IYGB GCE

Mathematics MP1

Advanced Level

Practice Paper P

Difficulty Rating: 3.9900/1.3930

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 11 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.

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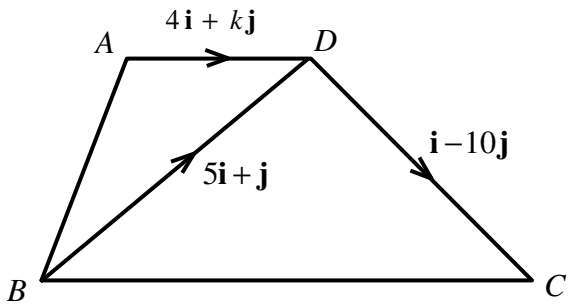
Question 1



The figure above shows a trapezium $ABCD$, where AD is parallel to BC.

The following information is given for this trapezium.

$$\overrightarrow{BD} = 5\mathbf{i} + \mathbf{j}, \quad \overrightarrow{DC} = \mathbf{i} - 10\mathbf{j} \quad \text{and} \quad \overrightarrow{AD} = 4\mathbf{i} + k\mathbf{j},$$

where k is an integer.

a) Use vector algebra to show that $k = -6$. **(4)**

b) Find the length of $\overrightarrow{AB}$. **(3)**

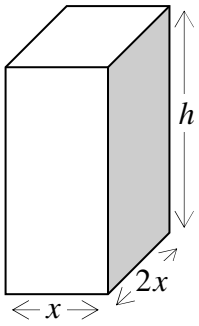
c) Calculate the size of the angle ABD. **(3)**

Question 2

Solve the following trigonometric equation in the range given.

$$\left(\sqrt{3} - 2\sin 3x\right)\left(\sqrt{3} + 2\cos 3x\right) = 0, \quad 0° \le x < 180°. \quad \textbf{(7)}$$

Question 3



The figure above shows the design of a fruit juice carton with capacity of $1000\ \text{cm}^3$.

The design of the carton is that of a closed cuboid whose base measures x cm by $2x$ cm, and its height is h cm.

a) Show that the surface area of the carton, $A\ \text{cm}^2$, is given by

$$A = 4x^2 + \frac{3000}{x}. \qquad \textbf{(3)}$$

b) Find the value of x for which A is stationary. **(4)**

c) Calculate the minimum value for A, justifying fully the fact that it is indeed the minimum value of A. **(4)**

Question 4

The circle C_1 has centre at $(8,4)$ and **touches** the y axis.

The circle C_2 has centre at $(16,4)$ and **touches** the x axis.

a) Find the equation of C_1 and the equation of C_2.
Give the answers in the form $(x-a)^2+(y-b)^2=c$, where a, b and c are constants to be found. **(4)**

The two circles intersect at the points A and B.

b) Determine, in exact surd form where appropriate, the coordinates of A and the coordinates of B. **(6)**

Question 5

If A, k and n are constants, with $n \in \mathbb{N}$, then

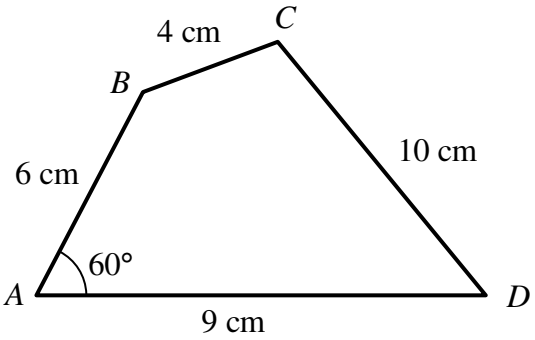
$$(1+kx)^n = 1+Ax+264x^2+1760x^3+\ldots$$

a) Show that

$$(n-2)k=20. \quad \textbf{(4)}$$

b) Determine the value of A. **(6)**

Question 6



The figure above shows a quadrilateral $ABCD$, with side lengths AB, BC, CD and DA are 6 cm, 4 cm, 10 cm and 9 cm, respectively.

