EDXCEL
A LEVEL MATHS

A LEVEL

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EXAM PRACTICE WORKBOOK
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## About this book

This book contains three sets of write-in, mock exam papers for the Edexcel A Level Maths exam (9MA0). Full details of this exam specification can be found on the Edexcel website.


There are three papers in each exam set. Papers 1 and 2 cover Pure, and Paper 3 covers Statistics and Mechanics. All three papers are 120 minutes long and are each worth 100 marks.

### The Large data set

The A Level examination will assume that you are familiar with a Large data set (LDS). In the exam, some questions will be based on the LDS and may include some extracts from it. It is Edexcel's intention that you should be taught using the LDS as this will give you a material advantage in the exam.

The data set consists of weather data samples provided by the Met Office for five UK weather stations and three overseas weather stations in the time periods May to October 1987 and May to October 2015. An Excel spreadsheet containing the LDS is available from the Edexcel website at the address given above.

### Answers

The back of this book contains short answers to all the questions. Full mark schemes for each mock paper can be found online.

https://global.oup.com/education/content/secondary/series/aqa-alevel-maths/edexcelalevelmaths-answers

### Formulae

In the exam, you will be provided with a 'Formulae for A Level Mathematics' booklet that is for use in AS Level and A Level Maths qualifications. These are provided at the end of this book. The relevant A Level Maths formulae and statistical tables are provided at the end of this book.

### Calculators

All papers are calculator papers. Make sure that you know how to use your calculator, particularly for statistical functions. The rules on which calculators are allowed can be found in the Joint Council for General Qualifications document 'Instructions for conducting examinations' (JCE).
Materials
For this paper you must have:
- The booklet of formulae and statistical tables
- You may use a graphics calculator.

Instructions
- Use black ink or black ball-point pen.
  Pencil should be used for drawing.
- Answer all questions.
- You must answer each question in the space provided for that question. If you require extra space, use a supplementary answer book; do not use the space provided for a different question.
- Do not write outside the box around each page.
- Show all necessary working; otherwise marks for method may be lost.
- Do all rough work in this book. Cross through any work that you do not want to be marked.

Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 100.

Advice
- Unless stated otherwise, you may quote formulae, without proof, from the booklet.
- You do not necessarily have to use all the space provided.
Answer all questions in the spaces provided.

1. Find \( \int \ln 2x \, dx \)
   You must show your working. [3 marks]

2. The diagram shows a sector \( ABC \) with radius \( r \) and angle \( \theta \), where \( \theta \) is in radians.
   
   ![Diagram of a sector](image)

   The arc length \( BC \) is \( P \) cm and the sector area \( ABC \) is \( Q \) cm\(^2\).
   It is given that \( Q = 3P \)

   a. Find the length \( r \) [3 marks]
It is also given that the triangle $ABC$ is equilateral.
Find the exact value of the area of the shaded segment.
You must fully justify your working.
3 A quadrilateral $ABCD$ is formed by joining the points of intersection of the lines with equations

\begin{align*}
y &= 2x + 1 \\
y - 2x &= -10 \\
2y &= 1 - 4x \\
y + 2x &= 6 \end{align*}

a i Write down the gradients of each of the four straight lines. \hspace{1cm} \text{[2 marks]}

ii What can you deduce about the shape of quadrilateral $ABCD$? You must justify your answer. \hspace{1cm} \text{[2 marks]}
3 b i Describe how you would find the coordinates of the four vertices of the quadrilateral. Do not include any calculations at this stage. [2 marks]

ii Find the exact values of the coordinates of each of the four vertices of the quadrilateral. [4 marks]
3 c. If $AB < BC$, what are lengths of sides $AB$ and $BC$ respectively in centimetres? [4 marks]

4 a. Prove, by contradiction, that $\sqrt{2}$ is irrational. [6 marks]
4 b Simplify \( \frac{\sqrt{2} \sqrt{2} \sqrt{2}}{\sqrt{2} \sqrt{2}} \), giving your answer in the form \( \sqrt{a} \), where \( a \) is an integer. [3 marks]

c A geometric sequence has first three terms 8, \( b \) and 4.

i Find the exact value of \( b \) in the form \( m \sqrt{n} \), where \( m \) and \( n \) are integers. [3 marks]
4 (c) ii Find the sum to infinity of the geometric sequence, showing all of your working.
Give your answer in the form \( f + g \sqrt{h} \), where \( f, g \) and \( h \) are integers. [5 marks]

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5 (a) Find the values of \( k \) such that \( kx^2 + 4x + 5 = k \) has no real solutions.
You must show all your working. [5 marks]
5 b \((x - p)\) is a factor of \(3x^2 - (p + 8)x - (p + 18)\), where \(p\) is an integer.

i Find the possible value(s) of \(p\)
You must show all your working. [6 marks]

ii For each value of \(p\) found in part b i, find the other factor of the quadratic expression. [2 marks]
6 a Solve the equation $\frac{14}{x} - x = 5$
You must show each step of your working. [3 marks]

b Write down the equation of the line $l$ shown in the diagram below. [2 marks]
By considering your answers to a and b, use calculus to find the area of the region labelled R.
Give your answer in the form \( \frac{a}{b} + c \ln 2 \), where \( a, b \) and \( c \) are integers. [11 marks]
Starting with the identity \( \cos^2 \theta + \sin^2 \theta = 1 \), prove that \( 1 + \tan^2 \theta = \sec^2 \theta \) [2 marks]

By using the identity from part a, or otherwise, solve the equation

\[ \sec^2 \theta - \sec \theta = 1 \text{ for } -\pi \leq \theta \leq 2\pi \]

Give all values of \( \theta \) in radians correct to three significant figures.

You must show every step of your working. [5 marks]
7 c Hence solve, for $-\pi \leq x \leq 2\pi$, the equation $\sec^2 \left( \sin \frac{1}{2} x \right) - \sec \left( \sin \frac{1}{2} x \right) = 1$.
Give your answers to three significant figures.  [4 marks]

8 a Show that the equation $x^2 - 6 = 0$ has a root between $x = 2.4$ and $x = 2.5$  [3 marks]
8 b Hence, starting with $x_0 = 2.4$, use the Newton-Raphson method once to find an approximate value of $\sqrt{6}$. [3 marks]
By defining a suitable function and then using the Newton–Raphson method (starting with $x_0 = 1.3$), find an approximation to the value of $\sqrt[3]{7}$ correct to six decimal places. [5 marks]
Jolene wishes to use the Newton–Raphson method to find an approximation to the positive root, \( \alpha \), of the curve \( y = f(x) \) (shown in the diagram).

She proposes starting the procedure at the point \( x_0 \), as shown in the diagram.

Will Jolene's method prove to be successful?

Justify your answer. [2 marks]
Given that $x = \tan y$, find $\frac{dx}{dy}$ as a function of $y$ (you must fully justify your working). [1 mark]

Hence find $\frac{d}{dx}(\tan^{-1} x)$ as a function of $x$ [4 marks]