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4MA1 June 2027 Paper 1H Best Guess Paper

Higher · Target 9 · Mark Scheme

Disclaimer

This independently compiled practice paper is for students preparing for Pearson Edexcel International GCSE Mathematics A (4MA1), Higher Tier, Paper 1H. 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 · 22 questions · 100 marks · Suggested time: 2 hours.

Video walkthrough playlist

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Question 1 · Algebra · 6 marks

Part	Answer	Marks	Marking guidance
(a)	$4x - 23$	2	M1: Expand both brackets: $6x - 15 - 2x - 8$. A1: Collect terms: $(6x - 2x) - 15 - 8 = 4x - 23$.
(b)	$6ab(3a - 2b)$	2	M1: The greatest common factor of $18a^2b$ and $12ab^2$ is $6ab$. A1: Divide each term by $6ab$ to obtain $6ab(3a - 2b)$.
(c)	$y > 5$	2	M1: $5y - 3 > 2y + 12$ gives $3y > 15$. A1: Divide by positive 3; the inequality stays in the same direction: $y > 5$.

Question 2 · Straight-line equation · 3 marks

Part	Answer	Marks	Marking guidance
2	$y = 3x - 1$	3	M1: Gradient $m = (17 - 5) \div (6 - 2) = 12 \div 4 = 3$. M1: Substitute $(2, 5)$ into $y = 3x + c$: $5 = 6 + c$, so $c = -1$. A1: The equation is $y = 3x - 1$; it also gives $y = 17$ when $x = 6$.

Question 3 · Ratio and mass · 4 marks

Part	Answer	Marks	Marking guidance
3	No; 17.7 kg of beads are needed.	4	M1: There are $7 + 5 = 12$ parts, so one part represents $180 \div 12 = 15$ bags. M1: Small bags: $7 \times 15 = 105$. Large bags: $5 \times 15 = 75$. M1: Total mass $= 105 \times 65 + 75 \times 145 = 6825 + 10875 = 17700$ grams. A1: $17700 \div 1000 = 17.7$ kg. This is more than 17 kg, so Zoe is not correct.

Question 4 · Direct proportion · 3 marks

Part	Answer	Marks	Marking guidance
4	$x = 6$	3	M1: Direct proportionality gives $y = kx^3$. M1: Use $x = 2$, $y = 40$: $40 = 8k$, so $k = 5$. A1: When $y = 1080$, $1080 = 5x^3$, giving $x^3 = 216$. Take the real cube root: $x = 6$.

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Question 5 · Probability without replacement · 3 marks

Part	Answer	Marks	Marking guidance
5	$\frac{35}{66}$	3	M1: Different colours can occur in two orders: red then blue, or blue then red. M1: P(RB) $= \frac{7}{12} \times \frac{5}{11}$ and P(BR) $= \frac{5}{12} \times \frac{7}{11}$. A1: Add the mutually exclusive probabilities: $\frac{35 + 35}{132} = \frac{35}{66}$.

Question 6 · Circle theorems · 4 marks

Part	Answer	Marks	Marking guidance
(a)	65°	2	M1: Angle ABC and the 130° central angle stand on the same minor arc AC. A1: The angle at the centre is twice the angle at the circumference, so ABC = 130° ÷ 2 = 65°.
(b)	115°	2	M1: ABCD is cyclic; opposite angles ABC and ADC sum to 180°. A1: ADC = 180° − 65° = 115°. Alternatively, halve the reflex central angle 230°.

Question 7 · Quadratic sequences · 5 marks

Part	Answer	Marks	Marking guidance
(a)	3, 3, 5	2	M1: Substitute n = 1 and n = 2: 1 − 3 + 5 = 3 and 4 − 6 + 5 = 3. A1: For n = 3: 9 − 9 + 5 = 5. The first three terms are 3, 3, 5.
(b)	Yes; 113 is the 12th term.	3	M1: Set $n^2 - 3n + 5 = 113$, giving $n^2 - 3n - 108 = 0$. M1: Factorise: $(n - 12)(n + 9) = 0$, so n = 12 or n = −9. A1: A term position must be a positive integer, so n = 12 is valid. Check: 144 − 36 + 5 = 113.

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Question 8 · Algebraic fraction simplification · 3 marks

Part	Answer	Marks	Marking guidance
8	$\frac{2x-3}{2x-1}$, with $x \neq -4$, $1/2$.	3	M1: Factorise the numerator: $2x^2 + 5x - 12 = (2x - 3)(x + 4)$. M1: Factorise the denominator: $2x^2 + 7x - 4 = (2x - 1)(x + 4)$. A1: Cancel the common factor $x + 4$: $\frac{(2x-3)(x+4)}{(2x-1)(x+4)} = \frac{2x-3}{2x-1}$.

