Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

0985148755

ADDITIONAL MATHEMATICS **0606/12**

Paper 1 **February/March 2015**

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 **16** printed pages.

DC (CW/SG) 99296/4

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

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

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

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

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 A sports club has members who play a variety of sports. Sets C, F and T are such that

$C = \{$ members who play cricket$\}$,
$F = \{$ members who play football$\}$,
$T = \{$ members who play tennis$\}$.

Describe the following in words.

(i) $C \cup F$ [1]

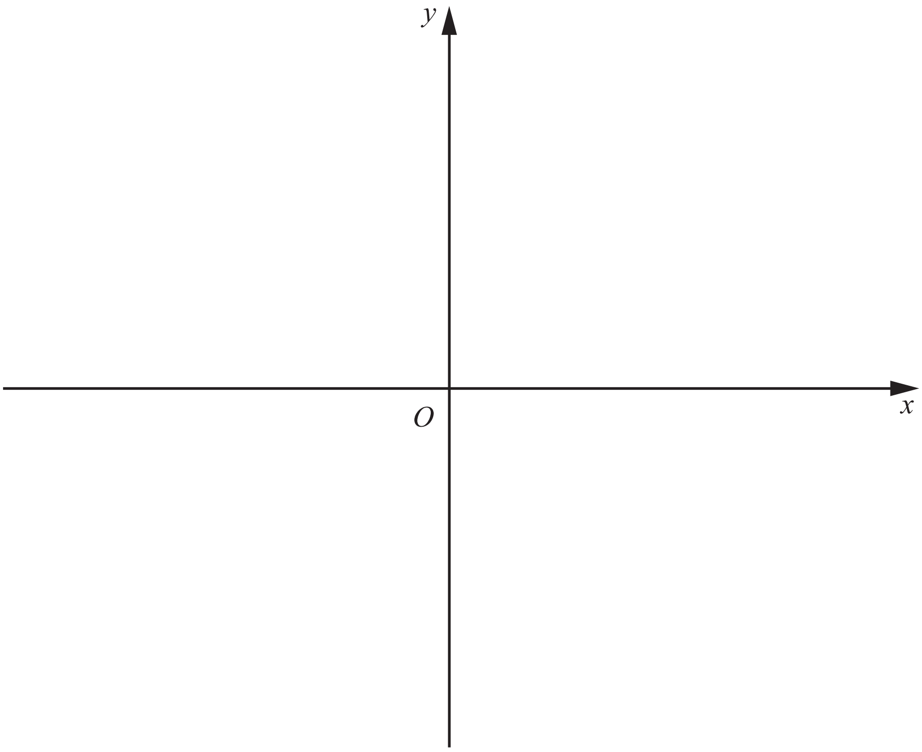
(ii) T' [1]

(iii) $F \cap T = \varnothing$ [1]

(iv) $\mathrm{n}(C \cap T) = 10$ [1]

2 Find the values of k for which the line $y = kx - 3$ does not meet the curve $y = 2x^2 - 3x + k$. [5]

3 **(i)** On the axes below sketch the graph of $y = |4 - 5x|$, stating the coordinates of the points where the graph meets the coordinate axes. [3]

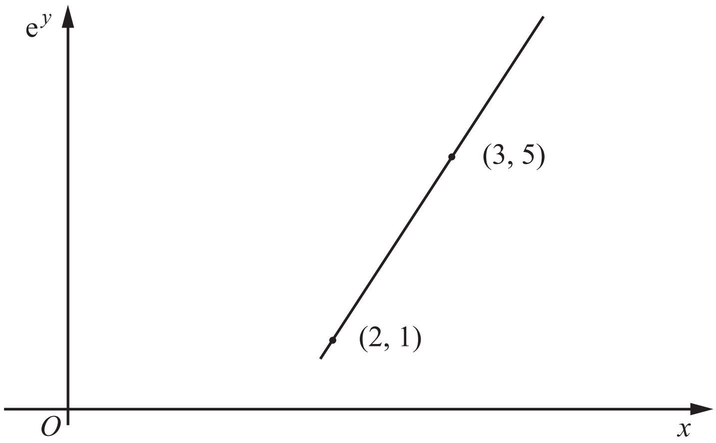


(ii) Solve $|4 - 5x| = 9$. [3]

4 **(i)** Write down, in ascending powers of x, the first 3 terms in the expansion of $(3+2x)^6$. Give each term in its simplest form. [3]

(ii) Hence find the coefficient of x^2 in the expansion of $(2-x)(3+2x)^6$. [2]

5



Variables x and y are such that when e^y is plotted against x a straight line graph is obtained. The diagram shows this straight line graph which passes through the points (2, 1) and (3, 5).

