MATHEMATICS (US) **0444/43**

Paper 4 (Extended) **October/November 2020**

2 hours 30 minutes

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, center 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.
- You should use a calculator where appropriate.
- You may use tracing paper.
- You must show all necessary work clearly.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.
- For π, use either your calculator value or 3.142.

INFORMATION

- The total mark for this paper is 130.
- The number of marks for each question or part question is shown in parentheses [ ].

This document has **20** pages. Blank pages are indicated.

DC (PQ/CGW) 196713/2

Formula List

For the equation $ax^2 + bx + c = 0$ $\quad x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Lateral surface area, A, of cylinder of radius r, height h. $\quad A = 2\pi rh$

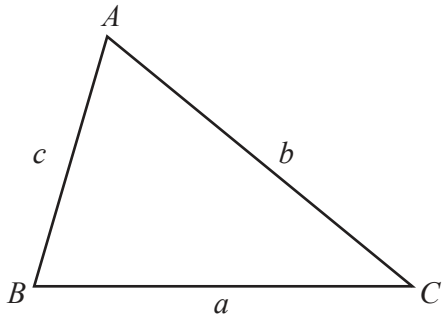
Lateral surface area, A, of cone of radius r, sloping edge l. $\quad A = \pi rl$

Surface area, A, of sphere of radius r. $\quad A = 4\pi r^2$

Volume, V, of pyramid, base area A, height h. $\quad V = \frac{1}{3}Ah$

Volume, V, of cone of radius r, height h. $\quad V = \frac{1}{3}\pi r^2 h$

Volume, V, of sphere of radius r. $\quad V = \frac{4}{3}\pi r^3$

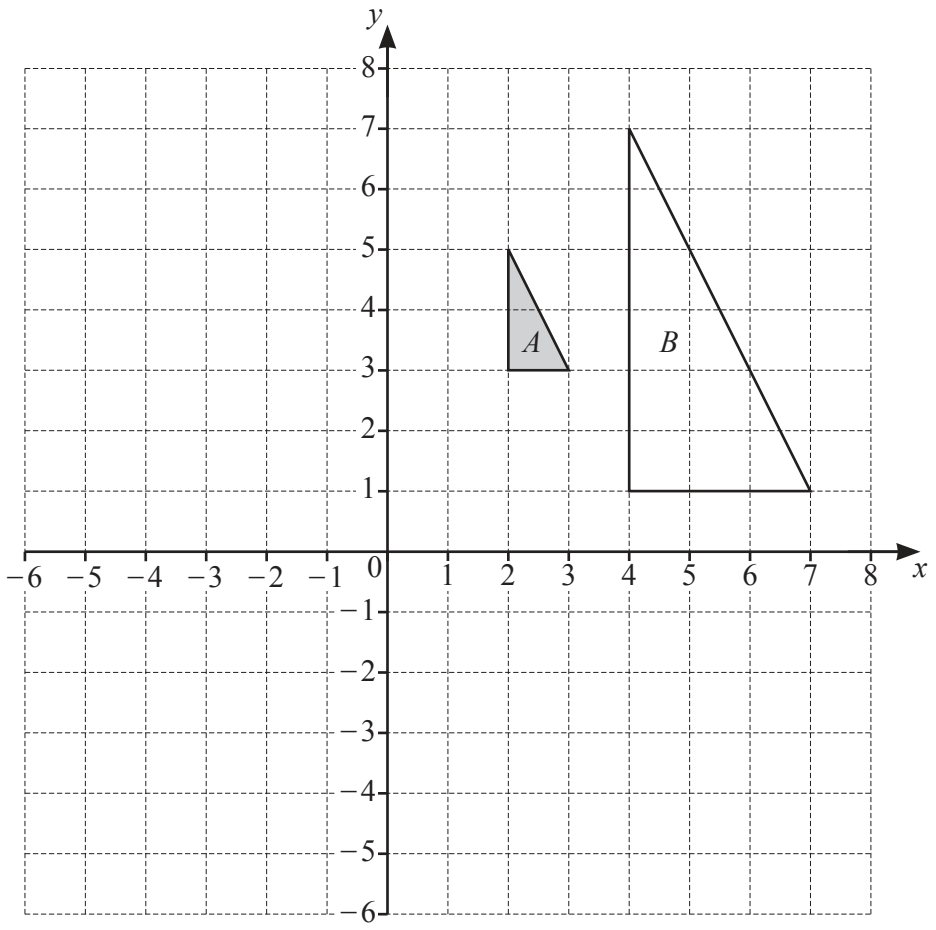


$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc\cos A$$

$$\text{Area} = \frac{1}{2}bc\sin A$$

1



(a) On the grid, draw the image of

(i) triangle A after a rotation of 90° counter-clockwise about (0, 0), [2]

(ii) triangle A after a translation by the vector $\begin{pmatrix} 3 \\ -5 \end{pmatrix}$. [2]

(b) Describe fully the **single** transformation that maps triangle A onto triangle B.

.....

..... [3]

2 **(a)** The Earth has a surface area of approximately 510 100 000 km^2.

