www.dynamicpapers.com

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

CANDIDATE NAME

CENTRE NUMBER | | | | | |

CANDIDATE NUMBER | | | | |

1001041770

ADDITIONAL MATHEMATICS **4037/13**

Paper 1 **October/November 2012**

2 hours

Candidates answer on the Question Paper.

No Additional Materials are required.

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** 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.

For Examiner's Use	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
Total	

This document consists of **16** printed pages.

© UCLES 2012

www.dynamicpapers.com

Mathematical Formulae

For Examiner's Use

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

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

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

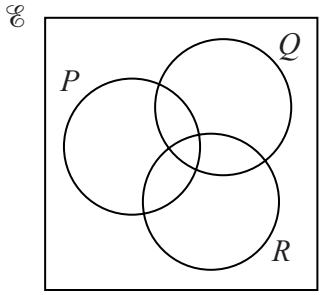
$$\Delta = \frac{1}{2} bc \sin A$$

© UCLES 2012

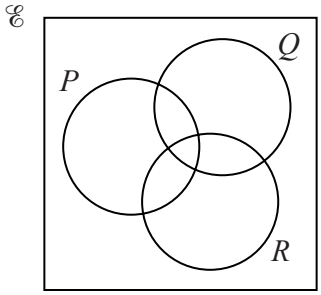
www.dynamicpapers.com

1 **(a)** On the Venn diagrams below, shade the region corresponding to the set given below each Venn diagram.

For Examiner's Use



$P \cup (Q \cap R)$



$P \cap (Q \cup R)$

[2]

(b) It is given that sets $\mathscr{E}$, B, S and F are such that

$\mathscr{E}$ = {students in a school},

B = {students who are boys},

S = {students in the swimming team},

F = {students in the football team}.

Express each of the following statements in set notation.

(i) All students in the football team are boys. [1]

(ii) There are no students who are in both the swimming team and the football team. [1]

www.dynamicpapers.com

For Examiner's Use

2 The rate of change of a variable x with respect to time t is $4\cos^2 t$.

(i) Find the rate of change of x with respect to t when $t = \frac{\pi}{6}$. [1]

The rate of change of a variable y with respect to time t is $3\sin t$.

(ii) Using your result from part **(i)**, find the rate of change of y with respect to x when $t = \frac{\pi}{6}$. [3]

---

3 A committee of 7 members is to be selected from 6 women and 9 men. Find the number of different committees that may be selected if

(i) there are no restrictions, [1]

(ii) the committee must consist of 2 women and 5 men, [2]

(iii) the committee must contain at least 1 woman. [3]

