Rewarding Learning

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
2013

Mathematics

Assessment Unit C1

assessing

Module C1: AS Core Mathematics 1

[AMC11]

FRIDAY 24 MAY, MORNING

AMC11

TIME

1 hour 30 minutes.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number on the Answer Booklet provided.
Answer **all eight** questions.
Show clearly the full development of your answers.
Answers should be given to three significant figures unless otherwise stated.
You are not permitted to use any calculating aid in this paper.

INFORMATION FOR CANDIDATES

The total mark for this paper is 75
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
A copy of the **Mathematical Formulae and Tables booklet** is provided.

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Answer all eight questions.

Show clearly the full development of your answers.

Answers should be given to three significant figures unless otherwise stated.

You are not permitted to use any calculating aid in this paper.

1 An outline for an airline logo is in the shape of an isosceles triangle as shown in **Fig. 1** below.

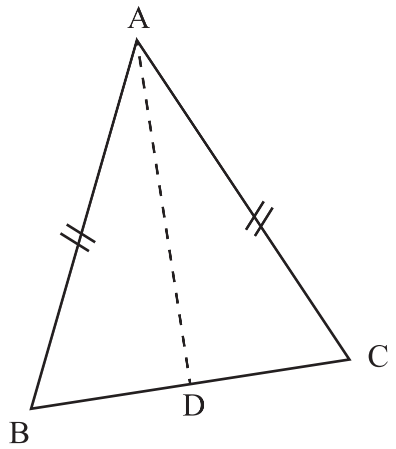

Fig. 1

AB = AC
B has coordinates (–1, 1)
C has coordinates (5, 3)
D is the mid point of BC

(i) Find the coordinates of D. [2]

(ii) Hence find the equation of the line AD. [4]

2 **Fig. 2** below shows a sketch of the function $y = \mathrm{f}(x)$

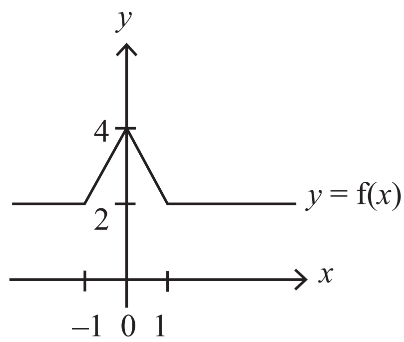

Fig. 2

Fig. 3 below shows a sketch of the function $y = \mathrm{f}(x)$ after a transformation.

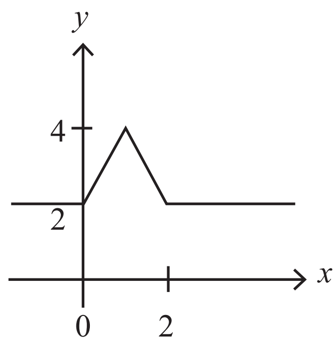

Fig. 3

(i) Describe the transformation, using function notation. [2]

Fig. 4 below shows a sketch of the **original** function $y = \mathrm{f}(x)$ after a **different** transformation.

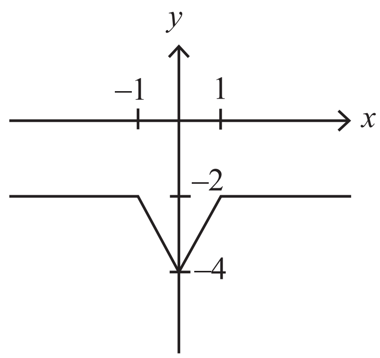

Fig. 4

(ii) Describe the transformation, using function notation. [2]

3 Rationalise the denominator of

$$\frac{5+\sqrt{3}}{1-2\sqrt{3}}$$

[6]

4 **(a)** Differentiate with respect to x

$$x^3+\sqrt{x}-\frac{x}{4}+\frac{1}{2x}$$

[5]

(b) Find the point on the curve $y=1+x-2x^2$ at which the gradient of the curve is 9 [6]

5 **(a)** **(i)** Write $x^2+6x+17$ in the form $(x+a)^2+b$ [2]

A curve has the equation $y=x^2+6x+17$

(ii) State the coordinates of the turning point on this curve and identify it as a maximum or minimum. [3]

(iii) State the range of values of x for which the value of y is increasing. [1]

(iv) Find the corresponding range of values of y. [1]

(b) Find x given that

$$3^{x+1}\times 9^{x}=\frac{1}{3\sqrt{3}}$$

[7]

6 f(x) is the expression $ax^2 + bx + c$.

When f(x) is divided by (x – 1) the remainder is 1
When f(x) is divided by (x – 2) the remainder is 16
When f(x) is divided by (x + 2) the remainder is 64

(i) Find a, b and c. [10]

(ii) Hence show that f(x) is a perfect square. [2]

7 A closed jewellery box is in the shape of a cuboid as shown in **Fig. 5** below.

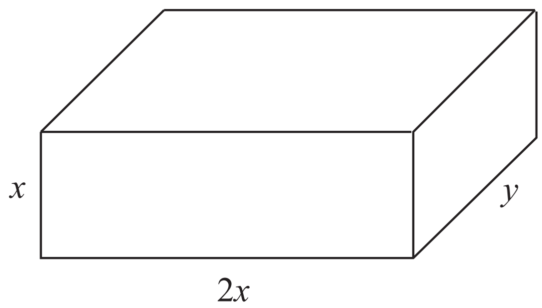

Fig. 5

The box has width $2x$ cm, length y cm and height x cm.
The box has a volume of 72 cm^3

(i) Show that the total surface area of the closed box can be expressed as

$$A = 4x^2 + \frac{216}{x}$$ [6]

(ii) Using calculus, find the dimensions of the box that give the minimum surface area. [8]

8 Find the range of values of k for which the equation

$$(k-1)x^2 - (k+3)x - 1 = 0$$

has two distinct real roots. [8]

THIS IS THE END OF THE QUESTION PAPER