(i) Write this surface area in scientific notation.

..... km^2 [1]

(ii) Water covers 70.8% of the Earth's surface.

Work out the area of the Earth's surface covered by water.

..... km^2 [2]

(b) The table shows the surface area of some countries and their estimated population in 2017.

Country	Surface area (km^2)	Estimated population in 2017
Brunei	5.77×10^3	433 100
China	9.60×10^6	1 388 000 000
France	6.41×10^5	67 000 000
Maldives	3.00×10^2	374 600

(i) Find the total surface area of Brunei and the Maldives.

..... km^2 [1]

(ii) The ratio surface area of the Maldives : surface area of China can be written in the form 1 : n.

Find the value of n.

$n =$ ..... [2]

(iii) Find the surface area of France as a percentage of the surface area of China.

..... % [2]

(iv) Find the population density of the Maldives.
[Population density = population ÷ surface area]

..... people/km^2 [2]

(c) The population of the Earth in 2017 was estimated to be 7.53×10^9.

The population of the Earth in 2000 was estimated to be 6.02×10^9.

(i) Work out the percentage increase in the Earth's estimated population from 2000 to 2017.

..... % [2]

(ii) Assume that the population of the Earth increased exponentially by y% each year for these 17 years.

Find the value of y.

$y =$ ..... [3]

3

P	O	S	S	I	B	I	L	I	T	Y

Morgan picks two of these letters, at random, **without** replacement.

(a) Find the probability that he picks

(i) the letter Y first,

..... [1]

(ii) the letter B then the letter Y,

..... [2]

(iii) two letters that are the same.

..... [3]

(b) Morgan now picks a third letter at random.

Find the probability that

(i) all three letters are the same,

..... [2]

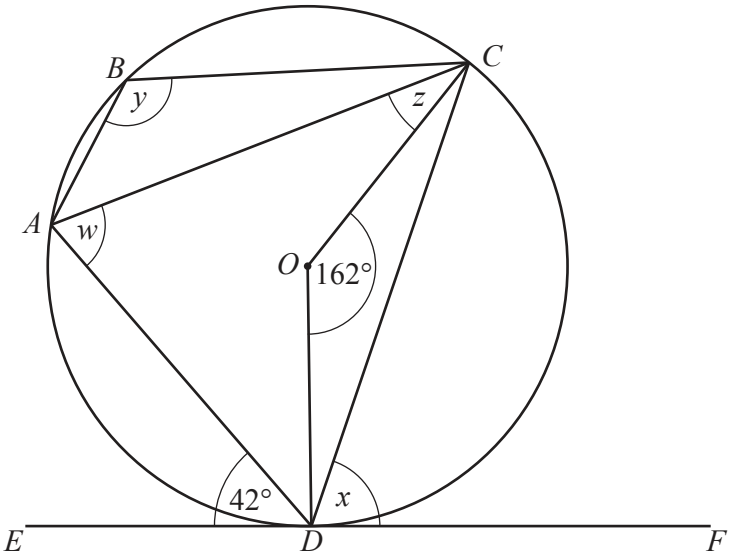
(ii) exactly two of the three letters are the same,

..... [5]

(iii) all three letters are different.

