Cambridge IGCSE

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTER NUMBER

CANDIDATE NUMBER

MATHEMATICS (US) **0444/43**

Paper 4 (Extended) **October/November 2019**

2 hours 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Geometrical instruments
Electronic calculator

READ THESE INSTRUCTIONS FIRST

Write your center number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If work is needed for any question it must be shown in the space provided.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant digits.
Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

The number of points is given in parentheses [ ] at the end of each question or part question.
The total of the points for this paper is 130.

Write your calculator model in the box below.

This document consists of **20** printed pages.

Cambridge Assessment International Education

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. $\quad A = 2\pi rh$

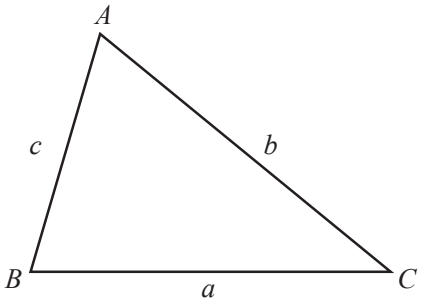
Lateral surface area, A, of cone of radius r, sloping edge l. $\quad A = \pi rl$

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. $\quad V = \frac{4}{3}\pi r^3$

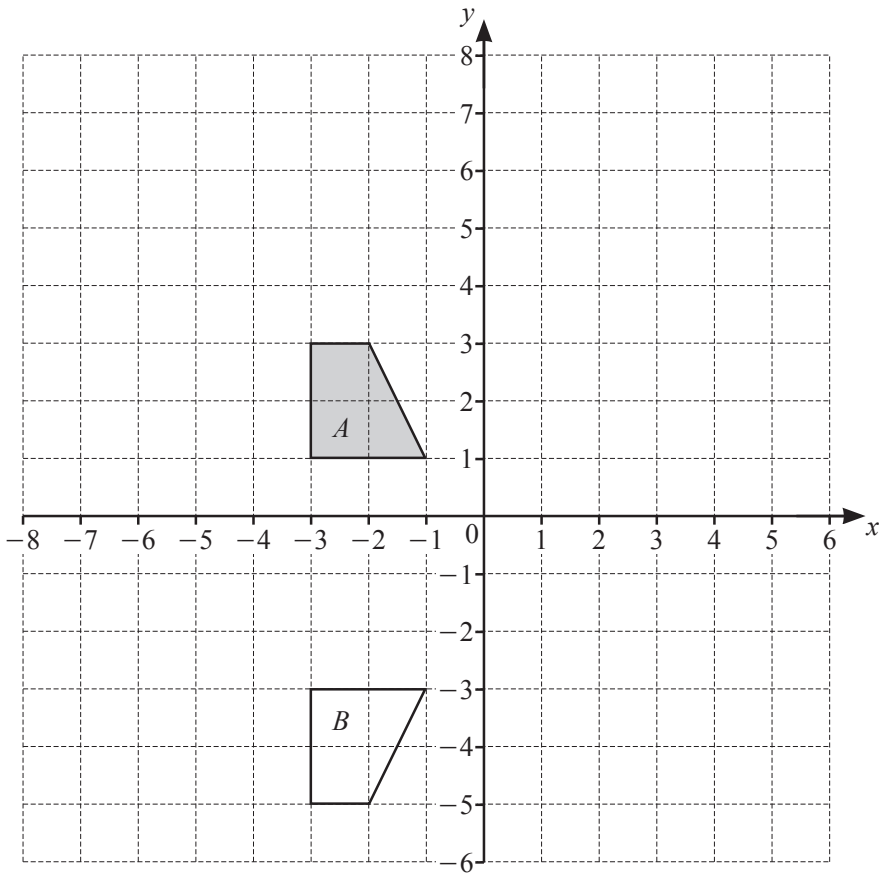


$\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$

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

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

1



(a) Describe fully the **single** transformation that maps shape *A* onto shape *B*.

.....

..... [2]

(b) On the grid, draw the image of

(i) shape *A* after a rotation through 180° about (0, 0), [2]

(ii) shape *A* after an enlargement, scale factor 2, center (−7, 0), [2]

(iii) shape *A* after a stretch, factor 2, with the *y*-axis invariant. [2]

[Turn over

2 **(a)** In a cycling club, the number of members are in the ratio males : females = 8 : 3.
The club has 342 females.

(i) Find the total number of members.

..... [2]

(ii) Find the percentage of the total number of members that are female.

