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4MA1 June 2027 Paper 2H Best Guess Paper

Higher · Standard · Mark Scheme

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This independently compiled practice paper is for students preparing for Pearson Edexcel International GCSE Mathematics A (4MA1), Higher Tier, Paper 2H. A calculator may be used.

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Revise the full specification. Attempt the matching question paper before using the mark scheme, model answers and practice resources at www.mygrade9mathstutor.com.

M: method; A: accuracy; B: independent. Accept equivalent valid methods. Accuracy marks require the related method; follow-through applies only where stated. Check the requested units and rounding. Proofs and questions that ask for reasons or algebra must be supported by working.

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Mark Scheme

M: method · A: accuracy · B: independent

Accept equivalent valid methods.

Give credit for the required working.

Calculator allowed · 25 questions · 100 marks · Suggested time: 2 hours.

Paper 2H · Standard Higher · Mark Scheme

Question 1 · Compound interest and percentage profit · 4 marks

Part	Answer	Marks	Marking guidance
(a)	£5368.71	2	M1: Value = £5000 × 1.024^3. A1: This is £5368.70912, so the value to the nearest penny is £5368.71.
(b)	18%	2	M1: Profit = £47.20 − £40 = £7.20; use cost price as the denominator. A1: Percentage profit = $\frac{7.20}{40} \times 100 = 18\%$.

Question 2 · Currency exchange · 4 marks

Part	Answer	Marks	Marking guidance
2	Bureau B; 17 more euros.	4	M1: Bureau A gives 1200 × 0.92 = 1104 euros. M1: Bureau B deducts its fee first: 1200 − 20 = 1180 US dollars are converted. M1: Bureau B gives 1180 × 0.95 = 1121 euros. A1: 1121 − 1104 = 17 euros, so Bureau B gives 17 more euros.

Question 3 · Regular polygons · 3 marks

Part	Answer	Marks	Marking guidance
(a)	24 sides	2	M1: The exterior angles of any convex polygon sum to 360°. A1: Number of sides = 360° ÷ 15° = 24.
(b)	165°	1	B1: Each interior angle is 180° − 15° = 165°.

Question 4 · Standard form · 3 marks

Part	Answer	Marks	Marking guidance
(a)	0.00034	1	B1: A power of 10^{-4} moves the decimal point four places left: 0.00034.
(b)	2.7×10^{10}	2	M1: Multiply coefficients and add powers: $4.5 \times 6 \times 10^9 = 27 \times 10^9$. A1: Normalise the coefficient: $27 \times 10^9 = 2.7 \times 10^{10}$.

Paper 2H · Standard Higher · Mark Scheme

Question 5 · Factorisation and solving · 3 marks

Part	Answer	Marks	Marking guidance
(a)	$(x + 5)(x - 2)$	2	M1: Identify 5 and -2, with product -10 and sum 3. A1: Factorise to $(x + 5)(x - 2)$.
(b)	$x = -5$ or $x = 2$	1	B1: $x = -5$ or $x = 2$; both roots required.

Question 6 · Index laws · 3 marks

Part	Answer	Marks	Marking guidance
(a)	1	1	B1: Any non-zero number raised to the power zero is 1, so $7^0 = 1$.
(b)	$\frac{p^4}{q}$	2	M1: Correctly expand the powers to p^6q^4. A1: p^4/q; accept p^4q^{-1} or an equivalent fully simplified expression.

Question 7 · Connected right-angled triangles · 4 marks

Part	Answer	Marks	Marking guidance
7	7.57 cm (3 significant figures)	4	M1: Correct cosine relationship for BD. A1: BD = 6.535668420… cm; accept 6.54 cm. M1: Pythagoras subtracting BD^2 from 10^2, with an unrounded intermediate value. A1: AB = 7.57 cm to 3 significant figures.

