Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

ADDITIONAL MATHEMATICS **0606/11**

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

DC (RW/SG) 153502/3

CAMBRIDGE International Examinations

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

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

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

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

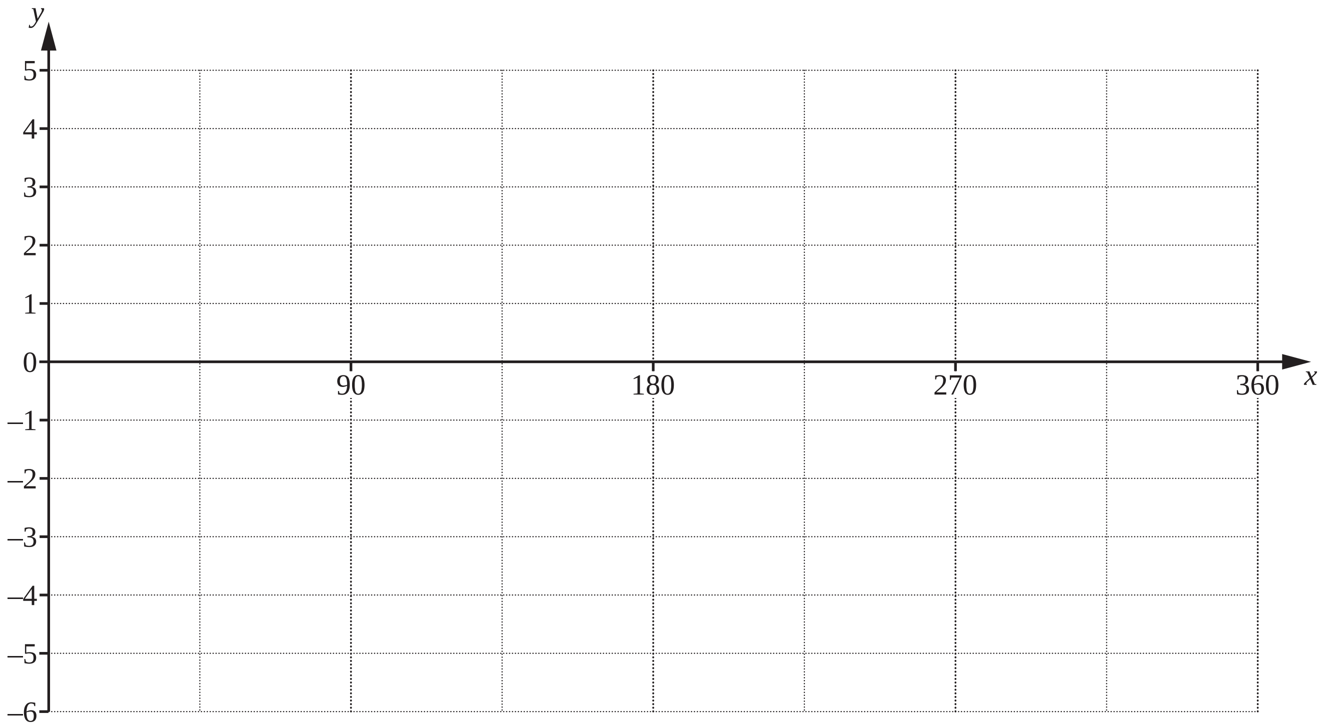
Formulae for ΔABC

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

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

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

1 **(a)** On the axes below, sketch the graph of $y = 3\cos 2x - 1$, for $0° \leqslant x° \leqslant 360°$.