..... % [1]

(b) The price of a bicycle is $1020.
Club members receive a 15% discount on this price.

Find how much a club member pays for this bicycle.

$ ..... [2]

(c) In 2019, the membership fee of the cycling club is $79.50 .
This is 6% more than last year.

Find the **increase** in the cost of the membership.

$ ..... [3]

(d) Asif cycles a distance of 105 km.
On the first part of his journey he cycles 60 km in 2 hours 24 minutes.
On the second part of his journey he cycles 45 km at 20 km/h.

Find his average speed for the whole journey.

..... km/h [4]

(e) Bryan invested $480 in an account 4 years ago.
The account pays compound interest at a rate of 2.1% per year.
Today, he uses some of the money in this account to buy a bicycle costing $430.

Calculate how much money remains in his account.

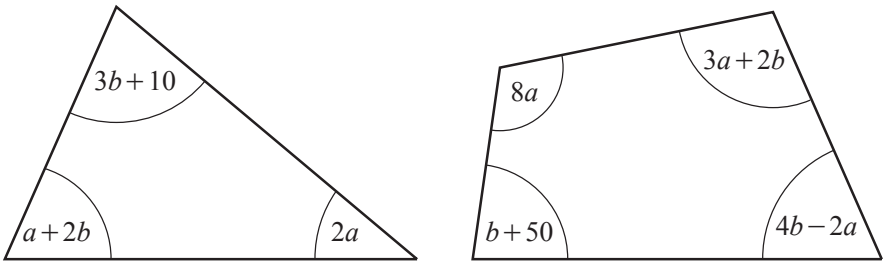
$ ..... [3]

(f) The formula $t = \sqrt{\frac{2s}{a}}$ is used to calculate the time, t, of a bicycle journey.

Find t when $s = 5$ and $a = 0.3$.
Give your answer correct to 2 significant figures.

$t =$ ..... [2]

3 **(a)** The diagram shows a triangle and a quadrilateral.
All angles are in degrees.



NOT TO SCALE

(i) For the triangle, show that $3a + 5b = 170$.

[1]

(ii) For the quadrilateral, show that $9a + 7b = 310$.

[1]

(iii) Solve this system of linear equations.
Show all your working.

$a =$ .....

$b =$ ..... [3]

(iv) Find the size of the smallest angle in the triangle.

..... [1]

(b) Solve the equation $6x - 3 = -12$.

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

(c) $2(4x - y) = 5x - 3$

Solve for y.

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

(d) Simplify.

$$(27x^9)^{\frac{2}{3}}$$

..... [2]

(e) Simplify.

$$\frac{x^2 + 5x}{x^2 - 25}$$

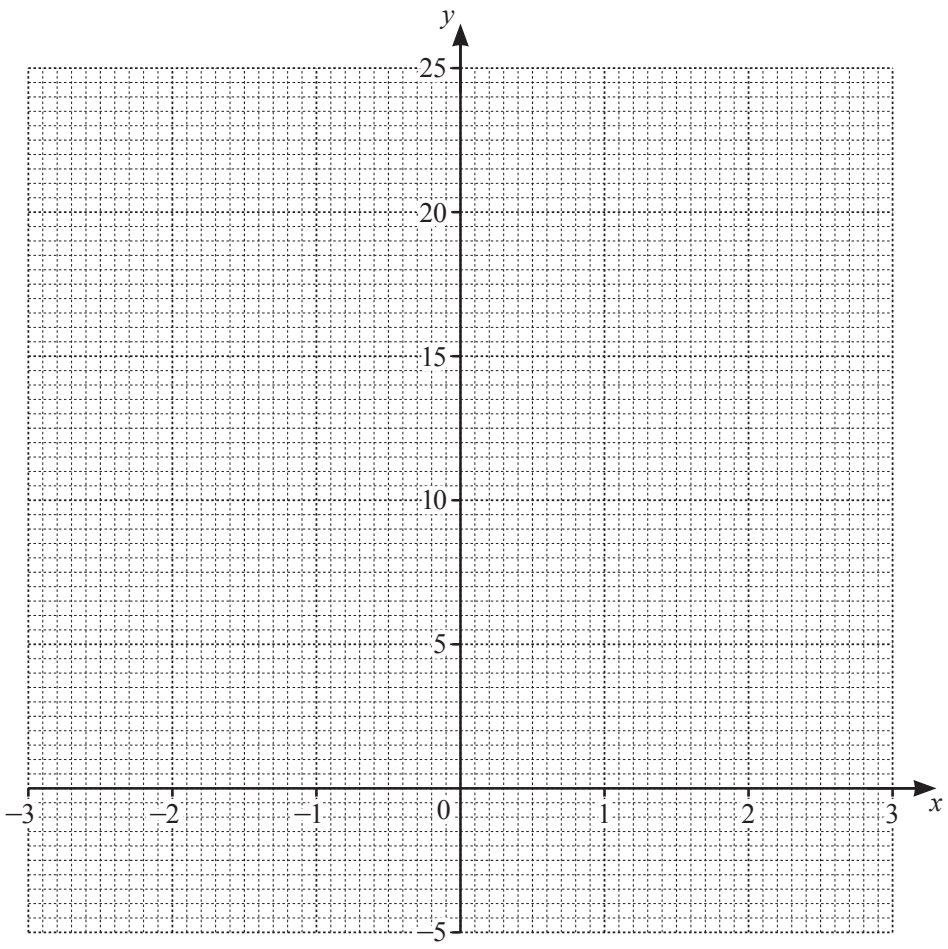
..... [3]

