



--

--	--	--	--	--

--	--	--	--

4037/22

May/June 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.

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.

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

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

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

$$(a + b)^n = a^n + \binom{n}{1} a^{n-1} b + \binom{n}{2} a^{n-2} b^2 + \dots + \binom{n}{r} a^{n-r} b^r + \dots + b^n,$$

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 $\triangle ABC$

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

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

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

- 1 It is given that P is the set of prime numbers, S is the set of square numbers and N is the set of numbers between 10 and 90. Write each of the following statements using set notation.

For
Examiner's
Use

(i) 7 is a prime number. [1]

(ii) 8 is not a square number. [1]

(iii) There are 6 square numbers between 10 and 90. [1]

2 (i) Given that $y = \sqrt{(4x + 1)^3}$, find $\frac{dy}{dx}$. [2]

(ii) Hence find the approximate increase in y as x increases from 6 to $6 + p$, where p is small. [2]

- 3 Find the values of m for which the line $y = mx - 5$ is a tangent to the curve $y = x^2 + 3x + 4$.

[5]

*For
Examiner's
Use*

- 4 In a competition the contestants search for hidden targets which are classed as difficult, medium or easy. In the first round, finding a difficult target scores 5 points, a medium target 3 points and an easy target 1 point. The number of targets found by the two contestants, Claire and Denise, are shown in the table.

For
Examiner's
Use

Contestant \ Target	Difficult	Medium	Easy
Claire	4	1	7
Denise	2	5	1

In the second round, finding a difficult target scores 8 points, a medium target 4 points and an easy target 2 points. In the second round Claire finds 2 difficult, 5 medium and 2 easy targets whilst Denise finds 4 difficult, 3 medium and 6 easy targets.

- (i) Write down the sum of two matrix products which, on evaluation, would give the total score for each contestant. [3]

- (ii) Use matrix multiplication and addition to calculate the total score for each contestant. [2]

5 It is given that $x - 2$ is a factor of $f(x) = x^3 + kx^2 - 8x - 8$.

(i) Find the value of the integer k .

[2]

For
Examiner's
Use

(ii) Using your value of k , find the non-integer roots of the equation $f(x) = 0$ in the form $a \pm \sqrt{b}$, where a and b are integers.

[5]

6 (a) Find the coefficient of x^3 in the expansion of

(i) $(1 - 2x)^7$,

[2]

For
Examiner's
Use

(ii) $(3 + 4x)(1 - 2x)^7$.

[3]

(b) Find the term independent of x in the expansion of $\left(x + \frac{3}{x^2}\right)^6$.

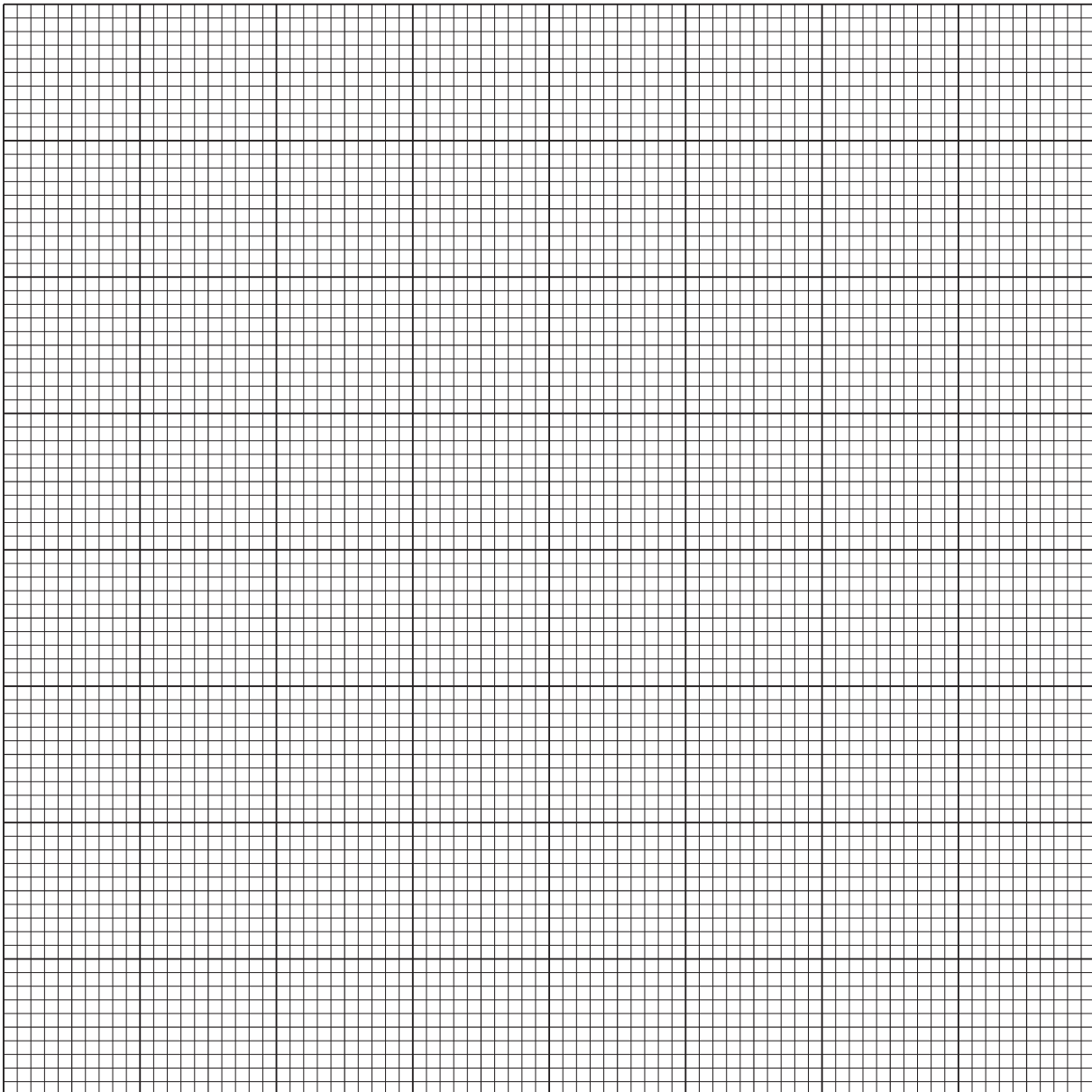
[3]