The angle BAD is $60°$.

a) Show that BD is $3\sqrt{7}$ cm. **(3)**

b) Find, to one decimal place, the size of the angle BCD. **(2)**

c) Determine, to one decimal place, the area of the quadrilateral $ABCD$. **(3)**

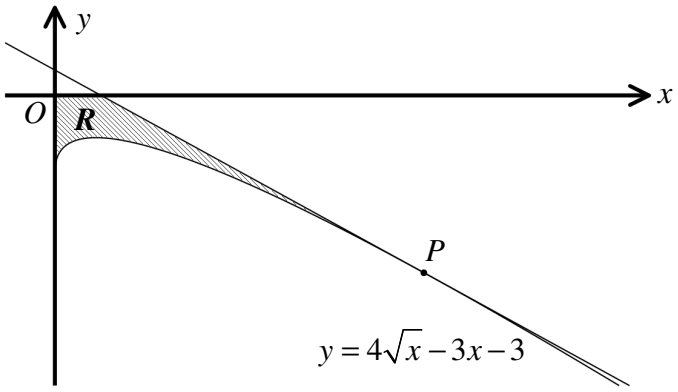
Question 7

A quadratic equation has two real roots differing by k, where k is a positive constant.

Determine, in terms of k, an exact simplified expression for the discriminant of this quadratic.

You may assume that the coefficient of the quadratic term of the equation is one. **(5)**

Question 8



The figure above shows part of the curve with equation

$$y = 4\sqrt{x} - 3x - 3\,,\ x > 0$$

a) Show that an equation of the tangent to the curve at the point P, where $x = 4$, is given by

$$y = 1 - 2x\,. \qquad \textbf{(4)}$$

The finite region R is bounded by the curve, the tangent to the curve at P and the coordinate axes.

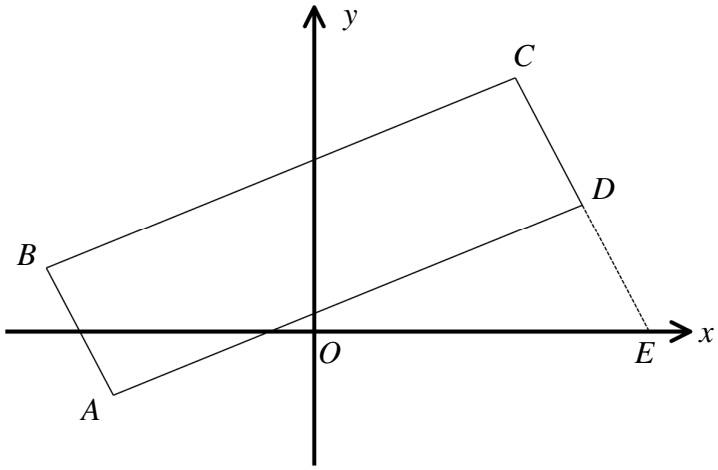
b) Determine the exact area of R. **(6)**

Question 9

Solve the following logarithmic equation.

$$2\log_2 x + \log_2(x-1) - \log_2(5x+4) = 1\,. \qquad \textbf{(8)}$$

Question 10



A parallelogram has vertices at $A(-3,-2)$, $B(-4,2)$, $C(3,8)$ and $D(4,4)$.

a) Show that $ABD = 90°$ and hence find the area of the parallelogram $ABCD$. **(6)**

The side CD is extended so that it meets the x axis at the point E.

b) Find the coordinates of E. **(4)**

c) Show that EB and AD bisect each other. **(2)**

d) By considering two suitable congruent triangles and without any direct area calculations, show that the area of the triangle EBC is equal to the area of the parallelogram $ABCD$. **(3)**

Question 11

$$f(x)=8^x,\ x\in\mathbb{R}.$$

a) Describe the geometric transformation which maps the graph of $f(x)$ onto the graph of …

i. … $y=\left(\frac{1}{8}\right)^x$. **(2)**

ii. … $y=2^x$. **(2)**

The graph of $f(x)$ is mapped onto the graph of $y=8^{x-1}$ by a single geometric transformation T, which is **not a translation**.

b) Describe T geometrically. **(2)**