4 The table shows some values for $y = x^3 + x^2 - 5x$.

x	−3	−2	−1.5	−1	0	1	1.5	2	2.5	3
y	−3	6	6.4		0		−1.9	2	9.4	

(a) Complete the table. [3]

(b) On the grid, draw the graph of $y = x^3 + x^2 - 5x$ for $-3 \leqslant x \leqslant 3$.



[4]

(c) Use your graph to solve the equation $x^3 + x^2 - 5x = 0$.

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

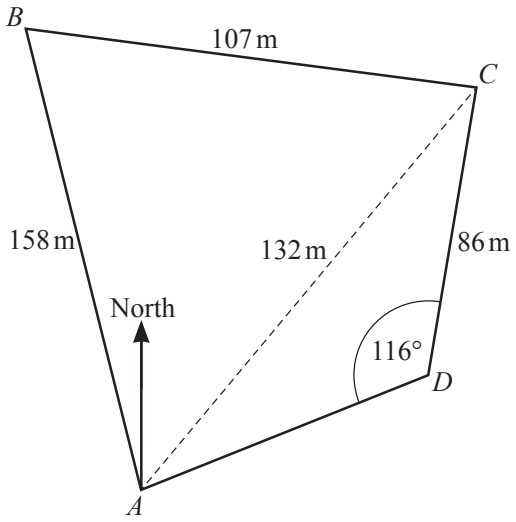
(d) By drawing a suitable tangent, find an estimate of the slope of the curve at $x = 2$.

..... [3]

(e) Write down the largest value of the integer, k, so that the equation $x^3 + x^2 - 5x = k$ has three solutions for $-3 \leqslant x \leqslant 3$.

$k =$ ..... [1]

5



NOT TO SCALE

The diagram shows a field, *ABCD*, on horizontal ground.

(a) There is a vertical post at *C*.
From *B*, the angle of elevation of the top of the post is 19°.

Find the height of the post.

..... m [2]

(b) Use the cosine rule to find angle *BAC*.

Angle *BAC* = ... [4]

(c) Use the sine rule to find angle CAD.

Angle CAD = ... [3]

(d) Calculate the area of the field.

