Candidate Name _____

Centre Number _____

Candidate Number _____

CAMBRIDGE INTERNATIONAL EXAMINATIONS
Cambridge International
General Certificate of Secondary Education

0580/31
MATHEMATICS
Paper 3 (Core)

May/June 2018
TIME: 2 hours

SUITABLE FOR VISUALLY IMPAIRED CANDIDATES

Candidates answer on the Question Paper.

Additional Materials:
Electronic calculator
Geometrical instruments
Tracing paper (optional)
Insert for Questions 1(b), 4, 5, 8 and 10.

READ INSTRUCTIONS OVERLEAF

DC (LK/CB) 172305

READ THESE INSTRUCTIONS FIRST

Write your Centre 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 working is needed for any question it must be shown below that question.

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 figures. Give answers in degrees to one decimal place.

For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.

The number of marks is given in brackets [ ] at the end of each question or part question.

The total of the marks for this paper is 104.

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1 Mr Marr asks his mathematics class to complete a statistics project about books.

(a) Olga counts the number of letters in each of the last 50 words in the book she is reading.
She has only counted the letters in 43 words so far.
Her results for these 43 words are shown in the table below.

Number of letters in each word	Tally	Frequency
1	|||	
2	𝍸	
3	𝍸 𝍸 ||	
4	𝍸 |||	
5	𝍸 ||||	
6	|||	
7	||	
8		
9	|	

The last seven words in the book that Olga needs to add to the table are

..... and they all lived happily ever after.

(i) Complete the tally and frequency columns in the table. [2]

(ii) Find the range.

_____ **[1]**

(iii) Find the median.

_____ **[1]**

(b) Billie asks 60 students in his school what their favourite type of book is.
He has started to draw a pictogram (Insert) to show his results.

The science fiction row in the pictogram is complete.

(i) Complete the key on the Insert.
There is one space to fill. **[1]**

(ii) Complete the pictogram.
There are five spaces to fill. **[2]**

(iii) Write down the mode.

_____ **[1]**

(iv) Work out how many more students choose detective books than music books.

_____ **[1]**

(v) Work out the fraction of students who did NOT choose romance books.

_____ **[2]**

2 (a) Write down

(i) the number twenty seven million, three hundred and sixty thousand and forty five in figures,

_____ **[1]**

(ii) the six factors of 20,

_____, _____, _____, _____, _____, _____ **[2]**

(iii) a fraction that is equivalent to $\frac{7}{9}$,

_____ **[1]**

(iv) a prime number between 30 and 40.

_____ **[1]**

(b) For each statement, insert one pair of brackets to make it correct.

(i) $17 - 3 \times 5 - 3 = 11$ **[1]**

(ii) $3 + 2^2 - 4 = 21$ **[1]**

(c) Find $\sqrt[3]{4913}$.

_____ **[1]**

3 **Three boys each have $600.**

(a) Victor spends 40% of his $600.
He spends the money in the ratio
clothes : books : music = 10 : 2 : 3.

(i) Work out how much he spends on music.

$ _____ [3]

(ii) Work out how much more he spends on clothes than books.

$ _____ [2]

(b) Walter invests his $600 for 3 years at a rate of 4.5% per year compound interest.

Calculate the interest Walter receives at the end of the 3 years.

$ _____ [3]

(c) Xavier goes on holiday to Europe and changes his $600 into euros (€).
He spends €325 whilst he is on holiday.
When he gets home he changes the euros he has left back into dollars.

The exchange rate is $1 = €0.864 .

Work out how many dollars he has left after his holiday.
Give your answer correct to the nearest cent.

$ _____ [3]

4 **The diagram (Insert) shows a quadrilateral *PQRS* which is made from four congruent triangles A, B, C and D.**

(a) Write down the mathematical name for the quadrilateral *PQRS*.

_____ **[1]**

(b) (i) Write down the co-ordinates of *S*.

(_____ , _____) **[1]**

(ii) Measure the obtuse angle *PSR*.

_____ **[1]**

(c) (i) Measure the length of the line *PQ*.

_____ **cm [1]**

(ii) Work out the perimeter of the quadrilateral *PQRS*.

_____ **cm [1]**

(d) Describe fully the SINGLE transformation that maps

(i) triangle A onto triangle B,

_____

_____ **[2]**

(ii) triangle A onto triangle C.