..... [2]

4 (a)



NOT TO SCALE

A, B, C and D are points on the circle, center O.
EF is a tangent to the circle at D.
Angle $ADE = 42°$ and angle $COD = 162°$.

Find the values of w, x, y, and z.

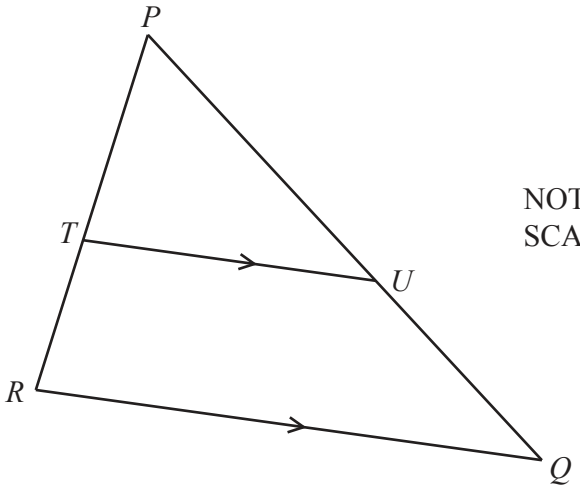
$w =$ .....

$x =$ .....

$y =$ .....

$z =$ ..... [7]

(b)



NOT TO SCALE

PQR is a triangle.
T is a point on *PR* and *U* is a point on *PQ*.
RQ is parallel to *TU*.

(i) Explain why triangle *PQR* is similar to triangle *PUT*.
Give a reason for each statement you make.

.....

.....

.....

..... [3]

(ii) $PT : TR = 4 : 3$

(a) Find the ratio $PU : PQ$.

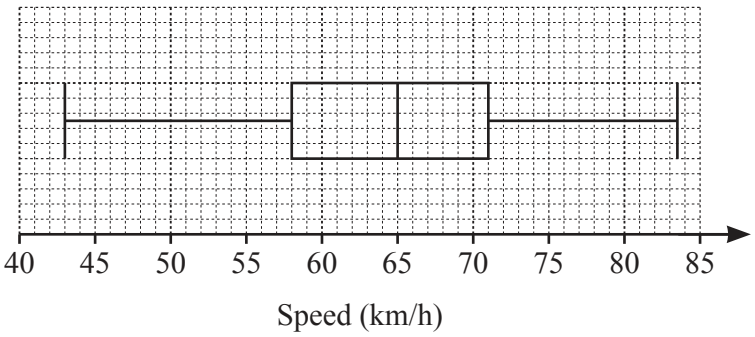
..... : ..... [1]

(b) The area of triangle *PUT* is $20\,\text{cm}^2$.

Find the area of the quadrilateral *QRTU*.

..... cm^2 [3]

5 **(a)** The average speeds, in km/h, of cars traveling along a road are recorded.
The box plot shows this information.



Find

(i) the lowest speed recorded,

..... km/h [1]

(ii) the median,

..... km/h [1]

(iii) the interquartile range.

..... km/h [1]

(b) Another car takes 18 seconds to travel 400 m along this road.

Calculate the average speed of this car in km/h.

..... km/h [3]

6 **(a)** Find the integer values that satisfy the inequality $2 < 2x \leqslant 10$.

..... [2]

(b) Factor.