Question 8 · Regions and inequalities · 3 marks

Part	Answer	Marks	Marking guidance
8	The triangular region with vertices (0, 1), (0, 4), (3, 4), including its boundaries.	3	B1: Draw the solid boundary line $y = x + 1$. B1: Draw the solid boundary line $y = 4$. B1: The third boundary is the given y-axis, $x = 0$. Shade the right of the y-axis, above $y = x + 1$ and below $y = 4$. Label the required triangle R; its boundaries are included.

Paper 2H · Standard Higher · Mark Scheme

Question 9 · Cumulative frequency · 5 marks

Part	Answer	Marks	Marking guidance
(a)	14, 42, 64, 76, 80	1	B1: Add successive frequencies: 14; 14 + 28 = 42; 42 + 22 = 64; 64 + 12 = 76; 76 + 4 = 80.
(b)	Graph through (0, 0), (10, 14), (20, 42), (30, 64), (40, 76), (50, 80).	2	M1: At least four correctly plotted non-origin points against upper class boundaries. A1: All five upper-boundary points, with a reasonable increasing curve or straight segments starting at (0, 0).
(c)	Approximately 16 km	2	M1: Read the 20th and 60th cumulative-frequency positions and subtract the lower quartile from the upper quartile. A1: Approximately 16 km; accept 15–17 km with quartile readings consistent with the student's graph.

Question 10 · Loci and regions: area of sectors · 4 marks

Part	Answer	Marks	Marking guidance
10	$14\pi a^2$	4	M1: The square shed blocks 90°, leaving a 270° main sector: $\frac{270}{360}\pi(4a)^2 = 12\pi a^2$. M1: Around either adjacent corner, the remaining cable is $4a - 2a = 2a$. M1: The two additional 90° sectors have combined area $2 \times \frac{90}{360}\pi(2a)^2 = 2\pi a^2$. They do not overlap. A1: The maximum area the mower can cut is $12\pi a^2 + 2\pi a^2 = 14\pi a^2$.

Question 11 · Upper bound of speed · 4 marks

Part	Answer	Marks	Marking guidance
11	52.8 km/h	4	B1: 230 km correct to the nearest 10 km gives an upper distance bound of 235 km. B1: 4.5 hours correct to 1 decimal place gives a lower time bound of 4.45 hours. M1: An upper speed bound uses the largest distance divided by the smallest time: 235 ÷ 4.45. A1: The bound is 52.80898… km/h, or 52.8 km/h to 3 significant figures.

Paper 2H · Standard Higher · Mark Scheme

Question 12 · Rearranging a formula · 3 marks

Part	Answer	Marks	Marking guidance
12	$x = \frac{3y + 5}{y - 2}$, $y \neq 2$.	3	M1: Multiply by $x - 3$: $y(x - 3) = 2x + 5$, so $xy - 3y = 2x + 5$. M1: Collect and factor the x terms: $xy - 2x = 3y + 5$, so $x(y - 2) = 3y + 5$. A1: Divide by $y - 2$: $x = \frac{3y + 5}{y - 2}$. The restriction is not a separate marking point.

Question 13 · Rationalising surds · 4 marks

Part	Answer	Marks	Marking guidance
(a)	$\frac{21 + 7\sqrt{5}}{2}$, so $a = 21$ and $b = 7$.	3	M1: Multiply numerator and denominator by the conjugate $3 + \sqrt{5}$. M1: $\frac{14}{3 - \sqrt{5}} = \frac{14(3 + \sqrt{5})}{(3 - \sqrt{5})(3 + \sqrt{5})} = \frac{14(3 + \sqrt{5})}{9 - 5}$. A1: Simplify to $\frac{21 + 7\sqrt{5}}{2}$. Hence $a = 21$ and $b = 7$, both integers.
(b)	$\frac{21 - 7\sqrt{5}}{2}$	1	B1: Change the conjugate sign: $\frac{14}{3 + \sqrt{5}} = \frac{21 - 7\sqrt{5}}{2}$. This has the same denominator 2.