[3]

(b) Given that $y = 4\sin 6x$, write down

(i) the amplitude of y, [1]

(ii) the period of y. [1]

2 $$p(x) = 2x^3 + 5x^2 + 4x + a$$

$$q(x) = 4x^2 + 3ax + b$$

Given that p(x) has a remainder of 2 when divided by $2x+1$ and that q(x) is divisible by $x+2$,

(i) find the value of each of the constants a and b. [3]

Given that $r(x) = p(x) - q(x)$ and using your values of a and b,

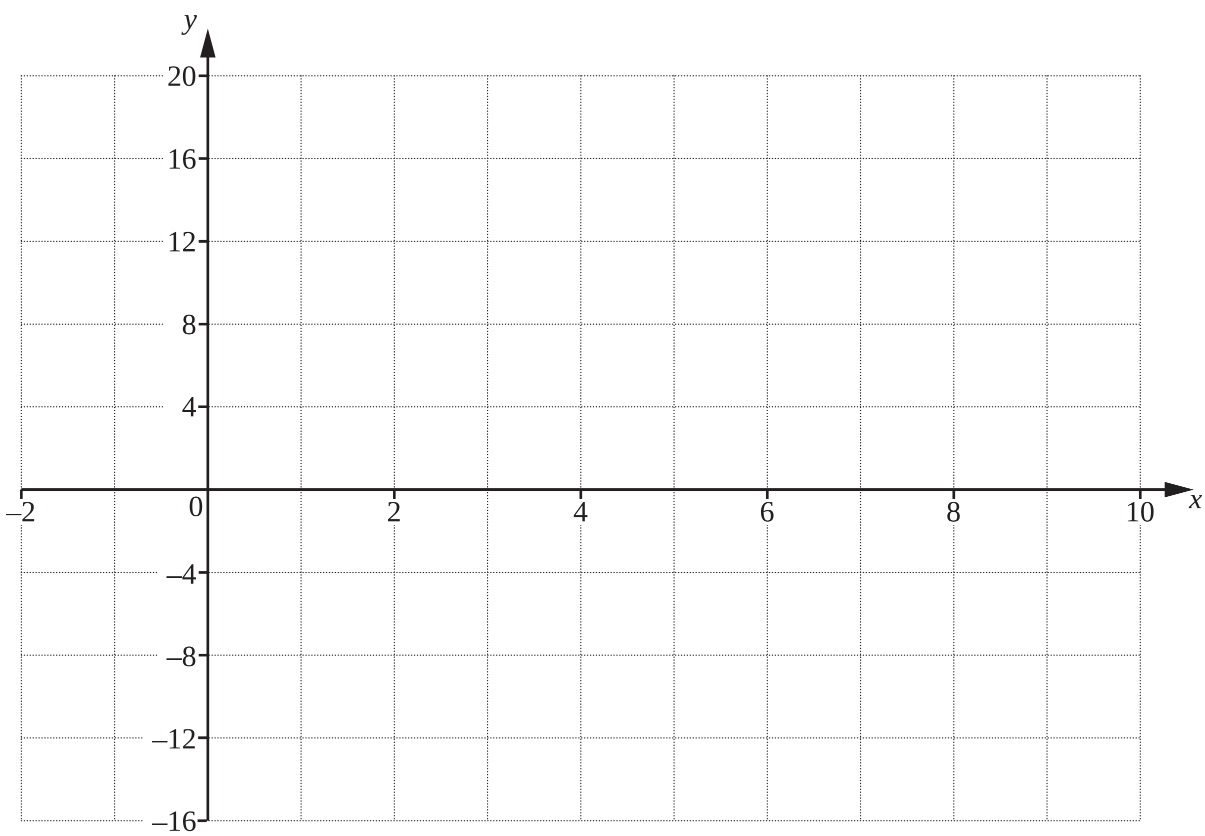
(ii) find the exact remainder when r(x) is divided by $3x-2$. [3]

3 The coefficient of x^2 in the expansion of $(2-x)(3+kx)^6$ is equal to 972. Find the possible values of the constant k. [6]

4 **(i)** Write $x^2 - 9x + 8$ in the form $(x - p)^2 - q$, where p and q are constants. [2]

(ii) Hence write down the coordinates of the minimum point on the curve $y = x^2 - 9x + 8$. [1]