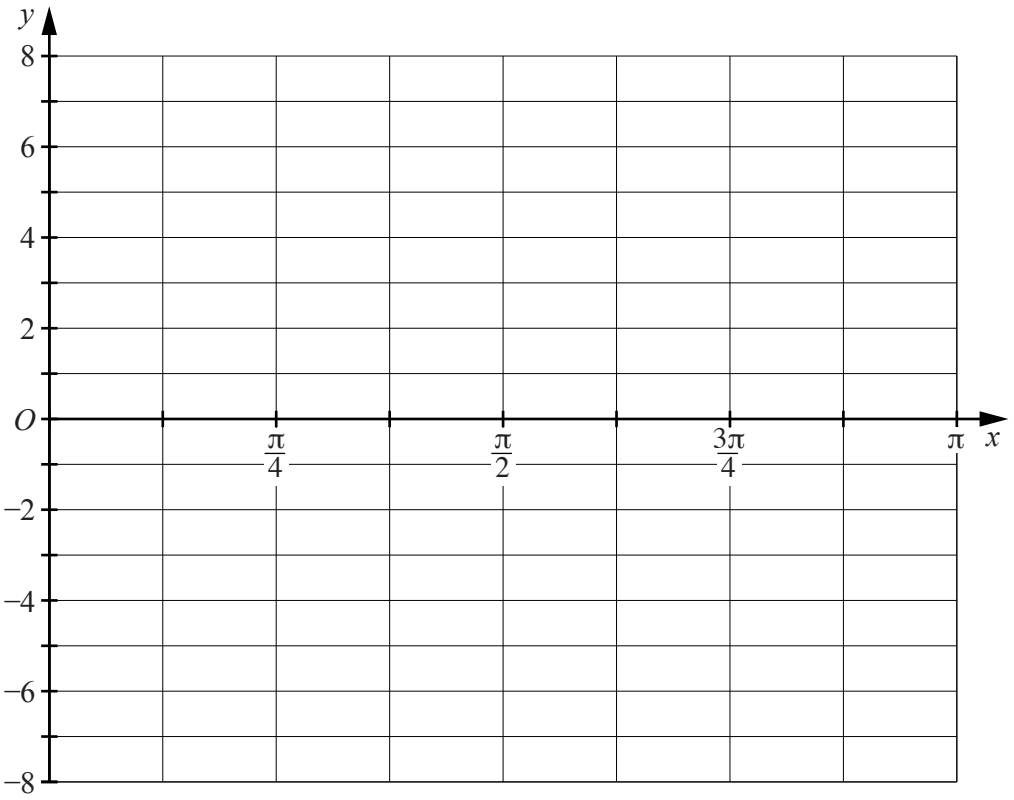
© UCLES 2012

www.dynamicpapers.com

4 **(i)** On the axes below sketch, for $0 \leqslant x \leqslant \pi$, the graphs of

$$y = \tan x \quad \text{and} \quad y = 1 + 3\sin 2x. \qquad [3]$$

For Examiner's Use



Write down

(ii) the coordinates of the stationary points on the curve $y = 1 + 3\sin 2x$ for $0 \leqslant x \leqslant \pi$, [2]

(iii) the number of solutions of the equation $\tan x = 1 + 3\sin 2x$ for $0 \leqslant x \leqslant \pi$. [1]

www.dynamicpapers.com

5 A pilot flies his plane directly from a point A to a point B, a distance of 450 km. The bearing of B from A is 030°. A wind of 80 km h^{-1} is blowing from the east. Given that the plane can travel at 320 km h^{-1} in still air, find

For Examiner's Use

(i) the bearing on which the plane must be steered, [4]

(ii) the time taken to fly from A to B. [4]

© UCLES 2012

www.dynamicpapers.com

6 In the expansion of $(p + x)^6$, where p is a positive integer, the coefficient of x^2 is equal to 1.5 times the coefficient of x^3.

For Examiner's Use

(i) Find the value of p. [4]

(ii) Use your value of p to find the term independent of x in the expansion of $(p + x)^6 \left(1 - \frac{1}{x}\right)^2$. [3]

www.dynamicpapers.com

For Examiner's Use

7 A particle P moves along the x-axis such that its distance, x m, from the origin O at time t s is given by $x = \dfrac{t}{t^2 + 1}$ for $t \geqslant 0$.

(i) Find the greatest distance of P from O. [4]

(ii) Find the acceleration of P at the instant when P is at its greatest distance from O. [3]

© UCLES 2012

www.dynamicpapers.com

8 **(i)** Given that $3x^3 + 5x^2 + px + 8 \equiv (x - 2)(ax^2 + bx + c)$, find the value of each of the integers a, b, c and p. [5]