Question 14 · Similar solids · 4 marks

Part	Answer	Marks	Marking guidance
14	405 cm^3	4	M1: Surface-area ratio $B : A = 90 : 40 = 9 : 4$. M1: The linear scale factor from A to B is $\sqrt{(9 \div 4)} = \frac{3}{2}$. M1: The volume scale factor is $\frac{27}{8}$. A1: Volume of $B = 120 \times \frac{27}{8} = 405\ cm^3$.

Paper 2H · Standard Higher · Mark Scheme

Question 15 · Differentiation and kinematics · 5 marks

Part	Answer	Marks	Marking guidance
(a)	$v = 6t^2 - 18t + 12$ m/s	2	M1: Velocity is the derivative of displacement with respect to time. A1: Differentiate $s = 2t^3 - 9t^2 + 12t + 5$: $v = 6t^2 - 18t + 12$.
(b)	$t = 1$ s or $t = 2$ s	3	M1: At rest, $v = 0$, so $6t^2 - 18t + 12 = 0$. M1: Divide by 6 and factorise: $t^2 - 3t + 2 = (t - 1)(t - 2) = 0$. A1: Therefore $t = 1$ or $t = 2$ seconds. Both satisfy $t \geq 0$.

Question 16 · Recurring decimals and fractions · 4 marks

Part	Answer	Marks	Marking guidance
16	$\frac{5}{33}$, as required.	4	M1: $x = 0.222\ldots$ gives $10x - x = 2$, so $9x = 2$ and $x = \frac{2}{9}$. M1: For $y = 0.681818\ldots$, subtract $10y = 6.81818\ldots$ from $1000y = 681.81818\ldots$ to obtain $990y = 675$. A1: Therefore $y = \frac{675}{990} = \frac{15}{22}$. A1: Multiply: $xy = \frac{2}{9} \times \frac{15}{22} = \frac{30}{198} = \frac{5}{33}$, as required.

Question 17 · Histogram and median · 3 marks

Part	Answer	Marks	Marking guidance
(a)	$a = 28$, $b = 42$	2	M1: The missing frequencies total $160 - 30 - 60 = 70$, so $a + b = 70$. Frequency density is frequency divided by class width. The height ratio gives $\frac{a}{5} = 2 \times \frac{b}{15}$, so $3a = 2b$. A1: Solving gives $a = 28$ and $b = 42$. Award M1 for the density relation and A1 for both values.
(b)	$15 < w \leq 25$	1	B1: The median is at cumulative frequency $160 \div 2 = 80$. The cumulative frequencies are 30, 58, 118, 160. Since $58 < 80 \leq 118$, the class interval which contains the median is $15 < w \leq 25$. Award B1 for the correct class interval.

Paper 2H · Standard Higher · Mark Scheme

Question 18 · Non-linear simultaneous equations · 5 marks

Part	Answer	Marks	Marking guidance
18	$x = 1 + \frac{3\sqrt{2}}{2}$, $y = -1 + 3\sqrt{2}$; or $x = 1 - \frac{3\sqrt{2}}{2}$, $y = -1 - 3\sqrt{2}$.	5	M1: Substitute correctly to eliminate y. M1: Correct quadratic, including equivalent multiples. M1: Apply a valid method to solve the quadratic. A1: Both exact x-values, allowing equivalent surd forms. A1: Both corresponding y-values, paired correctly with x; exact values required.

Question 19 · Angle between line and plane · 4 marks

Part	Answer	Marks	Marking guidance
19	23.2°	4	M1: The projection of BH onto plane ABCD is BD. The required angle is HBD. M1: BD $= \sqrt{(10^2 + 6^2)} = \sqrt{136}$ cm. M1: In right triangle BDH, $\tan\theta = \frac{DH}{BD} = \frac{5}{\sqrt{136}}$. A1: $\theta = \tan^{-1}(5 \div \sqrt{136}) = 23.20706…°$, which rounds to 23.2°.

