IYGB GCE

Mathematics MP1

Advanced Level

Practice Paper B

Difficulty Rating: 3.35/1.0567

Time: 2 hours

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 13 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

Write each of the following surd expressions as simple as possible.

a) $\sqrt{24}+\sqrt{6}$. **(1)**

b) $\left(2+\sqrt{3}\right)\left(4-\sqrt{12}\right)$ **(3)**

Detailed workings must support the answers in this question.

Question 2

Find the set of values of x, that satisfy the following inequality.

$$\frac{4x+1}{x-1}>3.$$ **(6)**

Question 3

$$f(n)=n^2+n+2, \quad n \in \mathbb{N}.$$

Show that $f(n)$ is always even. **(3)**

Question 4

$$f(x)=4x^2+20x+25, \ x \in \mathbb{R}.$$

a) Solve the equation $f(x)=0$. **(2)**

b) Hence, or otherwise, solve the equation $f\left(\frac{1}{2}x+1\right)=0$. **(2)**

Question 5

A cubic curve C has equation

$$y = 6x^3 + Ax^2 - 6x + B, \quad x \in \mathbb{R},$$

where A and B are constants.

The graph of C meets the x axis at $(5,0)$.

When the equation of C is divided by $(x-1)$ the remainder is -24.

a) Determine the value of A and the value of B. **(5)**

b) Factorize fully the equation of C. **(3)**

c) Sketch the graph of C.

The sketch must show clearly the coordinates of any points where the graph of C meets the coordinate axes. **(3)**

Question 6

The gradient function of the curve with equation

$$y = 2(x+a)^2,$$

where a is a non zero constant, is given by

$$\frac{dy}{dx} = 4x + 10.$$

Determine the value of a. **(4)**

Question 7

The straight line l_1 passes through the point $A(-7,-4)$ and meets the y axis at the point $B(0,2)$.

a) Determine, with full justification, whether the point $P(-5,-2)$ lies above l_1 or below l_1. **(6)**

The straight line l_2 passes through the point $C(-1,-10)$ and meets the l_1 at B.

b) Determine, with full justification, whether the point $Q\left(-\frac{1}{2},-5\right)$ lies inside or outside the triangle ABC. **(3)**

Question 8

The following table shows some experimental data.

t	2	4	6	8	10	12	14
P	20	64	110	180	260	320	420

It is assumed that the two variables t and P are related by the formula

$$P = at^b ,$$

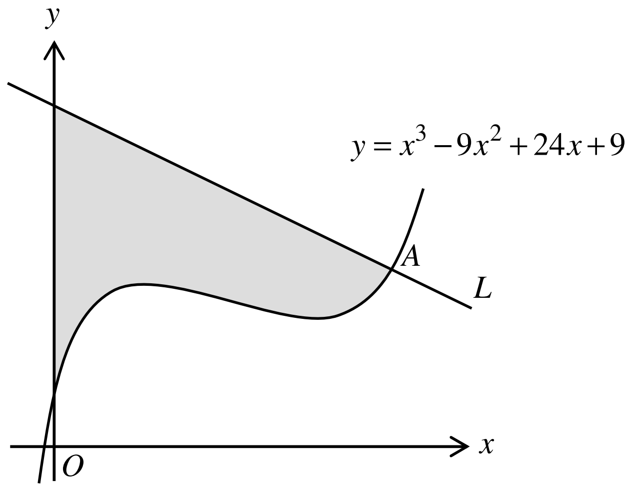
where a and b are non zero constants.

a) Use a graphical method, involving logarithms, to show that the above data is consistent with this assumption. **(7)**

b) Determine estimates for the value of a and the value of b, correct to one decimal place. **(4)**

c) Use the estimated values of a and b, to find an estimate for the value of P when $t = 20$. **(1)**

Question 9



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

$$y = x^3 - 9x^2 + 24x + 9.$$

The straight line L is the normal to C at the point A, whose x coordinate is 5.

a) Show that an equation of L is

$$x + 9y = 266. \qquad \textbf{(5)}$$

b) Show further that the area of the finite region bounded by C, L and the y axis is approximately 20 square units. **(6)**

Question 10

The curve C has equation

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

Show that C has only one stationary point and determine its nature. **(7)**

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Question 11

A circle C has equation

$$x^2 + y^2 + 4x - 10y + 9 = 0.$$

a) Find the coordinates of the centre of C and the size of its radius. **(3)**

A tangent to the circle T, passes through the point with coordinates $(0,-1)$ and has gradient m, where $m < 0$.

b) Show that m is a solution of the equation

$$2m^2 - 3m - 2 = 0. \qquad (6)$$

The tangent T meets C at the point P.

c) Determine the coordinates of P. **(5)**

Question 12

Solve, in **degrees**, the following trigonometric equation

$$\tan^4 y = 6 + \tan^2 y, \quad 0° \le y < 360°. \qquad (7)$$

Question 13

A curve has equation

$$f(x) = e^x + 10e^{-x} - 7, \quad x \in \mathbb{R}.$$

a) Solve the equation $f(x) = 0$. **(5)**

b) Hence, or otherwise, solve the equation

$$e^{2x-2} - 7e^{x-1} + 10 = 0. \qquad (3)$$
