CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

ADDITIONAL MATHEMATICS **0606/02**

Paper 2 **For Examination from 2013**

SPECIMEN PAPER

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 a pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid.

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.

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 $\binom{n}{r} = \dfrac{n!}{(n-r)!\,r!}$.

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

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

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

$$\Delta = \tfrac{1}{2}\, bc \sin A.$$

For Examiner's Use

1 Given that $\mathbf{A} = \begin{pmatrix} 13 & 6 \\ 7 & 4 \end{pmatrix}$, find the inverse matrix $\mathbf{A}^{-1}$ and hence solve the simultaneous equations

$$13x + 6y = 41,$$
$$7x + 4y = 24.$$

[4]

---

2 Variables x and y are connected by the equation $y = (2x - 9)^3$. Given that x is increasing at the rate of 4 units per second, find the rate of increase of y when $x = 7$. [4]

For Examiner's Use

3 Find the set of values of m for which the line $y = mx + 2$ does not meet the curve $y = x^2 - 5x + 18$. [5]

---

4 **(a)** A sports team of 3 attackers, 2 centres and 4 defenders is to be chosen from a squad of 5 attackers, 3 centres and 6 defenders. Calculate the number of different ways in which this can be done. [3]

For Examiner's Use

(b) How many different 4-digit numbers greater than 3000 can be formed using the six digits 1, 2, 3, 4, 5 and 6 if no digit can be used more than once? [3]

---

5 **(i)** Differentiate $x \ln x$ with respect to x. [2]

(ii) Hence find $\int \ln x \, dx$. [3]

---

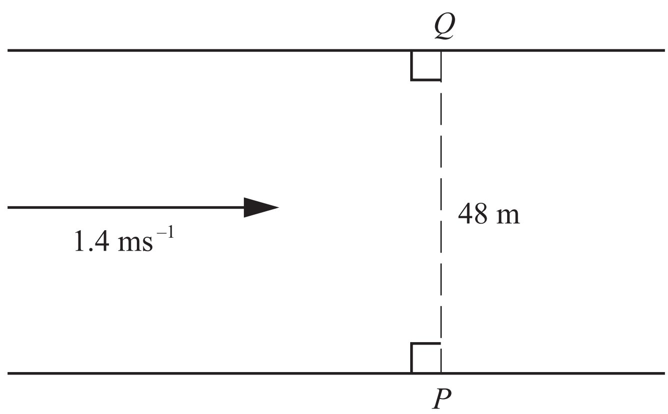
6 Solve the following equations.

For Examiner's Use

(i) $\dfrac{4^x}{2^{5-x}} = \dfrac{2^{4x}}{8^{x-3}}$ [3]

(ii) lg $(2y + 10)$ + lg $y = 2$ [3]

7



The diagram shows a river with parallel banks. The river is 48 m wide and is flowing with a speed of 1.4 ms^{-1}. A boat travels in a straight line from a point P on one bank to a point Q which is on the other bank directly opposite P. It is given that the boat takes 10 seconds to cross the river.

(i) Find the speed of the boat in still water. [4]

(ii) Find the angle to the bank at which the boat should be steered. [2]

For Examiner's Use

8 The function f is defined, for $0 \leqslant x \leqslant 2\pi$, by

$$f(x) = 3 + 5 \sin 2x.$$

State

(i) the amplitude of f, [1]

(ii) the period of f, [1]

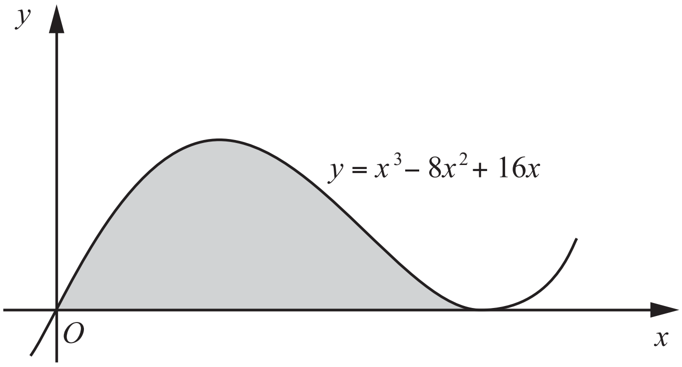
(iii) the maximum and minimum values of f. [2]

Sketch the graph of $y = f(x)$. [3]

9 The line $y = 2x - 9$ intersects the curve $x^2 + y^2 + xy + 3x = 46$ at the points A and B. Find the equation of the perpendicular bisector of AB. [8]

For Examiner's Use

10



The diagram shows part of the curve $y = x^3 - 8x^2 + 16x$.

(i) Show that the curve has a minimum point at (4, 0) and find the coordinates of the maximum point. [4]

(ii) Find the area of the shaded region enclosed by the x-axis and the curve. [4]

For Examiner's Use

11 The table shows experimental values of two variables x and y.

x	2	4	6	8
y	2.25	0.81	0.47	0.33

(i) On the graph paper below, plot xy against $\frac{1}{x}$ and draw a straight line graph. [3]

xy				
$\frac{1}{x}$				

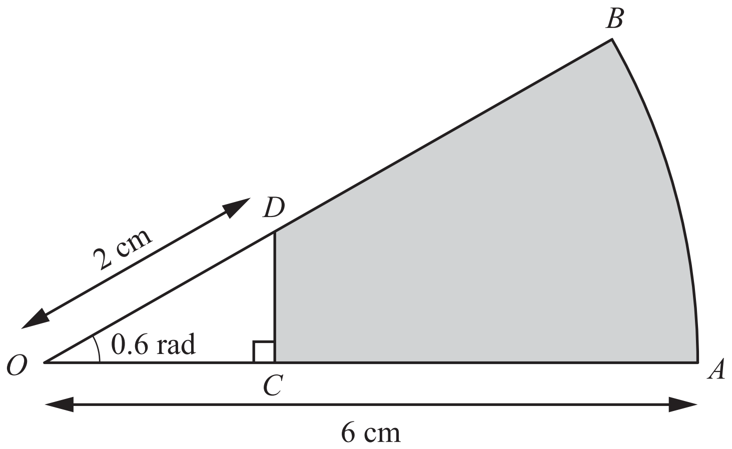
For Examiner's Use

(ii) Use your graph to express y in terms of x. [5]

For Examiner's Use

(iii) Estimate the value of x and of y for which $xy = 4$. [3]

12



The diagram shows a sector *AOB* of a circle with centre *O* and radius 6 cm. Angle *AOB* = 0.6 radians. The point *D* lies on *OB* such that the length of *OD* is 2 cm. The point *C* lies on *OA* such that *OCD* is a right angle.

(i) Show that the length of *OC* is approximately 1.65 cm and find the length of *CD*. [4]

(ii) Find the perimeter of the shaded region. [3]

For Examiner's Use

(iii) Find the area of the shaded region. [3]

BLANK PAGE