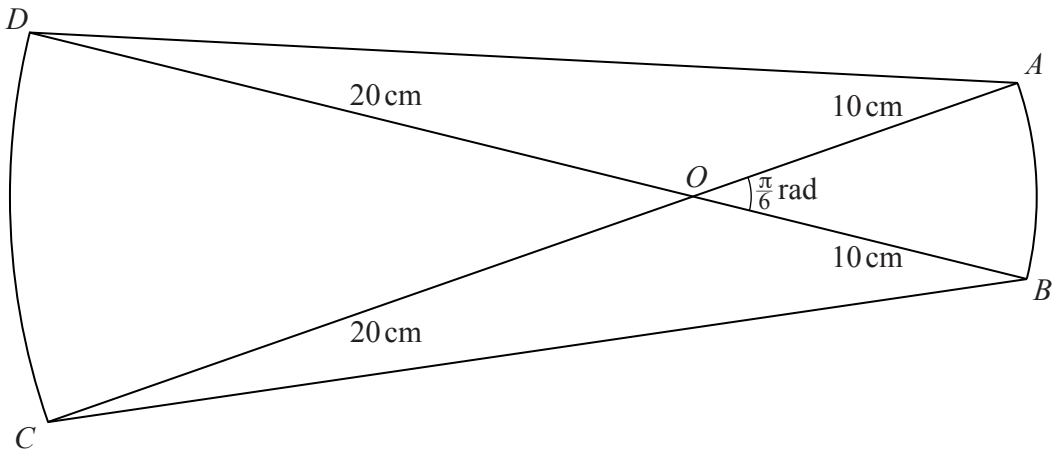
For Examiner's Use

(ii) Using the values found in part **(i)**, factorise completely $3x^3 + 5x^2 + px + 8$. [2]

www.dynamicpapers.com

9

For Examiner's Use



The diagram shows four straight lines, *AD, BC*, *AC* and *BD*. Lines *AC* and *BD* intersect at *O* such that angle *AOB* is $\frac{\pi}{6}$ radians. *AB* is an arc of the circle, centre *O* and radius 10 cm, and *CD* is an arc of the circle, centre *O* and radius 20 cm.

(i) Find the perimeter of *ABCD*. [4]

© UCLES 2012

www.dynamicpapers.com

(ii) Find the area of $ABCD$. [4]

For Examiner's Use

www.dynamicpapers.com

10 **(i)** Solve $\tan^2 x - 2\sec x + 1 = 0$ for $0° \leqslant x \leqslant 360°$. [4]

For Examiner's Use

(ii) Solve $\cos^2 3y = 5\sin^2 3y$ for $0 \leqslant y \leqslant 2$ radians. [4]

© UCLES 2012

www.dynamicpapers.com

(iii) Solve $2\text{cosec}\left(z + \frac{\pi}{4}\right) = 5$ for $0 \leqslant z \leqslant 6$ radians. [4]

For Examiner's Use

www.dynamicpapers.com

11 Answer only **one** of the following two alternatives.

For Examiner's Use

EITHER

The tangent to the curve $y = 5e^{x} + 3e^{-x}$ at the point where $x = \ln\frac{3}{5}$, meets the x-axis at the point P.

(i) Find the coordinates of P. [5]

The area of the region enclosed by the curve $y = 5e^{x} + 3e^{-x}$, the y-axis, the positive x-axis and the line $x = a$ is 12 square units.

(ii) Show that $5e^{2a} - 14e^{a} - 3 = 0$. [3]

(iii) Hence find the value of a. [3]

OR

(i) Given that $y = \dfrac{3e^{2x}}{1 + e^{2x}}$, show that $\dfrac{dy}{dx} = \dfrac{Ae^{2x}}{(1 + e^{2x})^2}$, where A is a constant to be found. [4]

(ii) Find the equation of the tangent to the curve $y = \dfrac{3e^{2x}}{1 + e^{2x}}$ at the point where the curve crosses the y-axis. [3]

(iii) Using your result from part **(i)**, find $\displaystyle\int \frac{e^{2x}}{(1 + e^{2x})^2}\,dx$ and hence evaluate $\displaystyle\int_{0}^{\ln 3} \frac{e^{2x}}{(1 + e^{2x})^2}\,dx$. [4]

Start your answer to Question 11 here.

Indicate which question you are answering.

EITHER	
OR	

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

© UCLES 2012

www.dynamicpapers.com

Continue your answer here.

For Examiner's Use

www.dynamicpapers.com

Continue your answer here if necessary.

For Examiner's Use

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

University of Cambridge International Examinations is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.

© UCLES 2012