

A Level Maths Pure 1: Algebra, Functions and Proof Practice Exam

Pearson Edexcel A Level Mathematics (9MA0) · 22 questions · 59 marks

Name _____

Date _____

Score / 59

- Answer every question. Show your working: most marks are for method.
- Calculator allowed.
- Topics: Disproof by counter-example; Laws of indices; Surds; Completing the square; Quadratic graphs and roots; Expanding and factorising polynomials; The modulus function and modulus equations; Graph transformations; Sketching cubics, quartics and reciprocals; Straight lines; Proof by deduction; Proof by contradiction; Solving quadratics and the discriminant; Linear and quadratic inequalities; Algebraic division and the factor theorem; Partial fractions; Composite functions; Inverse functions; Recurrence relations; Proof by exhaustion; Simultaneous equations.
- The mark scheme is a separate free PDF: alevelmathrevision.com/alevel-frontend/downloads/practice-exams/9ma0/a-level-maths-pure-1-algebra-functions-and-proof-practice-exam-mark-scheme.pdf

1. Disprove the statement: 'if a and b are real numbers with $a > b$, then $a^2 > b^2$ '. [2] [2]
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2. Write $\frac{(\sqrt{x})^3 \times x^{-2}}{\sqrt[4]{x}}$, $x > 0$, as a single power of x . [2] [2]
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3. Expand and simplify $(3 + \sqrt{2})(5 - 2\sqrt{2})$, giving your answer in the form $a + b\sqrt{2}$. [2] [2]
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4. By writing $x^2 - 10x + 31$ in completed-square form, find the coordinates of the minimum point of the curve $y = x^2 - 10x + 31$. [2] [2]
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5. Find the range of the function $f(x) = x^2 - 6x + 13$, $x \in \mathbb{R}$. [2] [2]
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6. Using the difference of two squares twice, factorise $x^4 - 16$ as far as possible using real coefficients. [2] [2]
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7. Find the set of values of x for which $|x + 1| \geq 4$. [2] [2]
8. Describe fully the single transformation that maps the graph of $y = x^2$ onto the graph of $y = (x - 3)^2 + 2$. [2] [2]
9. Describe the graph of $y = -\frac{2}{x^2}$: give its asymptotes and explain why it lies entirely below the x -axis. [2] [2]
10. Show that the points $A(1, 1)$, $B(3, 5)$ and $C(6, 11)$ lie on a single straight line. [2] [2]
11. Factorise $n^3 - n$ completely, and use the factorisation to prove that it is divisible by 6 for every integer n . [3] [3]
12. Prove by contradiction that there are no integers a and b for which $6a + 9b = 1$. [3] [3]
13. Use the quadratic formula to solve $x^2 - 4x - 1 = 0$, giving the roots in the form $a \pm \sqrt{b}$. [3] [3]
14. Solve $2x^2 + 5x - 3 \geq 0$, giving your answer in set notation. [3] [3]
15. Given that $(x - 3)$ is a factor of $2x^3 - 3x^2 - 11x + 6$, factorise the cubic completely. [3] [3]



16. By substituting suitable values of x , split $\frac{11-x}{(2x-1)(x+3)}$ into partial fractions. [3]
17. Given $f(x) = 3x + 1$, $x \in \mathbb{R}$, and $g(x) = x^2 - 2$, $x \in \mathbb{R}$, form the composite function gf and find both values of x that make $gf(x) = 7$. [3]
18. The cube-root function $f(x) = \sqrt[3]{x-2} + 1$, $x \in \mathbb{R}$, is one-to-one. Find its inverse $f^{-1}(x)$, and the value of x for which $f^{-1}(x) = 10$. [3]
19. A sequence is defined by $u_{n+1} = u_n^2 - 3$, $u_1 = a$. Find the exact values of a for which every term of the sequence is equal to a . [3]
20. By considering the cases $n = 3k$, $n = 3k + 1$ and $n = 3k + 2$, prove that $n(n^2 + 2)$ is a multiple of 3 for every integer n . [4]
21. Find the points of intersection of the line $y = 2x - 3$ and the curve $y = x^2 - 4x + 5$. [4]
22. The equation $x^3 - 6x^2 + 11x - 6 = 0$ has three integer roots, each a factor of 6. Use the factor theorem, testing small integers, to find all three. [4]



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