_____ **[3]**

(e) On the grid, draw the image of triangle D after a translation by the vector $\begin{pmatrix} 1 \\ -2 \end{pmatrix}$. **[2]**

5 **Lucy asked 12 people how many hours they each spent playing a computer game and the number of levels they each completed in one month.**

The results are shown in the table.

Time spent playing (hours)	Number of levels completed
90	22
32	5
70	12
75	17
30	6
70	7
40	18
80	20
40	8
65	15
50	11
32	9

(a) **Complete the scatter diagram (Insert).**
The first eight points have been plotted for you. **[2]**

(b) **One person completes more levels per hour than any of the others.**

On the scatter diagram, put a ring around the point for this person. **[1]**

(c) What type of correlation does this scatter diagram show?

_____ **[1]**

(d) On the scatter diagram, draw a line of best fit. [1]

(e) Another person, Monika, completed 19 levels but forgot to record the time spent playing.

Use your line of best fit to estimate the number of hours that Monika spent playing.

_____ **hours [1]**

6 Georgiana is travelling by train from Redtown to Teignley.

(a) The price of a ticket is $13.50 .
Georgiana's ticket price is reduced by one-third because she is a student.

Work out how much she pays for her ticket.

$ _____ [2]

(b) Georgiana travels on two trains.
The first train goes from Redtown to Southford.
The second train goes from Southford to Teignley.
She has written down some information about the times of her trains.

First train

Redtown	departs	13 45
Southford	arrives	16 39

Second train

Southford	departs	17 12

(i) Write 13 45 using the 12-hour clock.

_____ [1]

(ii) Work out how long the first train should take to travel from Redtown to Southford.
Give your answer in hours and minutes.

_____ **h** _____ **min [1]**

(iii) The first train arrives at Southford 46 minutes late.

By how many minutes has Georgiana missed her second train?

_____ **min [2]**

(c) While Georgiana waits for the next train, she buys a cup of hot chocolate.

Regular:	**$2.05**	**330 ml**
Large:	**$2.35**	**400 ml**
Extra large:	**$2.85**	**500 ml**

Work out which cup of hot chocolate is the best value. Show all your working.

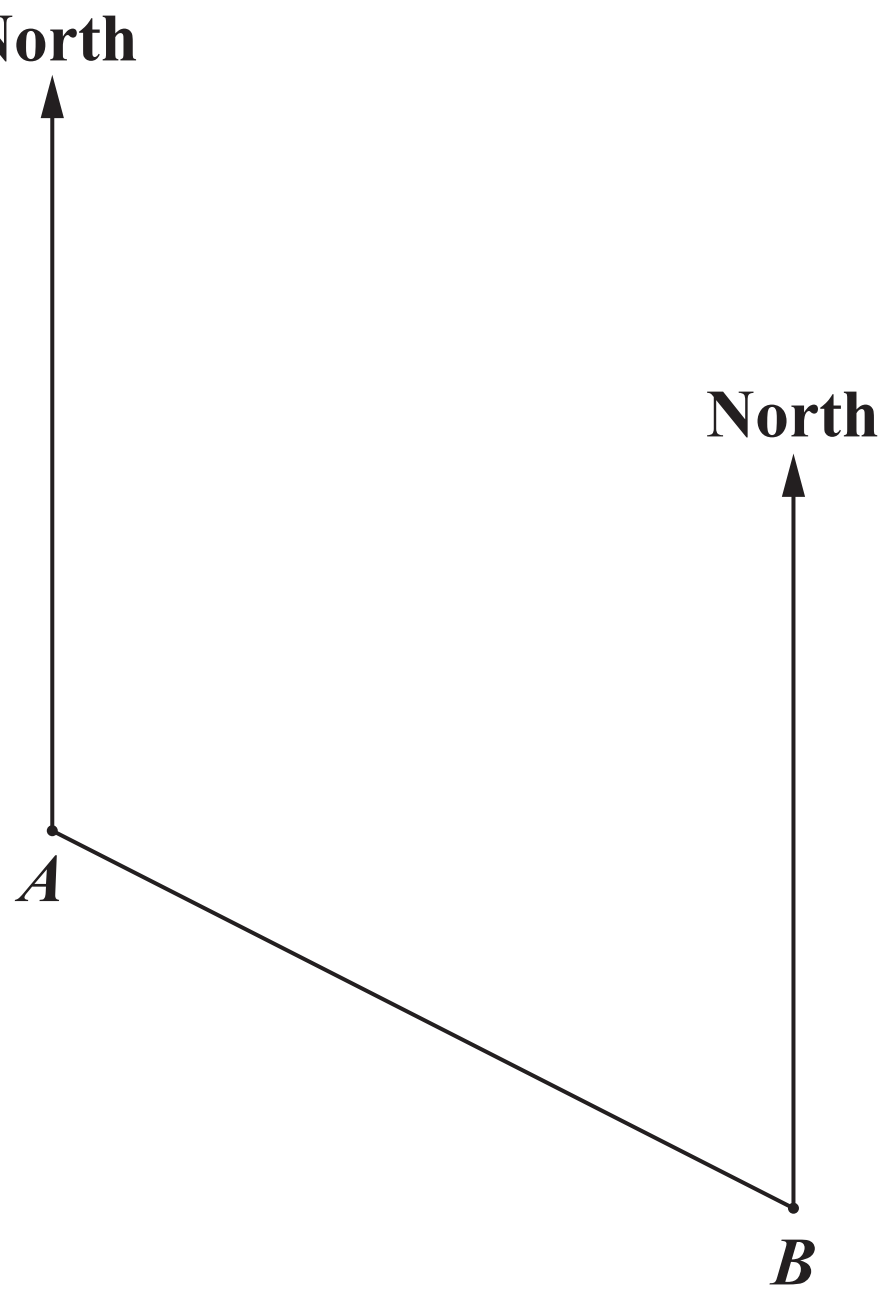
[3]

