Cambridge IGCSE

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME	

CENTRE NUMBER		CANDIDATE NUMBER	

5120051451

ADDITIONAL MATHEMATICS **0606/21**

Paper 2 **October/November 2019**

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 **15** printed pages and **1** blank page.

DC (NF/SG) 172320/3

Cambridge Assessment International Education

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

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

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

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

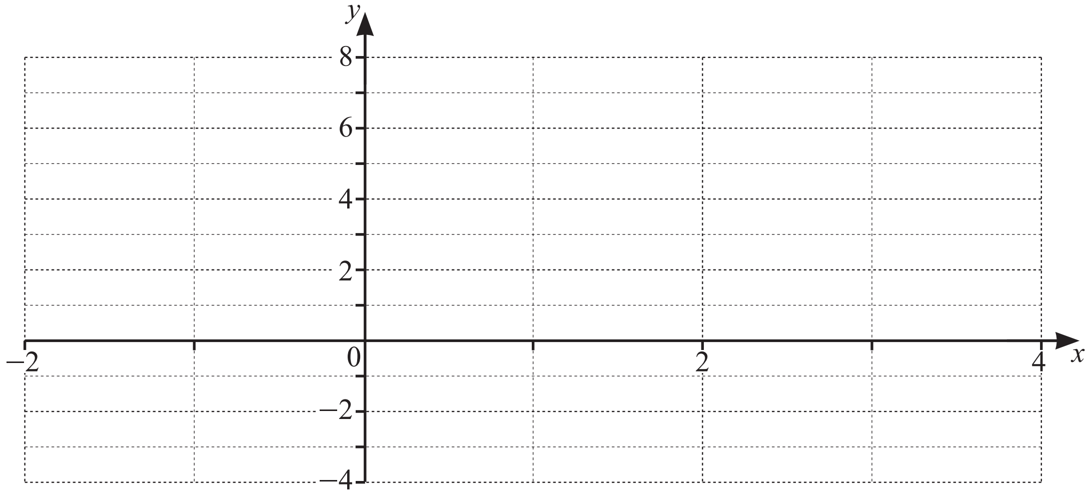
Formulae for ΔABC

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

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

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

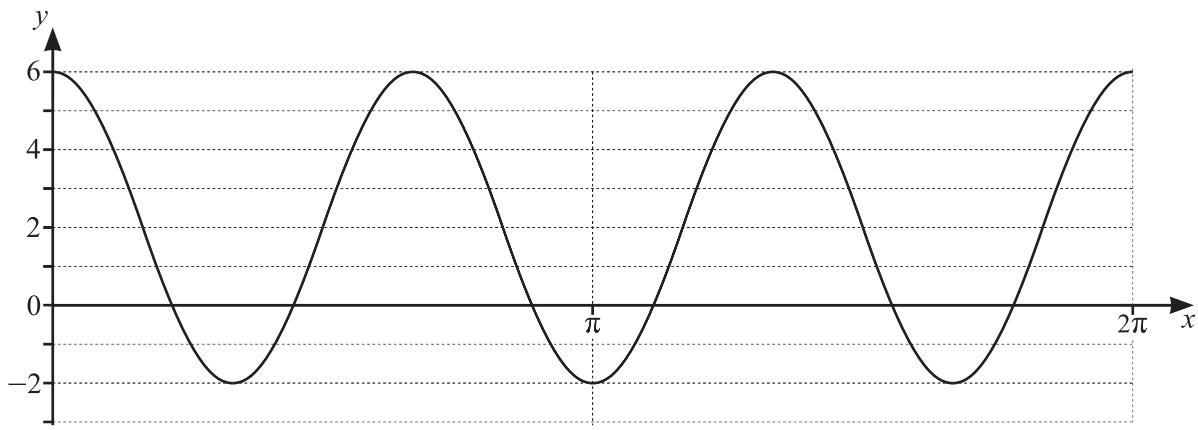
1 **(i)** On the axes below, draw the graph of $y = |2x - 3|$.



