Pre-U

Cambridge

MATHEMATICS (STATISTICS WITH PURE MATHEMATICS) (SHORT COURSE)	**1347/01**
Paper 1 Pure Mathematics	**May/June 2017**
	1 hour 45 minutes

Additional Materials: Answer Booklet/Paper
                           Graph Paper
                           List of Formulae (MF21)

READ THESE INSTRUCTIONS FIRST

If you have been given an Answer Booklet, follow the instructions on the front cover of the Booklet.
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.

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 65.

This document consists of **3** printed pages and **1** blank page.

1 Solve the simultaneous equations

$$y - x = 5,$$
$$x^2 + xy = 12.$$ [5]

2 **(i)** Find the expansion of $(2 + x)^4$. [3]

   (ii) Write $(2 + \sqrt{k})^4$ in the form $p + q\sqrt{k}$, where p and q are polynomial expressions involving integer powers of k. [3]

3 **(i)** Write the expression $2x^2 + 12x + 13$ in the form $a(x + b)^2 + c$, where a, b and c are constants to be found. [3]

   (ii) State a sequence of transformations that will transform the graph of $y = x^2$ onto the graph of $y = 2x^2 + 12x + 13$. [4]

4 Find the equation of the normal to the curve $y = 3x^2 - \sqrt{x} - 20x + 45$ at the point where $x = 4$. Give your answer in the form $ax + by = c$, where a, b and c are integers. [8]

5 **(i)** Solve the equation $e^{2x} - e^x - 6 = 0$, giving your answer(s) in exact form. [4]

   (ii) Find the range of values of h for which the equation $e^{2x} - e^x + h = 0$ has no real solutions. [3]

6 The temperature $\theta\,°C$ of a substance undergoing a chemical reaction is modelled by the equation $\theta = t^2 - 32\ln t$, where t is the time in minutes after the reaction begins (so that $t > 0$).

   (i) Find the value of t for which the temperature is a local maximum or minimum, and state the corresponding value of θ. [5]

   (ii) Determine whether this value is a local maximum or a local minimum. [3]

   (iii) State what the model predicts about the temperature for large values of t. [1]

7 **(a)** A curve satisfies $\dfrac{dy}{dx} = 6x^3 + \dfrac{1}{x^2}$ and passes through the point $(2, 20)$. Find the equation of the curve. [5]

   (b) Find the area contained between the line $y = x$ and the curve $y = 4x - x^2$. [6]

8 The line l_1 has equation $2x + 3y = 27$. The points $A\,(3, 7)$ and $B\,(12, m)$ lie on l_1.

   (i) Show that the distance AB is $3\sqrt{13}$. [2]

   (ii) The line l_2 is perpendicular to l_1 and passes through the point $C\,(4, 2)$. Find the equation of l_2. [3]

   (iii) Find the coordinates of the point of intersection of l_1 and l_2. [3]

   (iv) Find the area of triangle ABC. [4]

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