Question 9 · Quadratic inequality · 4 marks

Part	Answer	Marks	Marking guidance
9	$\{x : x < -1/3\} \cup \{x : x > 5\}$	4	M1: Factorise $3x^2 - 14x - 5 = (3x + 1)(x - 5)$. A1: The critical values are $x = -1/3$ and $x = 5$. M1: The quadratic has positive leading coefficient, so it is positive outside the roots. A1: The inequality is strict: $\{x : x < -1/3\} \cup \{x : x > 5\}$. Neither endpoint is included.

Question 10 · Proportion and percentage change · 4 marks

Part	Answer	Marks	Marking guidance
10	116% increase	4	B1: An increase of 20% multiplies q by 1.2; a decrease of 36% multiplies r by 0.64. M1: The multiplier for $P = kq^3/\sqrt{r}$ is $1.2^3/\sqrt{0.64}$. A1: This equals $1.728/0.8 = 2.16$. A1: The percentage increase is $(2.16 - 1) \times 100 = 116\%$.

Question 11 · Similar Triangles and Sightlines · 4 marks

Part	Answer	Marks	Marking guidance
11	14,925 m	4	M1: Measure both heights above Katie's eye level: $2 - 1.6 = 0.4$ m and $400 - 1.6 = 398.4$ m. M1: Similar triangles give total distance to the mountain $\div 15 = 398.4 \div 0.4 = 996$. M1: The total distance from Katie is $996 \times 15 = 14{,}940$ m. A1: The question asks for the distance beyond the tree: $14{,}940 - 15 = 14{,}925$ m.

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Question 12 · Histogram interpretation · 4 marks

Part	Answer	Marks	Marking guidance
12	24 apples	4	M1: The known class has width $120 - 100 = 20$, so its frequency density is $30 \div 20 = 1.5$. M1: The last bar is 8 fifteenths of the known bar's height, so its density is $1.5 \times \frac{8}{15} = 0.8$. M1: The last class has width $150 - 120 = 30$. A1: Frequency = density × class width $= 0.8 \times 30 = 24$ apples.

Question 13 · Equation of a tangent to a circle · 4 marks

Part	Answer	Marks	Marking guidance
13	$4x + 3y = 43$	4	M1: The radius from (3, 2) to A(7, 5) has gradient $\frac{5-2}{7-3} = \frac{3}{4}$. M1: The tangent is perpendicular to the radius, so its gradient is $-\frac{4}{3}$. M1: Using A(7, 5), its equation is $y - 5 = -\frac{4}{3}(x - 7)$. A1: Multiply by 3 and rearrange: $3y - 15 = -4x + 28$, so $4x + 3y = 43$.

Question 14 · Vectors in a parallelogram · 4 marks

Part	Answer	Marks	Marking guidance
14	$\frac{3}{4}a + \frac{1}{4}c$	4	M1: $AC = OC - OA = c - a$. M1: AX : XC = 1 : 3 means $AX = \frac{1}{4}AC = \frac{1}{4}(c - a)$. M1: $OX = OA + AX = a + \frac{1}{4}(c - a)$. A1: Collect the vectors: $OX = \frac{3}{4}a + \frac{1}{4}c$.

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Question 15 · Venn diagram and quadratic · 4 marks

Part	Answer	Marks	Marking guidance
15	$\frac{33}{50}$	4	M1: Add all four disjoint regions: $x^2 + 5x + (2x + 10) + 12 = 100$. M1: Rearrange to $x^2 + 7x - 78 = 0$ and factorise: $(x + 13)(x - 6) = 0$. A1: $x = 6$ or $x = -13$. Reject -13 because it makes the intersection $5x$ negative. Club A has $6^2 + 5(6) = 66$ students. A1: $P(A) = \frac{66}{100} = \frac{33}{50}$.

Question 16 · Functions and inverses · 7 marks

Part	Answer	Marks	Marking guidance
(a)	9	1	B1: $f(4) = \frac{2 \times 4 + 1}{4 - 3} = 9$.
(b)	$x = 3$ or $x = -3$	4	M1: Compose the functions: $fg(x) = \frac{2(x^2 - 4) + 1}{(x^2 - 4) - 3} = \frac{2x^2 - 7}{x^2 - 7}$. M1: Set $\frac{2x^2 - 7}{x^2 - 7} = \frac{11}{2}$ and cross-multiply: $2(2x^2 - 7) = 11(x^2 - 7)$. M1: Expand: $4x^2 - 14 = 11x^2 - 77$, so $7x^2 = 63$ and $x^2 = 9$. A1: Therefore $x = 3$ or $x = -3$. Both are valid because $x^2 - 7 = 2$, not zero.
(c)	$f^{-1}(x) = \frac{3x + 1}{x - 2}$, $x \neq 2$.	2	M1: Write $y = \frac{2x + 1}{x - 3}$. Then $xy - 3y = 2x + 1$, so $x(y - 2) = 3y + 1$. A1: Interchange the variables: $f^{-1}(x) = \frac{3x + 1}{x - 2}$, with $x \neq 2$.