(d) The next train from Southford to Teignley is at 18 12. The journey is 76 km and the train travels at an average speed of 48 km/h.

Work out the time that the train arrives in Teignley.

_____ **[3]**

7 **The scale drawing shows the positions of Annika's house, *A*, and Bernhard's house, *B*, on a map.**
The scale is 1 centimetre represents 300 metres.



Scale: 1 cm to 300 m

(a) Work out the actual distance, in metres, between Annika's house and Bernhard's house.

_____ **m [2]**

(b) Measure the bearing of Bernhard's house from Annika's house.

_____ **[1]**

(c) (i) USING A STRAIGHT EDGE AND COMPASSES ONLY, construct the perpendicular bisector of *AB*. Show all your construction arcs. [2]

(ii) Cordelia's house is

- **the same distance from Annika's house and Bernhard's house**

and

- **due south of Annika's house.**

Mark on the map the position of Cordelia's house.
Label this point *C*. [2]

(d) Dougie's house is

- **on a bearing of 320° from Bernhard's house**

and

- **1650 m from Annika's house.**

Mark on the map the two possible positions of Dougie's house.
Label each of these points *D*. [4]

8 **Three children from the same family travel from their home to the same school.**
Caroline cycles to school.
Rob runs to school.
William walks to school.

The travel graph (Insert) shows the journeys to school for Caroline and Rob.
Rob leaves home before Caroline.

(a) Explain what is happening when the two lines intersect on the travel graph.

_____

_____ **[1]**

(b) Work out Rob's speed in km/h.

_____ **km/h [2]**

(c) William leaves home at 07 25.
He walks to school at a constant speed of 6 km/h.

On the grid, draw William's journey. **[1]**

(d) At what time is the distance between Rob and William greatest?

_____ **[1]**

(e) Complete this list of names in the order they arrive at school.

