Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

ADDITIONAL MATHEMATICS **0606/21**

Paper 2 **October/November 2018**

2 hours

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator

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** the questions.
Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place in the case of angles in degrees, unless a different level of accuracy is specified in the question.
The use of an electronic calculator is expected, where appropriate.
You are reminded of the need for clear presentation in your answers.

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 number of marks for this paper is 80.

This document consists of **14** printed pages and **2** blank pages.

DC (ST/JG) 153499/2

CAMBRIDGE
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Mathematical Formulae

1. ALGEBRA

Quadratic Equation

For the equation $ax^2 + bx + c = 0$,

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}.$$

Binomial Theorem

$$(a + b)^n = a^n + \binom{n}{1}a^{n-1}b + \binom{n}{2}a^{n-2}b^2 + \ldots + \binom{n}{r}a^{n-r}b^r + \ldots + b^n,$$

where n is a positive integer and $\binom{n}{r} = \frac{n!}{(n-r)!r!}$.

2. TRIGONOMETRY

Identities

$$\sin^2 A + \cos^2 A = 1$$

$$\sec^2 A = 1 + \tan^2 A$$

$$\operatorname{cosec}^2 A = 1 + \cot^2 A$$

Formulae for ΔABC

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

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

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

1 Solve the inequality $(2-x)(x+9) < 10$. [4]

2 **(a)** Solve $3^{\left(\frac{x}{2}-1\right)} = 10$. [3]

(b) Solve $2e^{1-2y} = 3e^{3y+2}$. [4]

3 Do not use a calculator in this question.

(a) Simplify $(\sqrt{2}+2\sqrt{5})(4\sqrt{2}-3\sqrt{5})$, giving your answer in the form $a+b\sqrt{c}$, where a, b and c are integers. [3]

(b) Simplify $\dfrac{4-3\sqrt{6}}{\sqrt{3}+\sqrt{2}}$, giving your answer in the form $p\sqrt{3}+q\sqrt{2}$, where p and q are integers. [4]

4 Solve $\sec x = \cot x - 5\tan x$ for $0° < x < 360°$. [6]

5 $$\mathbf{A} = \begin{pmatrix} 3 & 2 \\ -1 & 1 \end{pmatrix}.$$

(i) Find $\mathbf{A}^2$. [2]

(ii) Find constants p and q such that $p\mathbf{A}^2 + q\mathbf{A} = \mathbf{I}$. [4]

6 A 5-digit code is to be formed from the digits 1, 2, 3, 4, 5, 6, 7, 8, 9. Each digit can be used once only in any code. Find how many codes can be formed if

(i) the first digit of the code is 6 and the other four digits are odd, [2]

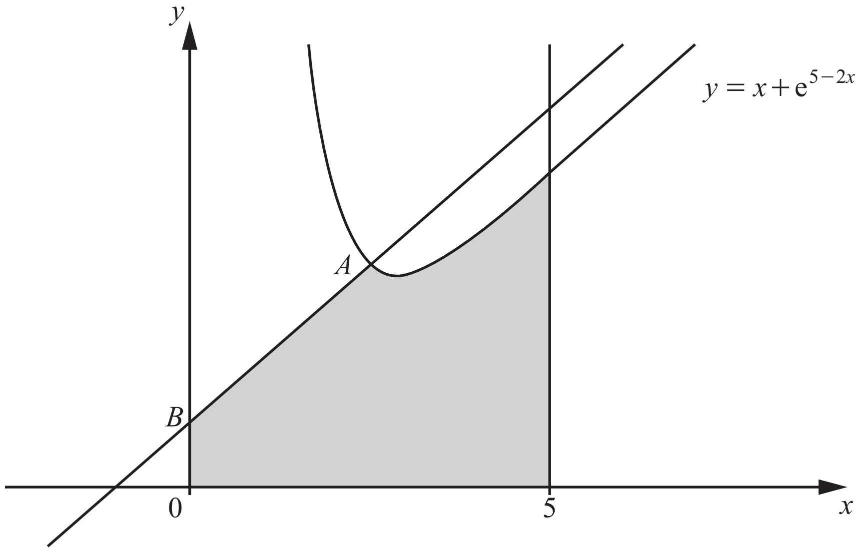
(ii) each of the first three digits is even, [2]