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Question 17 · Completing the Square & Quadratic Graphs · 9 marks

Part	Answer	Marks	Marking guidance
(a)	$A = 60 + 24x - 3x^2$	2	M1: Multiply the side lengths: $(10 - x)(3x + 6) = 30x + 60 - 3x^2 - 6x$. A1: Collect the terms to obtain $A = 60 + 24x - 3x^2$.
(b)	Maximum area 108 cm^2 at $x = 4$	4	M1: Factors the quadratic and linear terms by -3. M1: Uses half the coefficient inside the bracket to complete the square. A1: Correct completed-square form $-3(x - 4)^2 + 108$. A1: Maximum area 108 cm^2 at $x = 4$.
(c)	Downward parabola; maximum (4, 108); y-intercept (0, 60); x-intercepts $(-2, 0)$ and (10, 0).	3	B1: Correct downward-parabola shape. B1: Turning point (4, 108) correctly labelled. B1: All three intercepts correctly labelled with exact coordinates.

Question 18 · Overlapping Squares and Rectangles · 5 marks

Part	Answer	Marks	Marking guidance
18	$\frac{125}{8}$ cm^2	5	M1: Let the horizontal projection of PS be d. Since PS = 5 and the vertical separation is 4, $d^2 + 4^2 = 5^2$, so d = 3 cm. M1: Perpendicular square sides have interchanged horizontal and vertical projections: PQ rises 3 cm above AB. Also PB = 4 + 3 = 7 cm and RB = 4 − 3 = 1 cm. M1: Similar triangles give BT ÷ RB = 3 ÷ 4, so BT = $\frac{3}{4}$ cm and PT = $7 - \frac{3}{4} = \frac{25}{4}$ cm. M1: The part of the square outside the rectangle is triangle PQT: area = $\frac{1}{2} \times \frac{25}{4} \times 3 = \frac{75}{8}$ cm^2. A1: Shaded overlap = square area − triangle area = $25 - \frac{75}{8} = \frac{125}{8}$ cm^2 = 15.625 cm^2.

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Question 19 · Kinematics (Calculus) · 5 marks

Part	Answer	Marks	Marking guidance
(a)	$v = 3t^2 - 15t + 12$ m/s	2	M1: Velocity is the derivative of displacement with respect to time. A1: Differentiate $s = t^3 - 7.5t^2 + 12t + 4$ to obtain $v = 3t^2 - 15t + 12$.
(b)	$t = 2.5$ seconds	3	M1: Acceleration is the derivative of velocity: $a = 6t - 15$ m/s^2. M1: Set acceleration equal to zero: $6t - 15 = 0$. A1: Solve $6t = 15$ to obtain $t = 2.5$ seconds.

Question 20 · Bearings and advanced trigonometry · 4 marks

Part	Answer	Marks	Marking guidance
20	154°	4	B1: Included angle at P = 66°. M1: Correct cosine-rule method to obtain AB; accept an equivalent coordinate method. M1: Correct method to obtain the required bearing, e.g. sine/cosine rule and angle geometry or atan2 of coordinate differences. A1: 154°, with correct clockwise bearing and rounding.

Question 21 · Advanced Indices and Prime Bases · 5 marks

Part	Answer	Marks	Marking guidance
21	$n = 4$ or $n = -1$	5	M1: Use $10^{2n} = 2^{2n} \times 5^{2n}$ and $50^2 = 2^2 \times 5^4$. M1: Inside the bracket, combine powers and cancel 5^4: the expression becomes 2 raised to $(2n^2 - 6n - 2)$. M1: Raise to power $\frac{2}{3}$ and write $16 = 2^4$: $\frac{2}{3}(2n^2 - 6n - 2) = 4$. M1: Rearrange: $2n^2 - 6n - 2 = 6$, so $n^2 - 3n - 4 = 0 = (n - 4)(n + 1)$. A1: Both real solutions are valid: $n = 4$ or $n = -1$.

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Question 22 · Cone and exact values · 6 marks

Part	Answer	Marks	Marking guidance
22	$h = 4\sqrt{3}$ cm	6	M1: Total surface area is $\pi r^2 + \pi rl = 24\pi$. M1: Use $l = 3r$: $\pi r^2 + 3\pi r^2 = 24\pi$. A1: Hence $4r^2 = 24$, so $r^2 = 6$. M1: Pythagoras in the axial right triangle gives $h^2 = l^2 - r^2$. M1: Therefore $h^2 = 9r^2 - r^2 = 8r^2 = 48$. A1: As h is a length, $h = \sqrt{48} = 4\sqrt{3}$ cm.