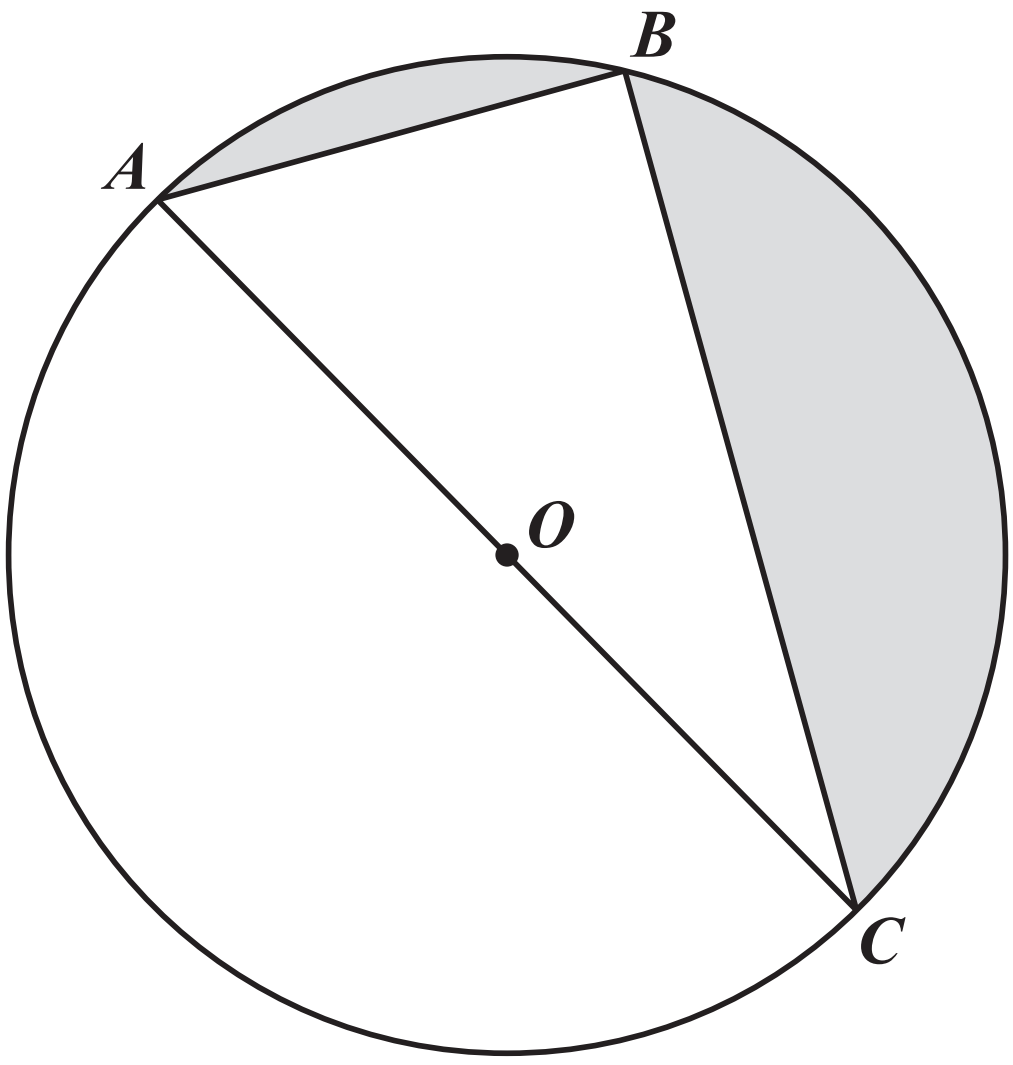
First _____

Second _____

Third _____ **[1]**

9

NOT TO SCALE



***A*, *B* and *C* are points on the circumference of a circle, centre *O*.**

(a) Write down the mathematical name for

(i) the straight line *AC*,

_____ **[1]**

(ii) the straight line *AB*.

_____ **[1]**

(b) Give a geometrical reason why angle *ABC* = 90°.

_____ **[1]**

(c) $AB = 20$ cm and $AC = 52$ cm.

(i) Use trigonometry to calculate angle *BAC*.

Angle *BAC* = _____ **[2]**

(ii) Show that $BC = 48$ cm.

[2]

(iii) Work out the area of triangle *ABC*.

_____ **cm^2 [2]**

(iv) Work out the total shaded area.

_____ **cm^2 [3]**

10 (a) (i) Write down the gradient of the line $y = -4x + 7$.

_____ **[1]**

(ii) Write down the equation of a line parallel to $y = 2x + 3$.

$y =$ _____ **[1]**

(iii) Write down the co-ordinates of the point where the graph of $y = 6x - 5$ crosses the y-axis.

(_____ , _____) **[1]**

(iv) The point $(k, 7)$ lies on the line $y = 4x - 3$.

Find the value of k.

$k =$ _____ **[2]**

(b) (i) Complete the table of values for $y = x^2 - x - 5$.
There are five spaces to fill.

x	y
−3	7
−2	
−1	−3
0	
1	−5
2	
3	
4	

[3]

(ii) On the grid (Insert), draw the graph of $y = x^2 - x - 5$ for $-3 \leqslant x \leqslant 4$. [4]

(iii) Write down the co-ordinates of the lowest point on the graph.

(_____ , _____) [1]

(iv) (a) On the grid, draw the line of symmetry of the graph. [1]

(b) Write down the equation of this line.

_____ [1]

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