IYGB GCE

Mathematics MP1

Advanced Level

Practice Paper H

Difficulty Rating: 3.66/1.1966

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 the following expression in the form $k\sqrt{3}$, where k is an integer.

$$\frac{90}{\sqrt{3}}-\sqrt{6}\times\sqrt{8}-\left(2\sqrt{3}\right)^3$$

Detailed workings must be shown in this question **(4)**

Question 2

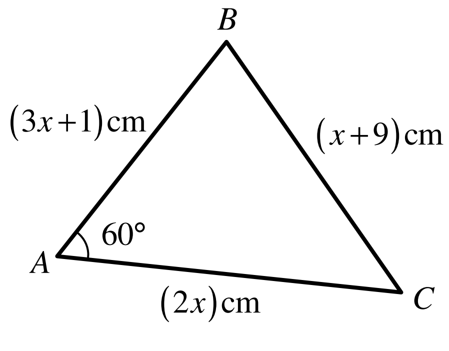
$$f(x)=(1-2x)^8$$

a) Find the first four terms in the expansion of $f(x)$, in ascending powers of x. **(3)**

b) Hence determine, in ascending powers of x, the first four terms in the expansion of

$$(2+3x)(1-2x)^8.$$ **(3)**

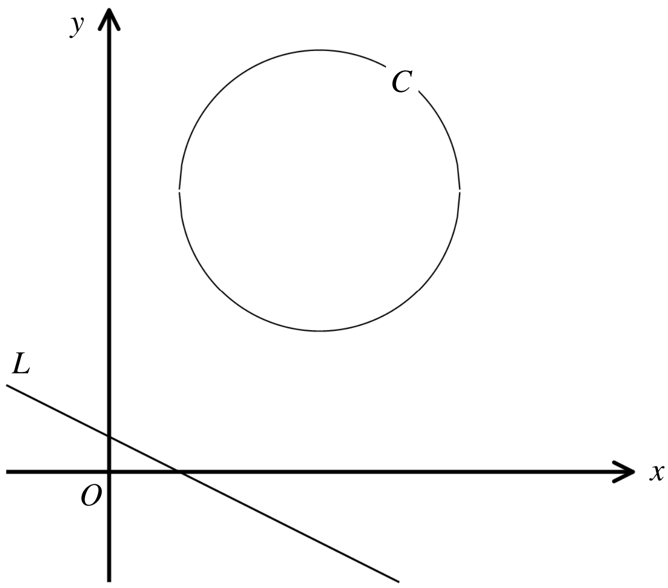
Question 3



The figure above shows a triangle ABC whose side lengths are given in terms of x.

Given that the angle BAC is $60°$, determine the exact area of the triangle. **(7)**

Question 4



The figure above shows the circle C and the straight line L with respective equations

$$x^2 + y^2 - 6x - 8y + 21 = 0 \quad \text{and} \quad x + 2y = 2 .$$

a) Find an equation of the line which passes through the centre of C and is perpendicular to L. **(6)**

b) Hence determine, in exact surd form, the shortest distance between C and L. **(6)**

Question 5

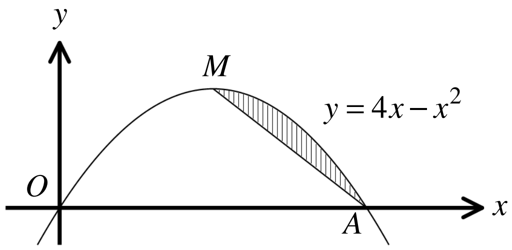
The quadratic equation

$$3(p+2)x^2 + (p+5)x + p = 0 ,$$

where p is a constant, $p \neq -2$, has repeated roots.

Find the possible roots of the equation. **(8)**

Question 6



The figure above shows the curve with equation

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

The point M is the maximum point of the curve and the point A is one of the x intercepts of the curve.

Find the exact area of the shaded region, bounded by the curve and the straight line segment joining A and M.

(9)

Question 7

$$f(x) \equiv x^3 - 3x + 2, \ x \in \mathbb{R}.$$

a) Express $f(x)$ as the product of three linear factors. **(5)**

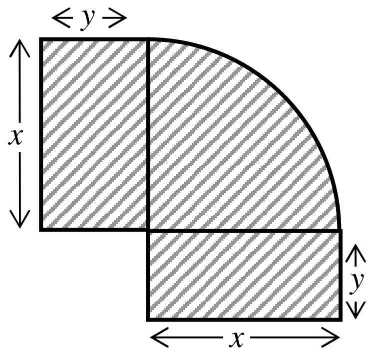
b) Sketch the graph of $f(x)$.

The sketch must include the coordinates of any points where the graph of $f(x)$ meets the coordinate axes. **(3)**

c) Solve the equation

$$f(x) = (x-1)^2.$$ **(4)**

Question 8



The figure above shows the design for an earring consisting of a quarter circle with two identical rectangles attached to either straight edge of the quarter circle. The quarter circle has radius x cm and the each of the rectangles measure x cm by y cm.

The earring is assumed to have negligible thickness and treated as a two dimensional object with area 12.25 cm^2.

a) Show that the perimeter, P cm, of the earring is given by

$$P = 2x + \frac{49}{2x}. \qquad (4)$$

b) Find the value of x that makes the perimeter of the earring minimum, fully justifying that this value of x produces a minimum perimeter. **(6)**

c) Show that for the value of x found in part **(b)**, the corresponding value of y is

$$\tfrac{7}{16}(4-\pi). \qquad (3)$$

Question 9

$$f(x) = \ln(4x),\ x \in \mathbb{R},\ x > 0.$$

Find, in exact simplified form, the solution of the equation

$$f(x) + f\left(x^2\right) + f\left(x^3\right) = 6. \qquad (6)$$

Question 10

Solve the following trigonometric equation in the range given.

$$\cos(4\psi - 120)° = \cos 200°, \ 0 \le \psi < 180. \qquad (6)$$

Question 11

Prove that the sum of two positive even consecutive powers of 2 is always a multiple of 20.

(5)

Question 12

$$T = 8x - 12y + 7.$$

It is further given that $-\frac{1}{2} < x < \frac{7}{8}$ and $-\frac{1}{6} < y < \frac{2}{3}$.

Determine the range of possible values of T. (4)

Question 13

The points $(2,10)$ and $(6,100)$ lie on the curve with equation

$$y = ax^n,$$

where a and n are non zero constants.

Find, to three decimal places, the value of a and the value of n. (8)
