

New
Specification



Rewarding Learning

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
2019

Centre Number

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Candidate Number

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Mathematics

Assessment Unit AS 1

assessing

Pure Mathematics



SMT11

[SMT11]

WEDNESDAY 15 MAY, MORNING

TIME

1 hour 45 minutes.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.

You must answer **all nine** questions in the spaces provided.

Do not write outside the boxed area on each page or on blank pages.

Complete in black ink only. **Do not write with a gel pen.**

Questions which require drawing or sketching should be completed using an H.B. pencil.

All working should be clearly shown in the spaces provided. Marks may be awarded for partially correct solutions. **Answers without working may not gain full credit.**

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

You are permitted to use a graphic or scientific calculator in this paper.

INFORMATION FOR CANDIDATES

The total mark for this paper is 100.

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.

Throughout the paper the logarithmic notation used is $\ln z$ where it is noted that $\ln z \equiv \log_e z$

11884



28SMT1101

1 (a) Solve the simultaneous equations

$$x + 2y + 3z = 9$$

$$2x - y + 4z = 17$$

$$3x + y - z = 2$$

[7]

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28SMT1102



Handwriting practice lines consisting of 20 horizontal dotted lines.

[Turn over



(b) $\overrightarrow{OA} = 4\mathbf{i} - \mathbf{j}$

$$\overrightarrow{\text{OB}} = 6\mathbf{i} + 2\mathbf{j}$$

Find:

(i) the magnitude of the vector $\overrightarrow{AB}$,

[3]

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.



[2]

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28SMT1105

- 2 Fig. 1 below shows a sketch of the graph of the curve given by the equation $y = f(x)$.

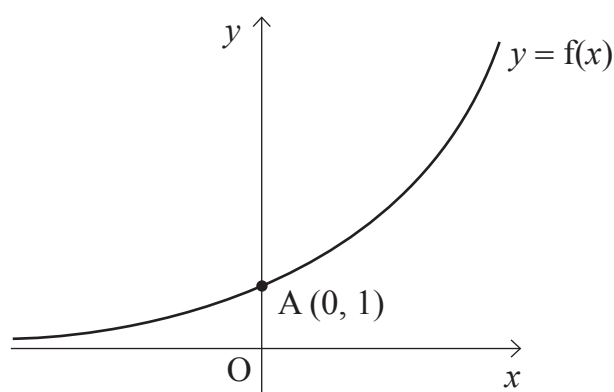


Fig. 1

Point A has coordinates (0, 1).

- (a) Write down the coordinates of the point A under the following transformations:

(i) $y = f(x) + 1$ [2]

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(ii) $y = f(x - 3)$ [2]

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(iii) $y = f(-x)$

[2]

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(b) $f(x)$ has an asymptote given by the equation $y = 0$

Write down the equation of the asymptote of the curve under the transformation

$$y + 2 = f(x).$$

[1]

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[Turn over]



3 (a) (i) Given that $\log_2 a = 3$ state the value of a . [1]

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(ii) Hence solve the equation

$$\log_2 x - \log_2 (x - 1) = 3 \quad [5]$$

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[illegible]

[4]

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28SMT1109

[illegible]

[6]

This image shows a full page of a handwriting practice worksheet. It consists of approximately 20 horizontal rows. Each row is defined by two parallel dotted lines, creating a series of uniform gaps for writing. The lines are evenly spaced across the entire page, providing a guide for letter height and placement. There is no text or other markings on the page.

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28SMT1111

5 (a) Given that

$$\int_1^k 2\sqrt{x} \, dx = \frac{28}{3}$$

find the value of k .

[6]

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28SMT1112

(b) Solve the equation

$$2 \cos^2 \theta = 1 - \sin \theta$$

for $0 \leq \theta \leq 360^\circ$

[7]

[Turn over



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28SMT1115

The volume of the tin is

$$V = 150\pi r - \frac{\pi r^3}{2}$$

- (iii)** Using calculus, find the values of r and h for which the volume of the tin is a maximum.

[7]

This image shows a full page of white paper designed for handwriting practice. It features approximately 20 evenly spaced horizontal dotted lines extending across the entire width of the page. There are no margins, text, or other markings present.

This image shows a full page of white paper with horizontal dotted lines, typical of primary school writing paper. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

[Turn over

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28SMT1117

7 Solve the equation

$$2x^3 - 8x^2 + 3x + 10 = 0$$

[7]



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[Turn over



28SMT1119

11884

[Turn over



28SMT1121

(ii) The midpoint of the line AB has equal x and y ordinates.

Find the possible values of a in their simplest surd form.

[5]

This image shows a full page of white paper with horizontal dotted lines. The lines are evenly spaced and run across the width of the page, providing a guide for handwriting practice. There are no margins, text, or other markings on the page.

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[Turn over



28SMT1123

9 Fig. 3 below shows a diagram of a circle with centre O.

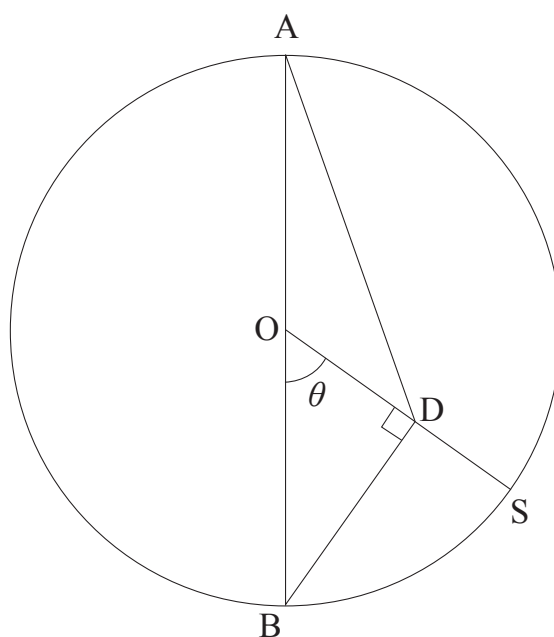


Fig. 3

AB is a diameter of the circle.

S lies on the circumference of the circle.

D is the foot of the perpendicular from B to OS.

The acute angle BOS is θ

$OA = OB = r$

$OD = x$

(i) By applying the cosine rule to triangle AOD, show that

$$AD^2 = r^2 (1 + 3 \cos^2 \theta) \quad [7]$$

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[illegible]

[Turn over

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28SMT1125

(ii) When BD bisects OS,

$$AD = \frac{r\sqrt{k}}{2}$$

Find the value of k , where k is a positive integer.

[5]

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THIS IS THE END OF THE QUESTION PAPER



28SMT1127

DO NOT WRITE ON THIS PAGE

For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
9	

Total Marks	
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Examiner Number

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28SMT1128