- 7 The table shows experimental values of variables x and y .

x	5	30	150	400
y	8.9	21.9	48.9	80.6

For
Examiner's
Use

- (i) By plotting a suitable straight line graph, show that y and x are related by the equation $y = ax^b$, where a and b are constants. [4]



- (ii) Use your graph to estimate the value of a and of b .

[4]

For
Examiner's
Use

- (iii) Estimate the value of y when $x = 100$.

[2]

- 8 An open rectangular cardboard box with a square base is to have a volume of 256 cm^3 . Find the dimensions of the box if the area of cardboard used is as small as possible. [7]

*For
Examiner's
Use*

9 (a) Solve the equation

(i) $3 \sin x - 5 \cos x = 0$ for $0^\circ < x < 360^\circ$,

[3]

For
Examiner's
Use

(ii) $5 \sin^2 y + 9 \cos y - 3 = 0$ for $0^\circ < y < 360^\circ$.

[5]

(b) Solve $\sin(3 - z) = 0.8$ for $0 < z < \pi$ radians.

[4]

For
Examiner's
Use

10 (a) A team of 7 people is to be chosen from 5 women and 7 men. Calculate the number of different ways in which this can be done if

(i) there are no restrictions, [1]

(ii) the team is to contain more women than men. [3]

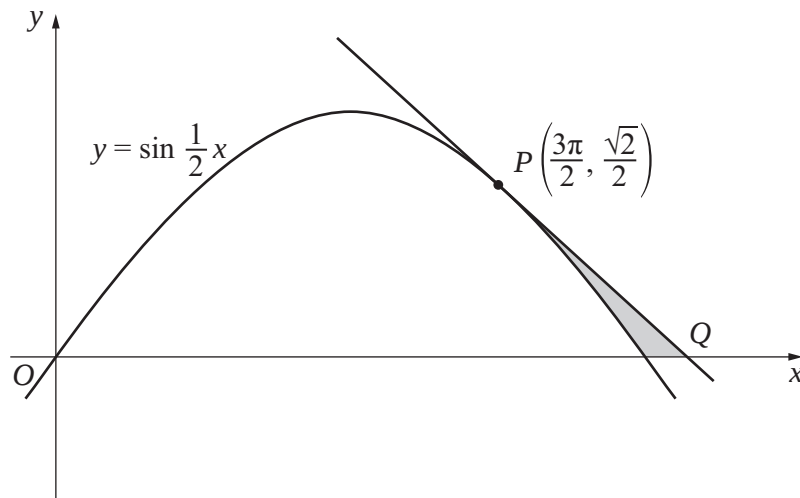
- (b) (i) How many different 4-digit numbers, less than 5000, can be formed using 4 of the 6 digits 1, 2, 3, 4, 5 and 6 if no digit can be used more than once? [2]

*For
Examiner's
Use*

- (ii) How many of these 4-digit numbers are divisible by 5? [2]
-

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

EITHER

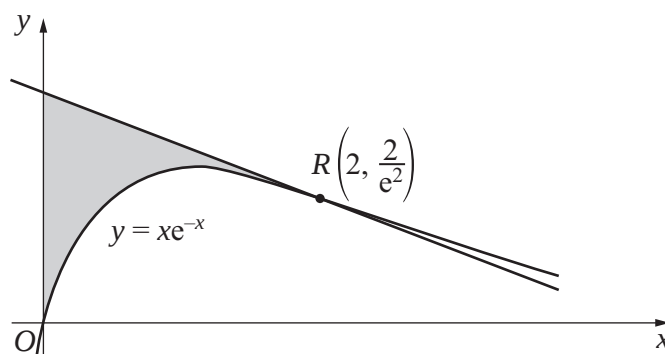


The diagram shows part of the curve $y = \sin \frac{1}{2}x$. The tangent to the curve at the point $P\left(\frac{3\pi}{2}, \frac{\sqrt{2}}{2}\right)$ cuts the x -axis at the point Q .

- (i) Find the coordinates of Q . [4]
- (ii) Find the area of the shaded region bounded by the curve, the tangent and the x -axis. [7]

OR

- (i) Given that $y = xe^{-x}$, find $\frac{dy}{dx}$ and hence show that $\int xe^{-x} dx = -xe^{-x} - e^{-x} + c$. [4]



The diagram shows part of the curve $y = xe^{-x}$ and the tangent to the curve at the point $R\left(2, \frac{2}{e^2}\right)$.

- (ii) Find the area of the shaded region bounded by the curve, the tangent and the y -axis. [7]

For
Examiner's
Use

Indicate which question you are answering.

EITHER	
OR	

This image shows a full page of white paper with horizontal dotted lines. The lines are evenly spaced and run across the width of the page, providing a guide for handwriting practice. There are no margins, text, or other markings on the page.

This image shows a full page of white paper with horizontal dotted lines, typical of primary-ruled notebook paper. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

www.theallpapers.com