(i) Express y in terms of x. [4]

(ii) State the values of x for which y exists. [1]

(iii) Find the value of x when $y = \ln 6$. [1]

6 **(i)** Given that $y = \frac{\tan 2x}{x}$, find $\frac{\mathrm{d}y}{\mathrm{d}x}$. [3]

(ii) Hence find the equation of the normal to the curve $y = \frac{\tan 2x}{x}$ at the point where $x = \frac{\pi}{8}$. [3]

7 The polynomial $\mathrm{p}(x) = ax^3 + bx^2 - 3x - 4$ has a factor of $2x - 1$ and leaves a remainder of -10 when divided by $x + 2$.

(i) Show that $a = 10$ and find the value of b. [4]

(ii) Given that $\mathrm{p}(x) = (2x - 1)(rx^2 + sx + t)$, find the value of each of the integers r, s and t. [2]

(iii) Hence find the exact solutions of $\mathrm{p}(x) = 0$. [3]

8 **(a)** A function f is such that $f(\theta) = \sin 2\theta$ for $0 \leqslant \theta \leqslant \frac{\pi}{2}$.

(i) Write down the range of f. [1]

(ii) Write down a suitable restricted domain for f such that f^{-1} exists. [1]

(b) Functions g and h are such that

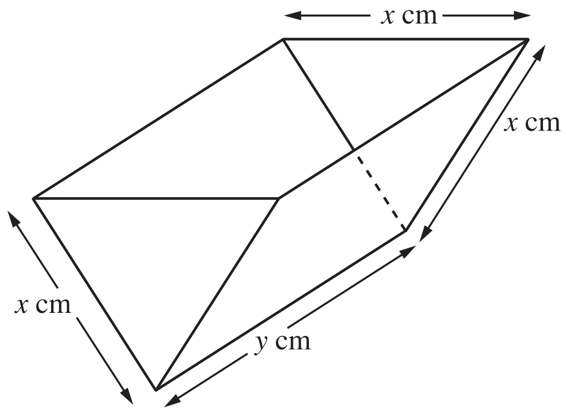
$$g(x) = 2 + 4\ln x \text{ for } x > 0,$$
$$h(x) = x^2 + 4 \text{ for } x > 0.$$

(i) Find g^{-1}, stating its domain and its range. [4]

(ii) Solve $gh(x) = 10$. [3]

(iii) Solve $g'(x) = h'(x)$. [3]

9

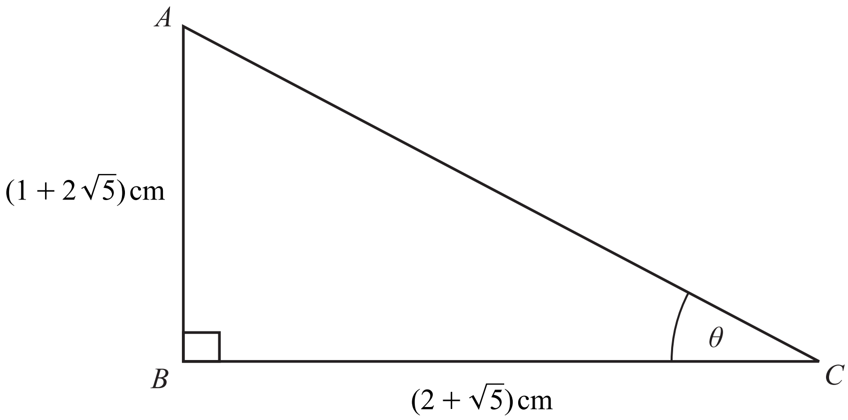


The diagram shows an empty container in the form of an open triangular prism. The triangular faces are equilateral with a side of x cm and the length of each rectangular face is y cm. The container is made from thin sheet metal. When full, the container holds $200\sqrt{3}$ cm^3.

(i) Show that A cm^2 , the total area of the thin sheet metal used, is given by $A = \frac{\sqrt{3}x^2}{2} + \frac{1600}{x}$. [5]

(ii) Given that x and y can vary, find the stationary value of A and determine its nature. [6]

10 Do not use a calculator in this question.



The diagram shows triangle ABC which is right-angled at the point B. The side $AB = (1 + 2\sqrt{5})$ cm and the side $BC = (2 + \sqrt{5})$ cm. Angle $BCA = \theta$.

(i) Find $\tan\theta$ in the form $a + b\sqrt{5}$, where a and b are integers to be found. [3]

(ii) Hence find $\sec^2\theta$ in the form $c + d\sqrt{5}$, where c and d are integers to be found. [3]

11 **(a)** **(i)** Show that $\dfrac{\operatorname{cosec} x}{\cot x + \tan x} = \cos x$. [3]

(ii) Hence solve $\dfrac{\operatorname{cosec} 3y}{\cot 3y + \tan 3y} = 0.5$ for $0 \leqslant y \leqslant \pi$ radians, giving your answers in terms of π. [3]

Question 11(b) is printed on the next page.

(b) Solve $2\sin z + 8\cos^2 z = 5$ for $0° < z < 360°$. [4]