

ADVANCED General Certificate of Education 2023

#### **Mathematics**

Assessment Unit A2 1 assessing Pure Mathematics

#### 

**Centre Number** 

**Candidate Number** 

[AMT11] TUESDAY 6 JUNE, AFTERNOON \*AMT11\*

#### TIME

2 hours 30 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 eleven questions in the spaces provided.

**Do not write outside the boxed area on each page or on blank pages or tracing paper.** Complete in black ink only. **Do not write with a gel pen**.

Questions which require drawing or sketching should be completed using an HB pencil. Show clearly the full development of your answers. **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 150

Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.

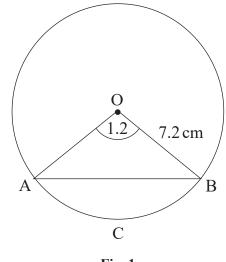
A copy of the Mathematical Formulae and Tables booklet is provided.

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

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- 1 The diagram in **Fig. 1** below shows the sector AOB of a circle with centre O and radius 7.2 cm. The angle AOB is 1.2 radians.



- Fig. 1
- (i) Calculate the area of the minor sector AOB. [2]



\*36AMT1102\*

ii)	Find the length of the chord AB.	[3]
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(iii	) Hence find the perimeter of the minor segment ABC.	[3]
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#### 2 (a) Solve the following

..... ..... ..... [Turn over]

|4x-1| > 5

[4]

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(1)	Find the values of $q$ and $p$ . [7]

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(ii)	State the range of values of $x$ for which this binomial expansion is valid. [1]
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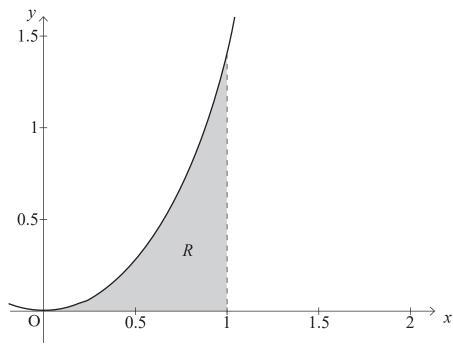


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[5]

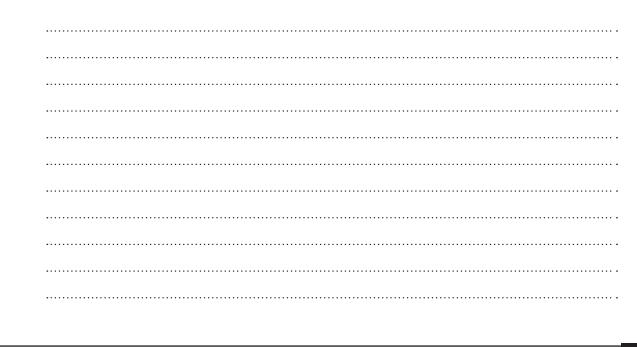






The region *R* is the area enclosed between the curve  $y = x^2 \sqrt{x^3 + 1}$ , the *x*-axis and the line x = 1

(i) Find an approximation for the shaded area *R* using the trapezium rule with 4 strips.



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The region *R* in **Fig. 2** forms a solid when rotated through  $2\pi$  radians about the *x*-axis.

[6]

#### (ii) Find the volume of this solid.

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4	The function $f(x) = \sin^{-1} x$	
	(i) Sketch the graph of $y = f(x)$	[3]
	$y_{\wedge}$	
	0	$\Rightarrow_X$
	(ii) State clearly the domain and range for this function.	
		[2]
		[2]
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$g(x) = 3 + 2\sin^{-1}x$	[3
	[Turn o

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5 (i)	Express $f(x) = \frac{25x}{(x-2)(x+3)^2}$ in partial fractions.	[7]
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Hence find the exact value of $\int_0^1 f(x) dx$	[6]
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6 In round one of a game show contestants get a prize of £100 for their first correct answer.					
	Wi	th each subsequent correct answer the prize money per question increases by $\pounds 50$			
	Ma	ndy won a total of £3,250			
	(i)	How many questions did she get correct? [5]			
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In round two of the game the prize values are different but are awarded in the same way.				
John answered 6 questions correctly and won £2,325				
Martha answered 3 questions correctly and won £825				
<ul> <li>(ii) Find the amount each contestant won for their first question and the increase in prize money per question in round two. [6]</li> </ul>				
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$\cos 2A = 1 - 2 \sin^2 A$ [3]
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	where $0 < \alpha < 90^{\circ}$		
(i)	Find the values of $R$ and $\alpha$ .		



