

A Level Maths Pure 1: Algebra, Functions and Proof

Practice Exam: Mark Scheme

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

- M marks are for a correct method; A marks for an accurate answer that follows a correct method; B marks are independent of method.
- Accept any correct method that reaches a correct answer, unless the question says which method to use.
- Practise these topics online with instant feedback: alevelmathrevision.com/alevel-frontend/alevel-unit.html?course=uk&unit=1

Question 1

2 marks

M1 Chooses b negative with $|b| \geq |a|$

A1 e.g. $a = 1, b = -2$: $a > b$ but $a^2 = 1 < 4 = b^2$

Final answer: e.g. $a = 1, b = -2$: $1 < 4$

Question 2

2 marks

M1 Powers $\frac{3}{2}$, -2 and $\frac{1}{4}$ combined: $\frac{3}{2} - 2 - \frac{1}{4}$

A1 $x^{-3/4}$

Final answer: $x^{-3/4}$

Question 3

2 marks

M1 $15 - 6\sqrt{2} + 5\sqrt{2} - 4$

A1 $11 - \sqrt{2}$

Final answer: $11 - \sqrt{2}$

Question 4

2 marks

M1 $(x - 5)^2 + 6$

A1 $(5, 6)$

Final answer: $(5, 6)$

Question 5

2 marks

M1 $(x - 3)^2 + 4$

A1 $f(x) \geq 4$

Final answer: $f(x) \geq 4$



Question 6**2 marks**

M1 $(x^2 - 4)(x^2 + 4)$

A1 $(x - 2)(x + 2)(x^2 + 4)$

Final answer: $(x - 2)(x + 2)(x^2 + 4)$

Question 7**2 marks**

M1 $x + 1 \geq 4$ or $x + 1 \leq -4$

A1 $x \leq -5$ or $x \geq 3$

Final answer: $x \leq -5$ or $x \geq 3$

Question 8**2 marks**

M1 A translation

A1 3 units in the positive x -direction and 2 units in the positive y -direction

Final answer: Translation 3 units in the positive x -direction and 2 units in the positive y -direction

Question 9**2 marks**

B1 Asymptotes $x = 0$ and $y = 0$

B1 $x^2 > 0$ so $y < 0$ for every $x \neq 0$

Final answer: $x = 0$, $y = 0$; $y < 0$ for all $x \neq 0$

Question 10**2 marks**

M1 Gradients $AB = \frac{4}{2}$ and $BC = \frac{6}{3}$

A1 Both equal 2 and share B , so collinear

Final answer: Gradients AB and BC both 2

Question 11**3 marks**

M1 $n^3 - n = (n - 1)n(n + 1)$, the product of three consecutive integers

M1 One of any two consecutive integers is even, and one of any three consecutive integers is a multiple of 3

A1* So the product is a multiple of $2 \times 3 = 6$

Final answer: proof: $(n - 1)n(n + 1)$ contains an even factor and a factor divisible by three

Question 12**3 marks**

B1 Assume integers a , b exist with $6a + 9b = 1$

M1 $3(2a + 3b) = 1$, so $2a + 3b = \frac{1}{3}$

A1 $2a + 3b$ is an integer but $\frac{1}{3}$ is not: a contradiction

Final answer: $3(2a + 3b) = 1$ gives $2a + 3b = \frac{1}{3}$, not an integer



Question 13**3 marks**

M1 $x = \frac{4 \pm \sqrt{16+4}}{2}$

M1 $\sqrt{20} = 2\sqrt{5}$

A1 $2 \pm \sqrt{5}$

Final answer: $2 \pm \sqrt{5}$

Question 14**3 marks**

M1 $(2x-1)(x+3) = 0$

M1 Chooses the outside region

A1 $\{x : x \leq -3\} \cup \{x : x \geq \frac{1}{2}\}$

Final answer: $\{x : x \leq -3\} \cup \{x : x \geq \frac{1}{2}\}$

Question 15**3 marks**

M1 Divides: $2x^2 + 3x - 2$

M1 Factorises the quadratic

A1 $(x-3)(2x-1)(x+2)$

Final answer: $(x-3)(2x-1)(x+2)$

Question 16**3 marks**

M1 $11 - x \equiv A(x+3) + B(2x-1)$

A1 $x = \frac{1}{2}: \frac{21}{2} = \frac{7}{2}A, A = 3$

A1 $x = -3: 14 = -7B, B = -2; \frac{3}{2x-1} - \frac{2}{x+3}$

Final answer: $\frac{3}{2x-1} - \frac{2}{x+3}$

Question 17**3 marks**

M1 $gf(x) = (3x+1)^2 - 2$

M1 $(3x+1)^2 = 9 \Rightarrow 3x+1 = \pm 3$

A1 $x = \frac{2}{3} \text{ or } x = -\frac{4}{3}$

Final answer: $x = \frac{2}{3} \text{ or } x = -\frac{4}{3}$

Question 18**3 marks**

M1 $y-1 = \sqrt[3]{x-2} \Rightarrow x = (y-1)^3 + 2$

A1 $f^{-1}(x) = (x-1)^3 + 2, x \in \mathbb{R}$

A1 $(x-1)^3 = 8, x = 3$

Final answer: $f^{-1}(x) = (x-1)^3 + 2; x = 3$



Question 19**3 marks**

M1 $u_2 = u_1: a^2 - 3 = a$

M1 $a^2 - a - 3 = 0$

A1 $a = \frac{1 \pm \sqrt{13}}{2}$

Final answer: $a = \frac{1 \pm \sqrt{13}}{2}$

Question 20**4 marks**

B1 $n = 3k: 3k(9k^2 + 2)$ is a multiple of 3

M1 $n = 3k + 1: n^2 + 2 = 9k^2 + 6k + 3 = 3(3k^2 + 2k + 1)$

M1 $n = 3k + 2: n^2 + 2 = 9k^2 + 12k + 6 = 3(3k^2 + 4k + 2)$

A1* Every integer is in one of the three cases, so $n(n^2 + 2)$ is always a multiple of 3

Final answer: proof: a factor 3 appears in each of the cases $3k, 3k + 1, 3k + 2$

Question 21**4 marks**

M1 $x^2 - 4x + 5 = 2x - 3$

A1 $x^2 - 6x + 8 = 0$

M1 $x = 2, x = 4$

A1 (2, 1) and (4, 5)

Final answer: (2, 1) and (4, 5)

Question 22**4 marks**

M1 Tests a small integer: $f(1) = 0$

M1 $(x - 1)(x^2 - 5x + 6)$

A1 $(x - 1)(x - 2)(x - 3)$

A1 $x = 1, 2, 3$

Final answer: $x = 1, x = 2, x = 3$

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