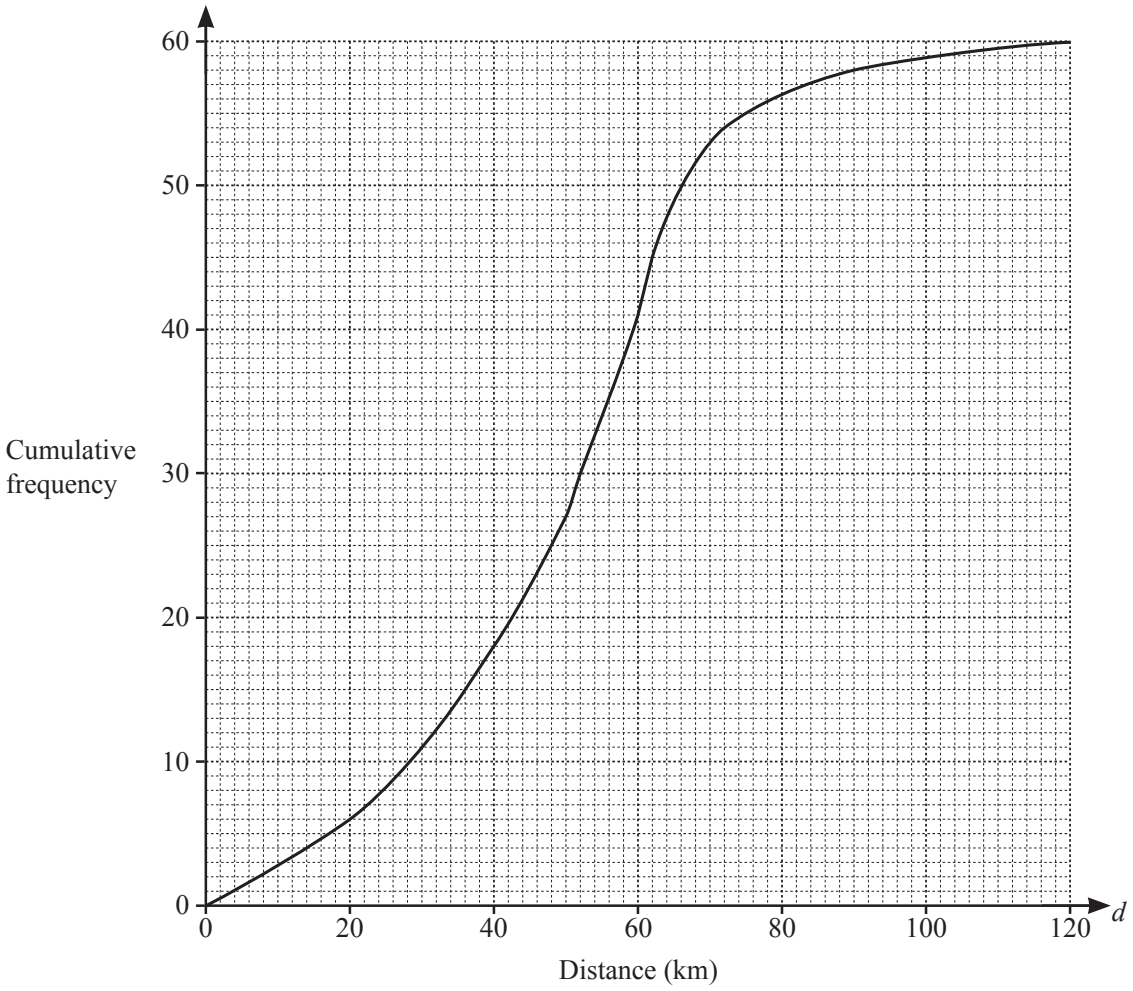
..... m^2 [3]

(e) The bearing of D from A is 070°.

Find the bearing of A from C.

..... [2]

6 The cumulative frequency diagram shows information about the distance, d km, traveled by each of 60 male cyclists in one weekend.



(a) Use the cumulative frequency diagram to find an estimate of

(i) the median,

..... km [1]

(ii) the lower quartile,

..... km [1]

(iii) the interquartile range.

..... km [1]

(b) For the same weekend, the interquartile range for the distances traveled by a group of female cyclists is 40 km.

Make one comment comparing the distribution of the distances traveled by the males with the distribution of the distances traveled by the females.

.....

..... [1]

(c) A male cyclist is chosen at random.

Find the probability that he traveled more than 50 km.

..... [2]

(d) **(i)** Use the cumulative frequency diagram to complete this frequency table.

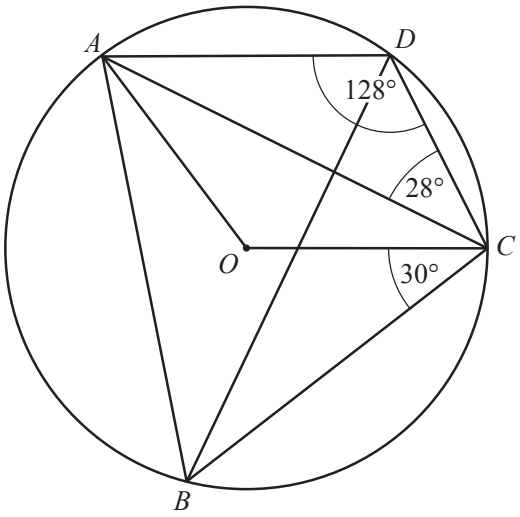
Distance (d km)	Number of male cyclists
$0 < d \leqslant 40$	18
$40 < d \leqslant 50$	9
$50 < d \leqslant 60$	
$60 < d \leqslant 70$	
$70 < d \leqslant 90$	
$90 < d \leqslant 120$	2

[2]

(ii) Calculate an estimate of the mean distance traveled.