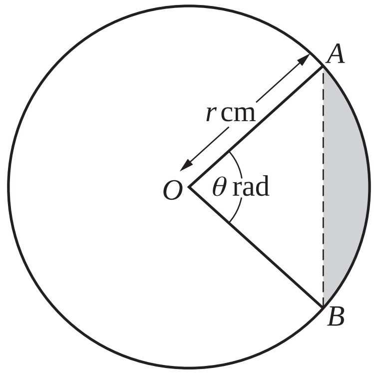
(iii) On the axes below, sketch the graph of $y = |x^2 - 9x + 8|$, showing the coordinates of the points where the curve meets the coordinate axes.



[3]

(iv) Write down the value of k for which $|x^2 - 9x + 8| = k$ has exactly 3 solutions. [1]

5



The diagram shows a circle with centre O and radius r cm. The minor arc AB is such that angle AOB is θ radians. The area of the minor sector AOB is $48\,\text{cm}^2$.

(i) Show that $\theta = \dfrac{96}{r^2}$. [2]

(ii) Given that the minor arc AB has length 12 cm, find the value of r and of θ. [3]

(iii) Using your values of r and θ, find the area of the shaded region. [2]

6 A curve has equation $y = \dfrac{\ln(2x^2+3)}{5x+2}$.

(i) Show that $\dfrac{dy}{dx} = -\dfrac{5}{4}\ln 3$ when $x = 0$. [4]

(ii) Hence find the equation of the tangent to the curve at the point where $x = 0$. [2]

7 **(a)** Express $2+3\lg x-\lg y$ as a single logarithm to base 10. [3]

(b) **(i)** Solve $6x+7-\frac{3}{x}=0$. [2]

(ii) Hence, given that $6\log_a 3+7-3\log_3 a=0$, find the possible values of a. [4]

8 **(i)** Find $\dfrac{d}{dx}(5x^2+4)^{\frac{3}{2}}$. [2]

(ii) Hence find $\int x(5x^2+4)^{\frac{1}{2}}\,dx$. [2]

Given that $\int_0^a x(5x^2+4)^{\frac{1}{2}}\,dx = \dfrac{19}{15}$,

(iii) find the value of the positive constant a. [4]

9 Variables s and t are such that $s = 4t + 3e^{-t}$.

(i) Find the value of s when $t = 0$. [1]

(ii) Find the exact value of t when $\frac{ds}{dt} = 2$. [4]

(iii) Find the approximate increase in s when t increases from $\ln 5$ to $\ln 5 + h$, where h is small. [3]

10 Particle A is at the point with position vector $\begin{pmatrix} 2 \\ -5 \end{pmatrix}$ at time $t = 0$ and moves with a speed of $10\,\text{ms}^{-1}$ in the same direction as $\begin{pmatrix} 3 \\ 4 \end{pmatrix}$.

(i) Given that A is at the point with position vector $\begin{pmatrix} 38 \\ a \end{pmatrix}$ when $t = 6\,\text{s}$, find the value of the constant a. [3]

Particle B is at the point with position vector $\begin{pmatrix} 16 \\ 37 \end{pmatrix}$ at time $t = 0$ and moves with velocity $\begin{pmatrix} 4 \\ 2 \end{pmatrix}\text{ms}^{-1}$.

(ii) Write down, in terms of t, the position vector of B at time $t\,\text{s}$. [1]

(iii) Verify that particles A and B collide. [4]

(iv) Write down the position vector of the point of collision. [1]

11 **(a)** $f(x) = 3 - \cos 2x$ for $0 \leqslant x \leqslant \frac{\pi}{2}$.

(i) Write down the range of f. [2]

(ii) Find the exact value of $f^{-1}(2.5)$. [3]

(b) $g(x) = 3 - x^2$ for $x \in \mathbb{R}$.

Find the exact solutions of $g^2(x) = -6$. [4]

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