(i) $6y^2 - 15xy$

..... [2]

(ii) $y^2 - 9x^2$

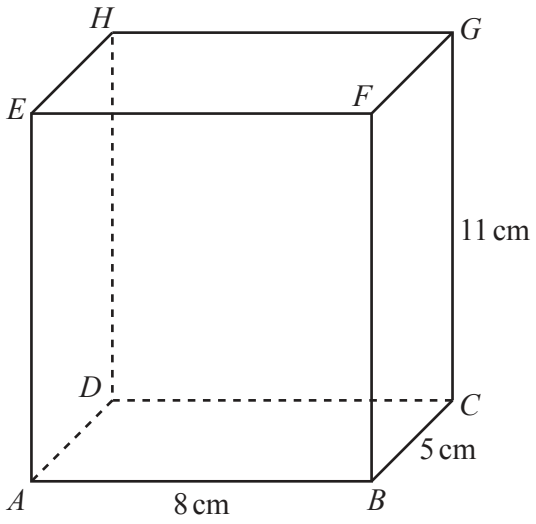
..... [2]

(c) Simplify.

$$\frac{3}{x-1} - \frac{2}{2x+1}$$

..... [3]

7



NOT TO SCALE

ABCDEFGH is a closed hollow cuboid.
$AB = 8$ cm, $BC = 5$ cm and $CG = 11$ cm.

(a) (i) Work out the total surface area of the cuboid.

..... cm^2 [2]

(ii) The cuboid is made from thin metal and 1 cm^2 of this metal has a mass of 0.73 grams.

Work out the mass of the cuboid.

..... g [1]

(b) Ivana has a rod of length 13 cm.

(i) The total mass of this rod and the cuboid is 0.3 kg.

Find the mass of the rod, giving your answer in grams.

..... g [2]

(ii) Show that the rod fits completely inside the cuboid.

[4]

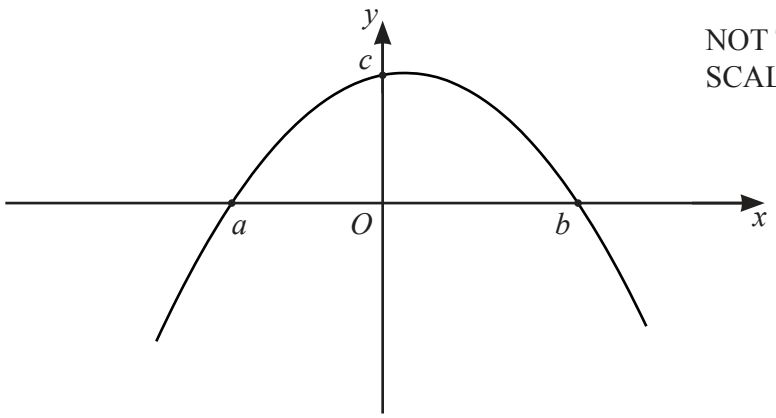
(c) Calculate angle *CAB*.

Angle *CAB* = ... [2]

8 **(a)** **(i)** Factor $24+5x-x^2$.

..... [2]

(ii) The diagram shows a sketch of $y = 24+5x-x^2$.



NOT TO SCALE

Work out the values of a, b, and c.

$a =$ .....

$b =$ .....

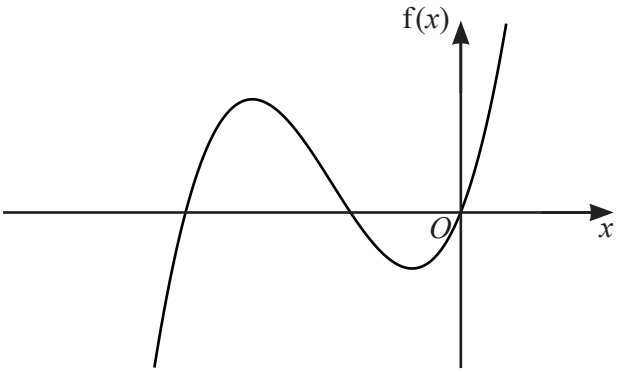
$c =$ ..... [3]

(iii) The line $y = 18$ intersects the graph of $y = 24+5x-x^2$ at P and Q.

Find the length of PQ.

