



Full-Length Mock Paper - Assessment Lab

Pearson Edexcel Level 3 Advanced GCE in Mathematics (9MA0)

Mock Paper 1 - Series 3: Pure Mathematics

Mock Examination - Practice Paper

Time allowed: 2 hours	Total marks: 100
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Candidate instructions

- Use black ink or ball-point pen. Fill in the boxes at the top of this page with your name and centre.
- Answer ALL questions. Show ALL your working - answers without working may not gain full credit.
- You must have: the Edexcel Mathematical Formulae and Statistical Tables booklet, a scientific or graphical calculator.
- Diagrams are NOT accurately drawn unless otherwise stated.
- Where a calculator is used, the answer should be given to an appropriate degree of accuracy, unless a different level is specified in the question.
- This paper has 13 questions. The total number of marks is 100.

Candidate information

There are 13 questions in this paper. The total mark for this paper is 100. The marks for each question are shown in brackets - use this as a guide to how much time to spend on each question.

This paper follows the style, weighting and demand of Pearson Edexcel Paper 1: Pure Mathematics. It is part of the Method Room Assessment Lab mock paper library (Paper 1 series).

Advice: Read each question carefully before starting your answer. Try to answer every question. Check your answers if you have time at the end.

Paper 1 - Series 3: Pure Mathematics - Answer ALL questions

1.

The circle C has equation $(x + 0)^2 + (y - 1)^2 = 36$. The line l has equation $y = x + k$, where k is a constant.

- (a) Write down the centre and radius of C. **(2 marks)**
(b) Find the two values of k for which l is a tangent to C. **(7 marks)**

(Total for Question 1 is 9 marks)

2.

An open-topped box with a square base of side x cm and height h cm has volume 100 cm^3 .

- (a) Show that the surface area, S cm^2 , of the box is given by $S = x^2 + 400/x$. **(3 marks)**
(b) Find the value of x that minimises S, and find this minimum surface area, justifying that it is a minimum. **(6 marks)**

(Total for Question 2 is 9 marks)

3.

- (a) Express $8 \sin x + 15 \cos x$ in the form $R \sin(x + \alpha)$, where $R > 0$ and $0 < \alpha < 90^\circ$, giving α to 2 decimal places. **(4 marks)**
(b) Hence solve, for $0 \leq x < 360^\circ$, the equation $8 \sin x + 15 \cos x = 5$, giving your answers to 1 decimal place. **(5 marks)**

(Total for Question 3 is 9 marks)

4.

$f(x) = x^3 - 4x - 9$.

- (a) Show that $f(x) = 0$ has a root between $x = 2$ and $x = 3$. **(2 marks)**
(b) Using $x_0 = 2.5$ and the Newton-Raphson formula, find x_1 , x_2 and x_3 , giving your answers to 5 decimal places. **(7 marks)**

(Total for Question 4 is 9 marks)

5.

An arithmetic sequence has first term $a = 3$. The 12th term of the sequence is 69.

- (a) Find the common difference, d. **(2 marks)**
(b) Find the sum of the first 32 terms of the sequence. **(2 marks)**

A geometric sequence has first term 9 and 4th term 243.

- (c) Find the common ratio, and hence find the sum of the first 8 terms of the geometric sequence. **(3 marks)**

(Total for Question 5 is 7 marks)

6.

A curve has parametric equations $x = 4t^2$, $y = 4t^3$.

- (a) Find dy/dx in terms of t. **(3 marks)**

(b) Find an equation of the tangent to the curve at the point where $t = 1$. **(4 marks)**

(Total for Question 6 is 7 marks)

7.

(a) Solve, for $0 \leq \theta < 360^\circ$, the equation $5 \sin^2 \theta - 3 \cos \theta = 0$, giving your answers to 1 decimal place. **(5 marks)**

(b) Prove that, for $\sin 2\theta \neq 0$, $(1 - \cos 2\theta) / \sin 2\theta \equiv \tan \theta$. **(3 marks)**

(Total for Question 7 is 8 marks)

8.

Relative to a fixed origin O , points A , B and C have position vectors $\mathbf{a} = -2\mathbf{i} - 2\mathbf{j} + \mathbf{k}$, $\mathbf{b} = 3\mathbf{i} + 0\mathbf{j} + 3\mathbf{k}$, $\mathbf{c} = 0\mathbf{i} + 4\mathbf{j} + 3\mathbf{k}$. Point D is such that $ABCD$ is a parallelogram (in that vertex order).

(a) Find the position vector of D . **(4 marks)**

(b) Show, using vectors, that $ABCD$ is indeed a parallelogram. **(3 marks)**

(c) Find $|\mathbf{AC}|$. **(2 marks)**

(Total for Question 8 is 9 marks)

9.

A spherical balloon is being inflated so that its volume, $V \text{ cm}^3$, increases at a constant rate of 36 cm^3 per second. Find the rate of increase of the radius, $r \text{ cm}$, of the balloon at the instant when $r = 15$. [The volume of a sphere of radius r is $V = (4/3)\pi r^3$.]

(Total for Question 9 is 7 marks)

10.

The region R is bounded by the curve $y = 2x^2 + 3$, the x -axis, and the lines $x = 0$ and $x = 4$.

Find the exact volume of the solid formed when R is rotated 2π radians about the x -axis. **(7 marks)**

(Total for Question 10 is 7 marks)

11.

The circle C has equation $x^2 + y^2 - 4x + 0y - 21 = 0$.

(a) Find the coordinates of the centre of C and the radius of C . **(3 marks)**

(b) Show that the point $A(6, 3)$ lies on C . **(1 mark)**

(c) Find an equation of the tangent to C at the point A , giving your answer in the form $ax + by + c = 0$, where a , b and c are integers. **(3 marks)**

(Total for Question 11 is 7 marks)

12.

Simplify fully: $(5x^2 - 180) \div (x^2 - x - 42)$ **(4 marks)**

(Total for Question 12 is 4 marks)

13.

(a) Find the binomial expansion of $(1 + 3x)^{1/3}$ in ascending powers of x , up to and including the term in x^3 , simplifying each coefficient. State the range of values of x for which the expansion is valid. **(6 marks)**

- (b) By substituting $x = 0.01$, use your expansion to find an approximation for $103/100^{(1/3)}$, giving your answer to 6 decimal places. **(2 marks)**

(Total for Question 13 is 8 marks)

END OF PAPER

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