IYGB GCE

Core Mathematics C1

Advanced Subsidiary

Practice Paper W

Difficulty Rating: 3.8733/1.8809

Time: 2 hours

Calculators may NOT be used in this examination.

Information for Candidates

This practice paper follows the Edexcel Syllabus.
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 9 questions in this question paper.
The total mark for this paper is 75.

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.
The examiner may refuse to mark any parts of questions if deemed not to be legible.

Question 1

a) Solve the equation

$$3^y = \frac{\sqrt{3}}{9}. \qquad (\mathbf{3})$$

b) Express

$$\sqrt{525},$$

in the form $a\sqrt{b}\sqrt{c}$, where a, b and c are prime numbers. $(\mathbf{2})$

Question 2

The straight line segment joining the points with coordinates $(-7,k)$ and $(-2,-11)$, where k is a constant, has gradient -2.

a) Determine the value of k. $(\mathbf{2})$

The midpoint of the straight line segment joining the points with coordinates $(a,-3)$ and $(4,1)$ has coordinates $(9,b)$, where a and b are constants.

b) Find the value of a and the value of b. $(\mathbf{2})$

The straight line segment joining the points with coordinates $(-7,7)$ and $(-3,c)$, where c is a constant, has length $\sqrt{17}$.

c) Determine the possible values of c. $(\mathbf{5})$

Question 3

A curve with equation $y = f(x)$ passes through the point $(2,3)$.

The gradient function of the curve is given by

$$f'(x) = (x-3)(3x-1).$$

a) Find an equation of the curve, giving the answer as a polynomial in its simplest form. **(7)**

b) Show clearly that

$$f(x) \equiv (x+k)(x-3)^2,$$

where k is a constant to be found. **(3)**

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

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

Question 4

It is given that for all positive integers

$$\sum_{r=1}^{n} u_r = 7 + 3n^2.$$

a) Evaluate $\sum_{r=1}^{4} u_r$. **(1)**

b) Hence find the value of u_5. **(2)**

Question 5

The equation of a quadratic curve C is

$$y = k\left(2x^2 - x + 1\right) - 5x^2 + x - 2,$$

where k is a constant.

Given that the graph of C lies below the x axis, determine the range of the possible values of k. **(9)**

Question 6

A recurrence relation is defined for $n \geq 1$ by

$$t_{n+1} = at_n + b, \quad t_1 = 2,$$

where a and b are non zero constants.

Given further that

$$t_2 = 3 \quad \text{and} \quad \sum_{r=1}^{3} t_r = 12,$$

find the possible value of a and the possible value of b. **(6)**

Question 7

A curve C has equation

$$y = 2x^3 - 5x^2 + a, \ x \in \mathbb{R},$$

where a is a constant.

The tangent to C at the point where $x = 2$ and the normal to C at the point where $x = 1$, meet at the point Q.

Given that Q lies on the x axis, determine in any order …

a) … the value of a.

b) … the coordinates of Q.

(11)

Question 8

A gym has 125 members and in order to meet its outgoings it needs 600 members.

A Public Relations company is hired to re-launch the gym and increase its membership thereafter, using a variety of marketing strategies.

A preliminary model for the recruitment of new members is as follows.

It is expected that 10 new members will join in the week following the gym's re-launch, 12 new members in the second week, 14 in the third week and so on with 2 new members joining the gym in each subsequent week.

a) Find according to this preliminary model …

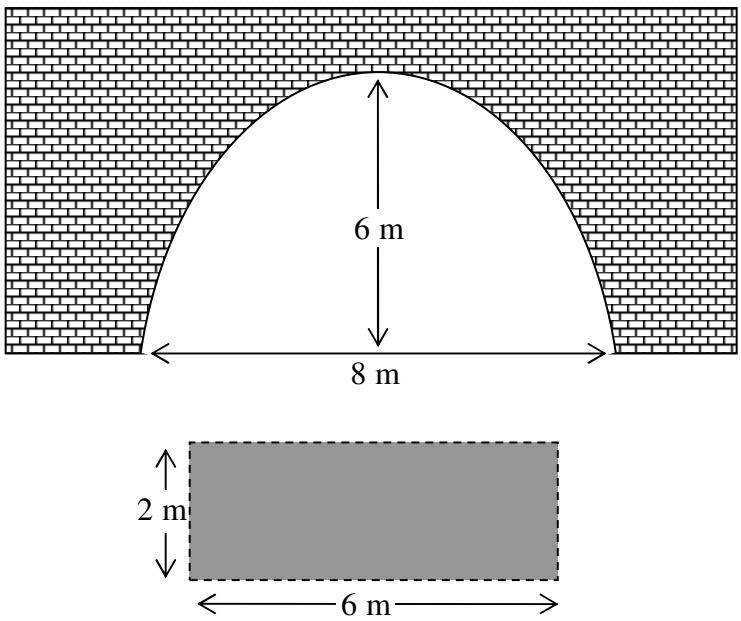
i. … the number of the new members that will join in the 12^{th} week. **(2)**

ii. … the **total** number of members after 12 weeks. **(3)**

The model is refined to allow for the gym losing members at the constant rate of 3 members per week. The gym **reaches** the desired target of 600 members in N weeks.

b) Determine the value of N. **(7)**

Question 9



The figure above shows the parabolic arch under a railway bridge.

The width of the arch at its lowest level is 8 metres and the highest point of the arch is 6 metres from the ground.

Determine, showing a clear algebraic method whether a lorry with a wide load of width 6 metres and height 2 metres can pass through this parabolic arch.

(7)