$PQ =$ ..... [4]

(b)



NOT TO SCALE

The diagram shows a sketch of the graph of a cubic function $f(x)$.
The graph passes through the points $(-5, 0)$, $(-2, 0)$, $(0, 0)$, and $(1, 36)$.

Find $f(x)$ in the form $ax^3 + bx^2 + cx$.

..... [6]

9 **(a)** $\overrightarrow{AB} = \begin{pmatrix} 6 \\ -1 \end{pmatrix}$ $\overrightarrow{BC} = \begin{pmatrix} -2 \\ 5 \end{pmatrix}$ $\overrightarrow{DC} = \begin{pmatrix} 2 \\ -3 \end{pmatrix}$

Find

(i) $\overrightarrow{AC}$,

$\overrightarrow{AC} = \begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [2]

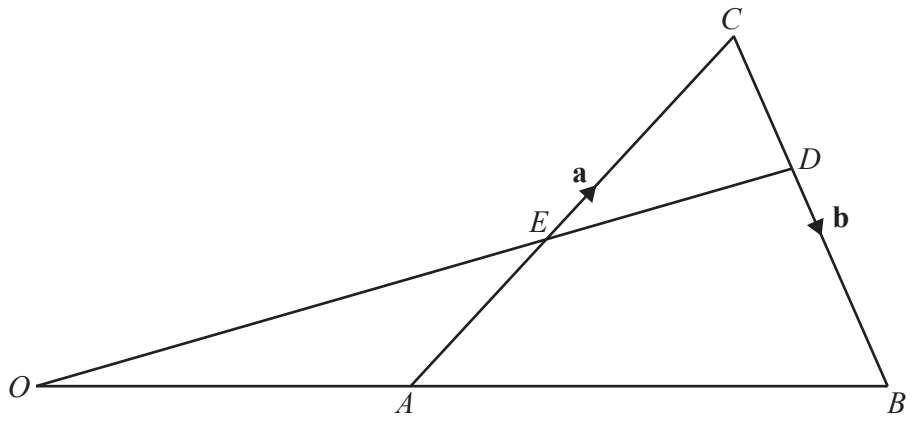
(ii) $\overrightarrow{BD}$,

$\overrightarrow{BD} = \begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [2]

(iii) $\left|\overrightarrow{BC}\right|$.

..... [2]

(b)



NOT TO SCALE

In the diagram, OAB and OED are straight lines.
O is the origin, A is the midpoint of OB and E is the midpoint of AC.
$\overrightarrow{AC} = \mathbf{a}$ and $\overrightarrow{CB} = \mathbf{b}$.

Find, in terms of **a** and **b**, in its simplest form

(i) $\overrightarrow{AB}$,

$\overrightarrow{AB} =$ ..... [1]

(ii) $\overrightarrow{OE}$,

$\overrightarrow{OE} =$ ..... [2]

(iii) the position vector of D.

..... [3]

10 $f(x) = 4 - 3x$ $g(x) = x^2 + x$ $h(x) = 3^x$

(a) Find f(h(2)).

..... [2]

(b) Find $f^{-1}(x)$.

$f^{-1}(x) =$ ..... [2]

(c) Simplify.

(i) $f(1 - 2x)$

..... [2]

(ii) $g(f(x)) - 9g(x)$

..... [4]

(d) $\frac{1}{\mathrm{h}(x)} = 9^{kx}$

Find the value of k.

$k =$ ..... [2]

(e) $\mathrm{j}(x) = (x+1)(x+2)$

The graph of $\mathrm{g}(x)$ is mapped onto the graph of $\mathrm{j}(x)$ by a translation.

Find the column vector that represents this translation.

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

Question 11 is printed on the next page.

11 The table shows the first four terms in sequences A, B, C and D.

Sequence	1st term	2nd term	3rd term	4th term	5th term		nth term
A	4	9	14	19			
B	3	10	29	66			
C	1	4	16	64			
D	$\frac{3}{17}$	$\frac{4}{26}$	$\frac{5}{37}$	$\frac{6}{50}$			

Complete the table.

[12]