[2]

(ii) Solve the equation $7 - |2x - 3| = 0$. [3]

2



The figure shows part of the graph of $y = p + q\cos rx$. Find the value of each of the integers p, q and r.

$p =$ $q =$ $r =$

[3]

3 **(a)** Solve $e^{2x+1} = 3e^{4-3x}$. [3]

(b) Solve $\lg(y-6) + \lg(y+15) = 2$. [5]

4 Do not use a calculator in this question.

Solve the following simultaneous equations, giving your answers for both x and y in the form $a+b\sqrt{2}$, where a and b are integers.

$$2x+y=5$$

$$3x-\sqrt{2}y=7$$

[5]

5 A particle is moving in a straight line such that t seconds after passing a fixed point O its displacement, s m, is given by $s = 3\sin 2t + 4\cos 2t - 4$.

(i) Find expressions for the velocity and acceleration of the particle at time t. [3]

(ii) Find the first time when the particle is instantaneously at rest. [3]

(iii) Find the acceleration of the particle at the time found in **part (ii)**. [2]

6 **Do not use a calculator in this question.**

The curve $xy = 11x + 5$ cuts the line $y = x + 10$ at the points A and B. The mid-point of AB is the point C. Show that the point C lies on the line $x + y = 11$. [7]

7 **(a)** **(i)** Use the factor theorem to show that $2x-1$ is a factor of $\mathrm{p}(x)$, where $\mathrm{p}(x)=4x^3+9x-5$. [1]

(ii) Write $\mathrm{p}(x)$ as a product of linear and quadratic factors. [2]

(b) **(i)** Show that $13\tan x\sec x - 4\sin x - 5\sec^2 x = 0$ can be written as $4\sin^3 x + 9\sin x - 5 = 0$. [3]

(ii) Using your answers to **part (a)(ii)** and **part (b)(i)** solve the equation

$$13\tan x\sec x - 4\sin x - 5\sec^2 x = 0 \quad \text{for } 0 < x < 2\pi \text{ radians.}$$ [4]

8 The equation of a curve is given by $y = xe^{-2x}$.

(i) Find $\frac{dy}{dx}$. [3]

(ii) Find the exact coordinates of the stationary point on the curve $y = xe^{-2x}$. [2]

(iii) Find, in terms of e, the equation of the tangent to the curve $y = xe^{-2x}$ at the point $\left(1, \frac{1}{e^2}\right)$. [2]

(iv) Using your answer to **part (i)**, find $\int xe^{-2x}\mathrm{d}x$. [3]

9 Given that $\mathbf{A} = \begin{pmatrix} 5 & 2 \\ -9 & -3 \end{pmatrix}$ and $\mathbf{B} = \begin{pmatrix} 2 & 1 \\ 6 & 5 \end{pmatrix}$, find

(i) $\mathbf{A}^{-1}$, [2]

(ii) $\mathbf{B}^2$, [2]

(iii) the matrix $\mathbf{C}$, where $\mathbf{B}^{-1}\mathbf{C} + \mathbf{A} = \mathbf{B}$, [3]

(iv) the matrix **D**, where $\mathbf{B}^{-2}\mathbf{D}\mathbf{A} = \mathbf{I}$. [3]

10 **(i)** Expand $(3+x)^4$ evaluating each coefficient. [3]

In the expansion of $\left(x-\frac{p}{x}\right)(3+x)^4$ the coefficient of x is zero.

(ii) Find the value of the constant p. [2]

(iii) Hence find the term independent of x. [1]

(iv) Show that the coefficient of x^2 is 90. [2]

11 A plane, which can travel at a speed of $300\,\text{km}\,\text{h}^{-1}$ in still air, heads due north. The plane is blown off course by a wind so that it travels on a bearing of 010° at a speed of $280\,\text{km}\,\text{h}^{-1}$.

(i) Find the speed of the wind. [3]

(ii) Find the direction of the wind as a bearing correct to the nearest degree. [3]

BLANK PAGE