..... km [4]

7 (a)



NOT TO SCALE

In the diagram, A, B, C and D lie on the circle, center O.
Angle $ADC = 128°$, angle $ACD = 28°$ and angle $BCO = 30°$.

(i) Show that obtuse angle $AOC = 104°$.
Give a reason for each step of your working.

[3]

(ii) Find angle BAO.

Angle $BAO =$ ..... [2]

(iii) Find angle ABD.

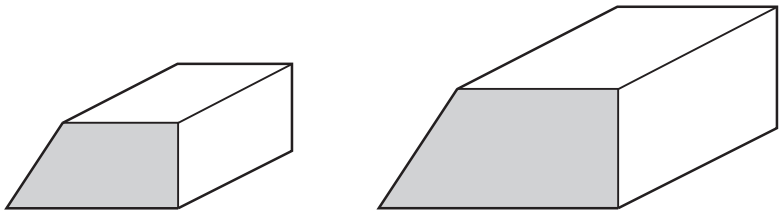
Angle $ABD =$ ..... [1]

(iv) The radius, OC, of the circle is 9.6 cm.

Calculate the total perimeter of the sector $OADC$.

..... cm [3]

(b)



NOT TO SCALE

The diagram shows two mathematically similar solid metal prisms.
The volume of the smaller prism is 648 cm^3 and the volume of the larger prism is 2187 cm^3.
The area of the cross-section of the smaller prism is 36 cm^2.

(i) Calculate the area of the cross-section of the larger prism.

..... cm^2 [3]

(ii) The larger prism is melted down into a sphere.

Calculate the radius of the sphere.

..... cm [3]

[Turn over

8 **(a)** A bag contains 4 red marbles and 2 yellow marbles.
Behnaz picks two marbles at random without replacement.

Find the probability that

(i) the marbles are both red,

..... [2]

(ii) the marbles are not both red.

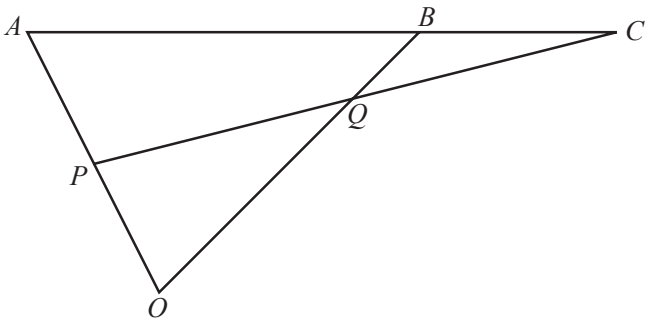
..... [1]

(b) Another bag contains 5 blue marbles and 2 green marbles.
Bryn picks one marble at random without replacement.
If this marble is not green, he picks another marble at random without replacement.
He continues until he picks a green marble.

Find the probability that he picks a green marble on his first, second or third attempt.

..... [4]

9



NOT TO SCALE

OAB is a triangle and ABC and PQC are straight lines.
P is the midpoint of OA, Q is the midpoint of PC and $OQ : QB = 3 : 1$.
$\overrightarrow{OA} = 4\mathbf{a}$ and $\overrightarrow{OB} = 8\mathbf{b}$.

(a) Find, in terms of **a** and/or **b**, in its simplest form

(i) $\overrightarrow{AB}$,

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

(ii) $\overrightarrow{OQ}$,

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

(iii) $\overrightarrow{PQ}$.

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

(b) By using vectors, find the ratio $AB : BC$.

..... : ..... [3]

[Turn over

10 $f(x) = 2x - 3$ $g(x) = 9 - x^2$ $h(x) = 3^x$

(a) Find

(i) $f(4)$,

..... [1]

(ii) $h(g(3))$,

..... [2]

(iii) $g(2x)$ in its simplest form,

..... [1]

(iv) $f(g(x))$ in its simplest form.

..... [2]

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

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

(c) Find x when $5f(x) = 3$.

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

(d) Solve the equation $g(f(x)) = -16$.

$x =$ ..... or $x =$ ..... [4]

(e) Find x when $h^{-1}(x) = -2$.

$x =$ ..... [1]

Question 11 is printed on the next page.

11 Solve.

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

Show all your working and give your answers correct to 2 decimal places.

$x =$ ..... or $x =$ ..... [7]