IYGB GCE

Mathematics MP1

Advanced Level

Practice Paper W

Difficulty Rating: 4.4050/1.7555

Time: 2 hours 30 minutes

Candidates may use any calculator allowed by the regulations of this examination.

Information for Candidates

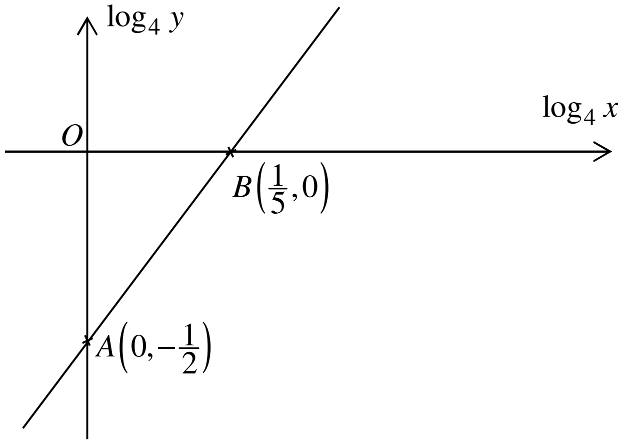
This practice paper follows closely the Pearson Edexcel Syllabus, suitable for first assessment Summer 2018.

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 12 questions in this question paper.
The total mark for this paper is 100.

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.
Non exact answers should be given to an appropriate degree of accuracy.
The examiner may refuse to mark any parts of questions if deemed not to be legible.

Question 1



The figure above shows a set of axes where $\log_4 y$ is plotted against $\log_4 x$.

A straight line passes through the points $A\left(0,-\frac{1}{2}\right)$ and $B\left(\frac{1}{5},0\right)$.

Find a relationship, not involving logarithms between x and y. **(5)**

Question 2

The height of tides in a harbour, on a particular day, can be modelled by the equation

$$h = a + b\sin(30t)°,$$

where h is the height of the water in metres, t hours after midnight, and a and b are constants.

At 02.00, $h = 9.5$ m and at 08.00, $h = 3.5$ m.

Determine …

a) … the value of a and the exact value of b. **(4)**

b) … the first time after midnight when the height of the tide is 5 metres. **(6)**

Question 3

$$f(x) = x^2 + 2kx - 15k^2 \text{, where } k \text{ is a constant.}$$

a) Express $f(x)$ in completed the square form. **(2)**

b) Hence solve the equation $f(x) = 0$. **(3)**

Question 4

The quadratic functions f and g are defined by

$$f(x) \equiv 4x^2 + a, \ x \in \mathbb{R}$$

$$g(x) \equiv x^2 + bx + a, \ x \in \mathbb{R},$$

where a, b and c are non zero constants, such that $a = -2c$ and $b = -3c$.

It is further given that $(x+c)$ is a common factor f and g.

Determine the value of a, b and c, and hence factorize f and g, showing clearly the common factor in these factorizations. **(7)**

Question 5

The points A, B and C have coordinates $(6,6)$, $(0,8)$ and $(-2,2)$, respectively.

a) Find an equation of the perpendicular bisector of AB. **(3)**

The points A, B and C lie on the circumference of a circle whose centre is located at the point D.

b) Determine the coordinates of D. **(7)**

Question 6

The distance between the town of Arundel (A) and the town of Berry (B) is 60 km.

Berry is on bearing of $75°$ from Arundel.

The village of Crake (C) is on a bearing of $120°$ from Arundel and on a bearing of $195°$ from Berry. The village of Dorking (D) is on a bearing of $135°$ from Arundel and on a bearing of $210°$ from Berry.

a) Find, to three significant figures where appropriate, the distance between …

i. … Berry and Crake. **(3)**

ii. … Berry and Dorking. **(3)**

iii. … Crake and Dorking. **(3)**

b) State the bearing of Dorking from Crake. **(1)**

Question 7

A curve C and a straight L have respective equations

$$C: \; y = 4x^2 - 6x + 3 \quad \text{and} \quad L: \; 2x - 4y + 3 = 0.$$

Show that L is a normal to C, at some point on C. **(10)**

Question 8

Show that

$$6125^{\frac{1}{4}} + 5^{\frac{5}{4}}$$

can be written in the form $\sqrt{10}\left(a\sqrt{5} + b\sqrt{7}\right)^{\frac{1}{2}}$, where a and b are positive integers to be found. **(8)**

Question 9

A quadratic has equation

$$y = A + Bx - x^2, \ x \in \mathbb{R}.$$

The image of the curve, when reflected in the y axis, is identical to the image of the curve when translated by the vector $\begin{pmatrix} -3 \\ 0 \end{pmatrix}$.

Given further that the curve meets the y axis at $(0,10)$, determine the area of the finite region bounded by the curve and the x axis. **(10)**

Question 10

The curve C has equation

$$y = 1 - \frac{3x}{x^2 - 2x + 4}, \ x \in \mathbb{R}.$$

Use a method **not involving differentiation** to find the coordinates of the stationary points of C. **(10)**

Question 11

The four vertices of a quadrilateral $ABCD$ lie on the same plane.

The points M and N are the midpoints of AB and CD, respectively.

Determine the possible values of the scalar constant λ, given further that

$$\left(\lambda^2 - 6\lambda + 10\right)\overrightarrow{MN} = \overrightarrow{AD} + \overrightarrow{BC}.$$ **(7)**

Question 12

Use algebra, to solve the following equation.

$$e^x + e^{1-x} = e + 1.$$ **(8)**
