IYGB GCE

Core Mathematics C1

Advanced Subsidiary

Practice Paper O

Difficulty Rating: 3.4400/1.5625

Time: 1 hour 30 minutes

Calculators may NOT be used in this examination.

Information for Candidates

This practice paper follows the Edexcel Syllabus.
The standard booklet "Mathematical Formulae and Statistical Tables" may be used.
Full marks may be obtained for answers to ALL questions.
The marks for the parts of questions are shown in round brackets, e.g. **(2)**.
There are 9 questions in this question paper.
The total mark for this paper is 75.

Advice to Candidates

You must ensure that your answers to parts of questions are clearly labelled.
You must show sufficient working to make your methods clear to the Examiner.
Answers without working may not gain full credit.
The examiner may refuse to mark any parts of questions if deemed not to be legible.

Question 1

a) Simplify the following expression, writing the final answer in the form $a+b\sqrt{3}$, where a and b are integers

$$\frac{2\sqrt{3}-1}{2-\sqrt{3}}.$$ **(3)**

b) Solve the equation

$$2^{x+2}=4\sqrt{2}.$$ **(3)**

Question 2

$$y=4\sqrt{x}, \ x\in\mathbb{R}, \ x>0.$$

Show clearly that

$$\frac{d^2y}{dx^2}+\frac{8}{y^2}\frac{dy}{dx}=0.$$ **(5)**

Question 3

A recurrence relation is defined for $n\geq 1$ by

$$a_{n+1}=(a_n)^2-4, \quad a_1=k,$$

where k is a non zero constant.

a) Find the value of a_3 in terms of k. **(2)**

It is given that $a_2+a_3=26$.

b) Find the possible values of k. **(5)**

Question 4

The straight lines l_1 and l_2 have respective equations

$$x + 4y + 5 = 0 \text{ and } y = 2x - 2 .$$

These two lines intersect at the point P. **(4)**

a) Sketch l_1 and l_2 on the same diagram, showing clearly all the points where each of these lines meet the coordinate axes.

b) Calculate the exact coordinates of P. **(4)**

c) Determine an equation of the straight line which passes through P, and is perpendicular to l_1.
Give the answer in the form $ax + by = c$, where a, b and c are integers. **(4)**

Question 5

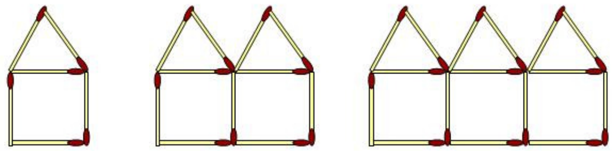
Find the range of values of the constant k so that the quadratic equation

$$x^2 + (2k+1)x + k^2 = 2$$

has **real** roots. **(5)**

Question 6

Thomas is making patterns using sticks. He uses 6 sticks for the first pattern, 11 sticks for the second pattern, 16 sticks for the third pattern and so on.



a) Find how many sticks Thomas uses to make the tenth pattern. **(2)**

b) Show clearly that Thomas uses 285 sticks to make the first ten patterns. **(2)**

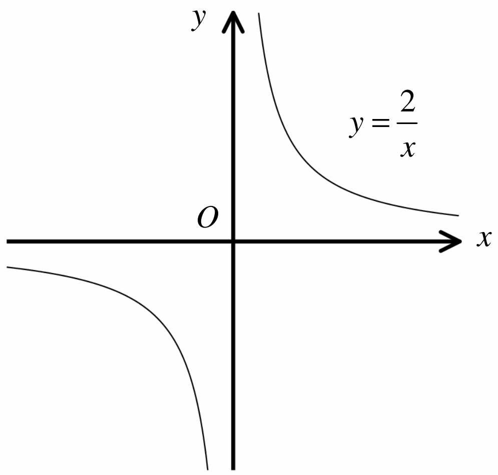
Thomas has a box with 1200 sticks. Thomas can make k **complete** patterns with the sticks in his box.

c) Show further that k satisfies the inequality

$$k(5k+7) \le 2400.$$ **(3)**

d) Hence find the value of k. **(2)**

Question 7



The figure above shows the graph of the curve C with equation

$$y = \frac{2}{x}, \quad x \neq 0.$$

a) Describe the geometric transformation which maps the graph of C onto the graph with equation

$$y = \frac{2}{x-2}, \quad x \neq 0. \qquad \textbf{(3)}$$

b) Sketch the graph of the curve with equation

$$y = \frac{2}{x} + 2, \quad x \neq 0. \qquad \textbf{(3)}$$

Indicate the coordinates of any points of intersections between the curve and the coordinate axes. State the equations of the two asymptotes of the curve.

c) Show that the x coordinates of the points of intersection between the graph of $y = \frac{2}{x-2}$ and the graph of $y = \frac{2}{x} + 2$ are the roots of the quadratic equation

$$x^2 - 2x - 2 = 0. \qquad \textbf{(3)}$$

d) Hence find, in exact surd form, the x coordinates of the points of intersection between the graph of $y = \frac{2}{x-2}$ and the graph of $y = \frac{2}{x} + 2$. **(3)**

Question 8

The curve C has equation

$$y = 2x^3 - 6x^2 + 3x + 5.$$

The point $P(2,3)$ lies on C and the straight line L_1 is the tangent to C at P.

a) Find an equation of L_1. **(4)**

The straight lines L_2 and L_3 are parallel to L_1, and they are the respective normals to C at the points Q and R.

b) Determine the x coordinate of Q and the x coordinate of R. **(3)**

Question 9

The points $(-2,-1)$ and $(1,-4)$ lie on the curve C with equation $y = f(x)$.

The gradient function of C is given by

$$\frac{dy}{dx} = 3x^2 + 4x + k \ ,$$

where k is a constant.

a) Find an equation of C, in the form $y = f(x)$. **(7)**

The straight line L has equation

$$y = -3x - 5.$$

b) Show that L is a tangent to C and determine further the coordinates of the point of tangency. **(5)**