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# (ii) Hence find the solution of $2\cos 2x + 5\sin 2x = 3$ for $0 \le x \le 180^{\circ}$ [4] ..... ..... ..... [Turn over]



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<b>8</b> (a)	) A curve is defined by the equation						
	$3y^2 + 2x - \frac{3x}{y} = 5$						
	Find $\frac{dy}{dx}$ in terms of <i>x</i> and <i>y</i> .	[8]					
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	$y = 3xe^{2x}$
)	Find the equation of the tangent to this curve at the point where $x = -2$ giving your answer in the form $e^a y = bx + c$ [9]
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(ii)	This curve has one turning point. Find the coordinates of this point and determine its nature.[7]
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x = a.					
(i)	Show that the value of <i>a</i> lies between $x = 1$ and $x = 2$ [4]				
(ii)	Starting with $x_0 = 1.5$ use the Newton-Raphson method twice to find a better approximation for the value of <i>a</i> . [6]				
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(ii)					

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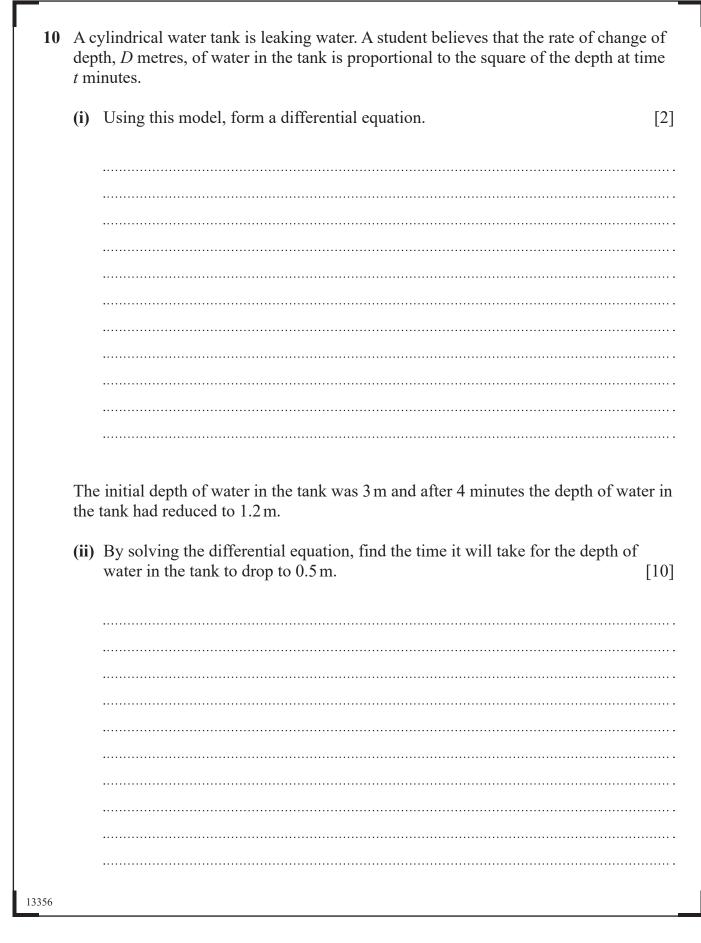
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	where $0 < t < \pi$
-	Find an expression for $\frac{dy}{dx}$ in terms of <i>t</i> . [7
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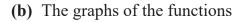
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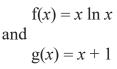
$\int_{0}^{\frac{\pi}{6}} (\sin x + \cos x)^2  \mathrm{d}x $ [7]



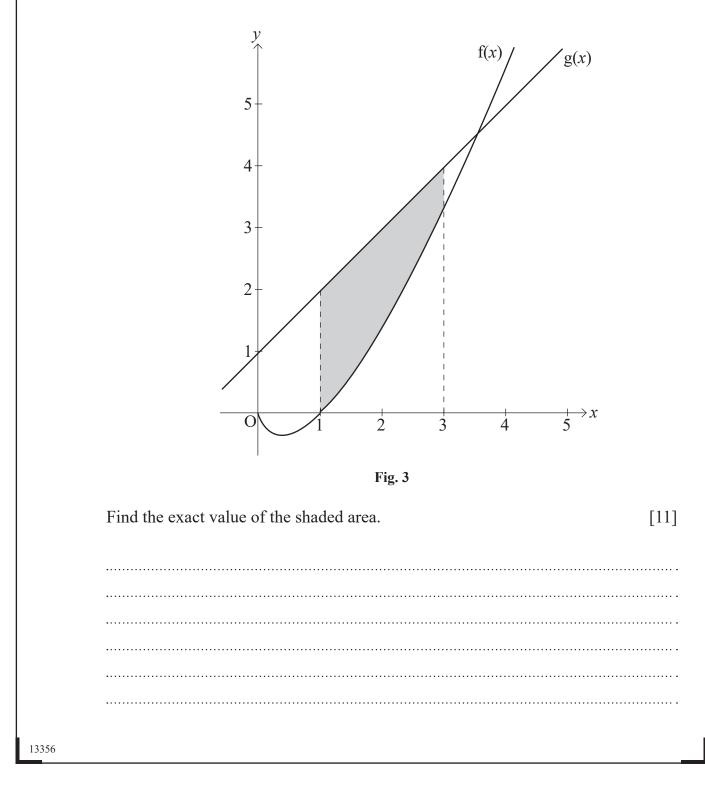
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are shown in Fig. 3 below.





\*36AMT1134\*

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#### THIS IS THE END OF THE QUESTION PAPER

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Question Number	Marks	
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Examiner Number

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