(iii) the first and last digits are prime. [2]

7 **(i)** Show that $\dfrac{1}{1-\cos x}-\dfrac{1}{1+\cos x}=2\operatorname{cosec}x\cot x$. [4]

(ii) Hence solve the equation $\dfrac{1}{1-\cos x}-\dfrac{1}{1+\cos x}=\sec x$ for $0 \leqslant x \leqslant 2\pi$ radians. [4]

8

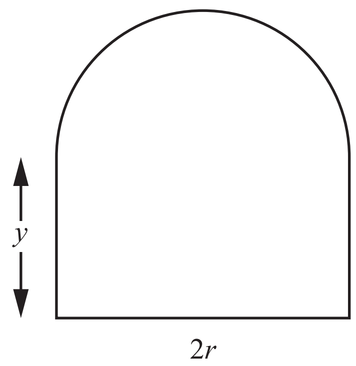


The diagram shows part of the curve $y = x + e^{5-2x}$, the normal to the curve at the point A and the line $x = 5$. The normal to the curve at A meets the y-axis at the point B. The x-coordinate of A is 2.5.

(i) Find the equation of the normal AB. [4]

(ii) Showing all your working, find the area of the shaded region. [6]

9 In this question, all lengths are in metres.



The diagram shows a window formed by a semi-circle of radius r on top of a rectangle with dimensions $2r$ by y. The total perimeter of the window is 5.

(i) Find y in terms of r. [2]

(ii) Show that the total area of the window is $A = 5r - \frac{\pi r^2}{2} - 2r^2$. [2]

(iii) Given that r can vary, find the value of r which gives a maximum area of the window and find this area. (You are not required to show that this area is a maximum.) [5]

10 The line $y = 12 - 2x$ is a tangent to two curves. Each curve has an equation of the form $y = k + 6 + kx - x^2$, where k is a constant.

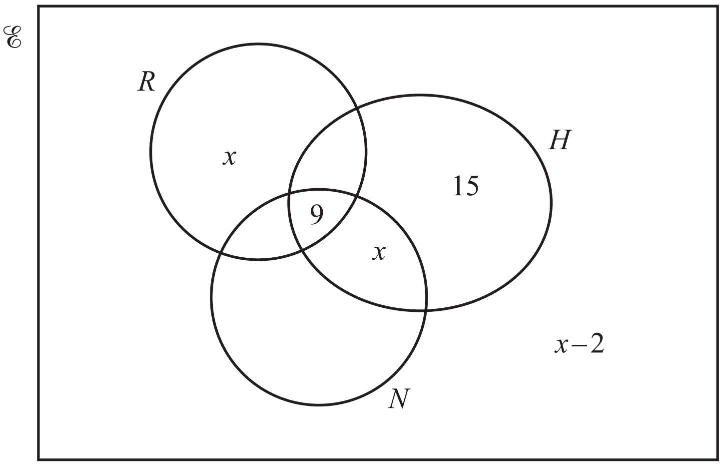
(i) Find the two values of k. [5]

The line $y = 12 - 2x$ is a tangent to one curve at the point A and the other curve at the point B.

(ii) Find the coordinates of A and of B. [3]

(iii) Find the equation of the perpendicular bisector of AB. [3]

11



There are 70 girls in a year group at a school. The Venn diagram gives **some** information about the numbers of these girls who play rounders (R), hockey (H) and netball (N).

$n(R) = 28$ $n(H) = 38$ $n(N) = 35$.

Find the value of x and hence the number of girls who play netball only. [6]

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