Question 20 · Vectors in a triangle · 4 marks

Part	Answer	Marks	Marking guidance
20	$-\frac{1}{2}a - \frac{1}{6}b$	4	M1: Since M is the midpoint, $OM = \frac{1}{2}(a + b)$. M1: ON : NB = 1 : 2, so $ON = \frac{1}{3}b$. M1: $MN = ON - OM = \frac{1}{3}b - \frac{1}{2}(a + b)$. A1: Collect terms: $MN = -\frac{1}{2}a - \frac{1}{6}b$.

Paper 2H · Standard Higher · Mark Scheme

Question 21 · Turning points · 5 marks

Part	Answer	Marks	Marking guidance
21	$(-1,\ 12)$ and $(2,\ -15)$	5	M1: Differentiate: $dy/dx = 6x^2 - 6x - 12$. M1: At a stationary point, $6x^2 - 6x - 12 = 0$, so $(x - 2)(x + 1) = 0$. A1: Thus the two x-coordinates are $x = -1$ and $x = 2$. M1: Substitute into the original cubic: $y(-1) = -2 - 3 + 12 + 5 = 12$; $y(2) = 16 - 12 - 24 + 5 = -15$. A1: The coordinates are $(-1,\ 12)$ and $(2,\ -15)$. They are respectively a maximum and minimum; classification is not required for a mark.

Question 22 · Transformations of functions · 4 marks

Part	Answer	Marks	Marking guidance
g(x)	$g(x) = f(x - 4) - 3$	2	M1: A translation 4 units right replaces x by $x - 4$ inside f. A1: A translation 3 units down subtracts 3 outside f: $g(x) = f(x - 4) - 3$.
h(x)	$h(x) = f(\frac{x}{2})$	2	M1: A stretch parallel to the x-axis with scale factor 2 doubles each x-coordinate. A1: Replace the input x by x/2: $h(x) = f(\frac{x}{2})$. Accept $f(0.5x)$.

Question 23 · Algebraic probability · 5 marks

Part	Answer	Marks	Marking guidance
23	8 counters	5	M1: Let the total number of counters be N. Probability of two red counters is $\frac{5}{N} \times \frac{4}{N - 1}$. M1: Set this equal to $\frac{5}{14} : \frac{20}{N(N - 1)} = \frac{5}{14}$. M1: Cross-multiply and simplify: $N(N - 1) = 56$, so $N^2 - N - 56 = 0$. M1: Factorise: $(N - 8)(N + 7) = 0$. A1: Reject $N = -7$ because a number of counters must be positive. $N = 8$ gives $\frac{5}{8} \times \frac{4}{7} = \frac{5}{14}$, as required.

Paper 2H · Standard Higher · Mark Scheme

Question 24 · Cosine rule and exact values · 5 marks

Part	Answer	Marks	Marking guidance
24	$x = \sqrt{46} - 1$	5	M1: Cosine rule gives $7^2 = x^2 + (x + 2)^2 - 2x(x + 2)\cos 60^\circ$. M1: Use $\cos 60^\circ = \frac{1}{2}$ and expand: $49 = x^2 + 2x + 4$. M1: Rearrange to $x^2 + 2x - 45 = 0$, or $(x + 1)^2 = 46$. M1: Take square roots: $x = -1 \pm \sqrt{46}$. A1: Reject the negative value because x is a length. The exact answer is $x = \sqrt{46} - 1$.

Question 25 · Arithmetic series · 5 marks

Part	Answer	Marks	Marking guidance
25	$X = 45$	5	M1: Use the arithmetic-series sum formula to obtain $2a + 59d = 17.6$. M1: Combine with $a + 54d = 18.6$ to obtain $d = 0.4$ and $a = -3$. M1: Form a correct quadratic for X using the sum 261. M1: Solve the quadratic, obtaining 45 and -29. A1: $X = 45$ only; reject the negative root because X counts terms.