IYGB GCE

Mathematics MP1

Advanced Level

Practice Paper T

Difficulty Rating: 5.0000/2.4000

Time: 3 hours

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

Information for Candidates

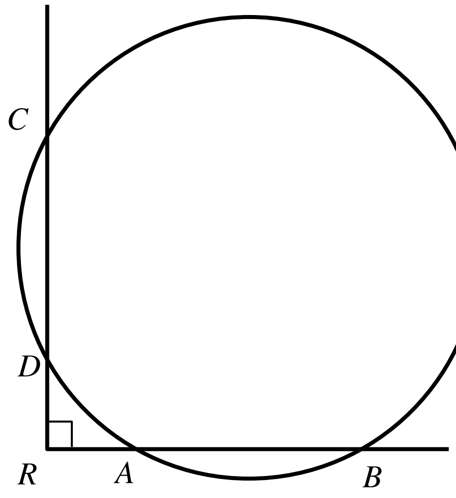
This practice paper follows closely the Pearson Edexcel Syllabus, suitable for first assessment Summer 2018.

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 12 questions in this question paper.
The total mark for this paper is 125.

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 straight line intersecting a circle at the points A and B so that $|AB| = 8$ units.

Another straight line intersects the same circle at the points C and D so that $|CD| = 12$ units.

The two straight lines intersect each other at right angles at the point R.

Given further that $|AR| = 4$ units, determine the length of the radius of the circle. **(4)**

Question 2

It is given that $x \in \mathbb{R}$ and $y \in \mathbb{R}$ such that $x + y = 1$.

Prove that

$$x^2 + y = y^2 + x.$$ **(6)**

Question 3

Show that

$$\frac{3}{\sqrt[3]{4}-1}$$

can be written in the form $\sqrt[3]{a}+\sqrt[3]{b}+1$, where a and b are integers to be found. **(6)**

Question 4

$$f(x) \equiv \frac{1}{6}x^2 + 3x + 12, \quad x \in \mathbb{R}.$$

Determine the four possible ways of expressing $f(x)$ as product of two linear factors **(6)**

Question 5

$$4\cos^2\theta + \tan^4\theta = 10, \quad 0 \le \theta < 2\pi.$$

Show that $\theta = \frac{1}{3}\pi$ is a solution of the above trigonometric equation and use a non verification method to find the other solutions. **(14)**

Question 6

A rectangle $ABCD$ is such so that $|DC| = 6$ and $|DA| = 4$.

The side DA is extended to the point E and the side DC is extended to the point F so that EBF is a straight line.

Determine, with full justification, the minimum area of the triangle EDF. **(10)**

Question 7

It is given that

$$\left(a+bx\right)^n = 8192+6656x+2496x^2+\dots,$$

where a, b and n are non zero constants.

Use algebra to determine the values of a, b and n.

No credit will be given to solutions by inspection and/or verification **(12)**

Question 8

A quadratic curve has equation

$$f\left(x\right) \equiv x^2+6x+20+k\left(x^2-3x-12\right),$$

where k is a constant.

Given that the point $P\left(-2,p\right)$ is the minimum point of the curve, determine the value of each of the constants p and k. **(9)**

Question 9

The point $A\left(6,-1\right)$ lies on the circle with equation

$$x^2+y^2-4x+6y=7.$$

The tangent to the circle at A passes through the point P, so that the distance of P from the centre of the circle is $\sqrt{65}$.

Another tangent to the circle, at some point B, also passes through P.

Determine in any order the two sets of the possible coordinates of P and B. **(18)**

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Question 10

Solve the following equation.

$$\left(1+e^{-2}\right)\left(e^{2}\right)^{x^2-4x+5} = e^{2}+e^{4(x-2)^2}, \ x \in \mathbb{R}. \qquad \textbf{(12)}$$

Question 11

The points P and Q have coordinates $(7,3)$ and $(-5,0)$, respectively.

The straight line segment RT, with equation $3x+5y=19$, intersects the straight line segment PQ at the point R.

Given further that the length of PT is $\sqrt{85}$, show that the area of the triangle PTR can take two values, one being twice as large as the other. **(14)**

Question 12

A curve C and a straight line L have respective equations

$$C: \ y = \frac{3}{4}x^2 - 4\sqrt{x} + 7, \ x \geq 0$$

$$L: \ y = 5x - 9$$

a) Show that L is a tangent to C at some point P, further determining the coordinates of P. **(10)**

b) Show further that L does not meet C again. **(8)**
