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4MA1 June 2027 Paper 1H Best Guess Paper

Higher · Standard · Mark Scheme

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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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Video walkthrough

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

Paper 1H · Standard Higher · Mark Scheme

Question 1 · Mixed-number multiplication · 3 marks

Part	Answer	Marks	Marking guidance
1	$8\frac{2}{5}$, as required.	3	M1: Convert both mixed numbers: $3\frac{1}{5}=\frac{16}{5}$ and $2\frac{5}{8}=\frac{21}{8}$. M1: Multiply: $\frac{16}{5}\times\frac{21}{8}=\frac{336}{40}=\frac{42}{5}$. A1: Convert back: $\frac{42}{5}=8\frac{2}{5}$. This proves the stated result.

Question 2 · Prime factorisation · 2 marks

Part	Answer	Marks	Marking guidance
2	$2^2 \times 31$	2	M1: $124 = 2 \times 62 = 2 \times 2 \times 31$. A1: 31 is prime, so the prime factorisation is $2^2 \times 31$.

Question 3 · 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 4 · Modal class and estimated mean · 4 marks

Part	Answer	Marks	Marking guidance
(a)	$20 < h \leq 30$	1	B1: Highest frequency is 14.
(b)	29 cm	3	M1: Use class midpoints. M1: Sum of products = 1160. A1: $1160 \div 40 = 29$.

Paper 1H · Standard Higher · Mark Scheme

Question 5 · Sets and Venn diagrams · 4 marks

Part	Answer	Marks	Marking guidance
(a)	A only: 2, 5, 7, 11; intersection: 3; B only: 6, 9, 12; outside: 1, 4, 8, 10.	3	B1: A = {2, 3, 5, 7, 11} and B = {3, 6, 9, 12}; put 3 in the intersection. B1: Put 2, 5, 7, 11 in A only and 6, 9, 12 in B only. B1: Put 1, 4, 8, 10 outside both circles, inside the universal set. All 12 numbers must appear exactly once.
(b)	$\frac{2}{3}$	1	B1: Correct probability 2/3; accept an equivalent fraction such as 8/12.

Question 6 · Reverse compound depreciation · 3 marks

Part	Answer	Marks	Marking guidance
6	£22,598	3	M1: The annual multiplier is $1 - 0.12 = 0.88$. M1: If the original value is V, then $V \times 0.88^3 = 15{,}400$, so $V = 15{,}400 \div 0.88^3$. A1: V = 22,598.14049…; to the nearest pound the value was £22,598.

Question 7 · Cylinder surface area · 3 marks

Part	Answer	Marks	Marking guidance
7	590 cm^2 (3 significant figures)	3	M1: Total surface area includes two circular ends and the curved surface: $2\pi r^2 + 2\pi rh$. M1: Substitute r = 5.4 and h = 12: $2\pi(5.4)^2 + 2\pi(5.4)(12) = 187.92\pi$. A1: $187.92\pi = 590.36809\ldots$ cm^2, which is 590 cm^2 to 3 significant figures.

Question 8 · Ratio and mass · 4 marks

Part	Answer	Marks	Marking guidance
8	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.

Paper 1H · Standard Higher · Mark Scheme

Question 9 · Linear simultaneous equations · 3 marks

Part	Answer	Marks	Marking guidance
9	$x = 4$, $y = 1$	3	M1: Multiply the first equation by 3 and the second by 2: $9x + 6y = 42$ and $10x - 6y = 34$. Add to get $19x = 76$. A1: Therefore $x = 4$. A1: Substitute into $3x + 2y = 14$: $12 + 2y = 14$, so $y = 1$. Both original equations are satisfied.

Question 10 · Straight-line equation · 3 marks

Part	Answer	Marks	Marking guidance
10	$y = 3x - 1$	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 11 · Probability without replacement · 3 marks

Part	Answer	Marks	Marking guidance
11	$\frac{35}{66}$	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 12 · 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 $ABC = 130^\circ \div 2 = 65^\circ$.
(b)	115°	2	M1: ABCD is cyclic; opposite angles ABC and ADC sum to 180°. A1: $ADC = 180^\circ - 65^\circ = 115^\circ$. Alternatively, halve the reflex central angle 230°.

Paper 1H · Standard Higher · Mark Scheme

Question 13 · 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: $144 - 36 + 5 = 113$.

Question 14 · Similar Triangles and Sightlines · 4 marks

Part	Answer	Marks	Marking guidance
14	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.

Question 15 · Cosine rule and triangle area · 5 marks

Part	Answer	Marks	Marking guidance
(a)	QR = 19.2 cm	3	M1: Use the cosine rule: $QR^2 = 18^2 + 24^2 - 2(18)(24)\cos 52^\circ$. M1: $QR^2 = 368.068485\ldots$; take the positive square root. A1: QR = 19.185111… cm = 19.2 cm to 3 significant figures.
(b)	170 cm^2	2	M1: Area $= \frac{1}{2} \times 18 \times 24 \times \sin 52^\circ$. A1: Area = 170.210322… cm^2 = 170 cm^2 to 3 significant figures.

Paper 1H · Standard Higher · Mark Scheme

Question 16 · Algebraic fraction simplification · 3 marks

Part	Answer	Marks	Marking guidance
16	$\frac{2x-3}{2x-1}$, 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 17 · Histogram interpretation · 4 marks

Part	Answer	Marks	Marking guidance
17	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 $\times$ class width $= 0.8 \times 30 = 24$ apples.

Question 18 · Direct proportion · 3 marks

Part	Answer	Marks	Marking guidance
18	$x = 6$	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: $x = 6$.

Question 19 · Algebraic fraction subtraction · 3 marks

Part	Answer	Marks	Marking guidance
19	$\frac{2x-17}{(x+2)(x-5)}$, with $x \neq -2, 5$.	3	M1: Use common denominator $(x + 2)(x - 5)$. M1: Combine the numerators: $3(x - 5) - (x + 2) = 3x - 15 - x - 2 = 2x - 17$. A1: The result is $\frac{2x-17}{(x+2)(x-5)}$. No common factor cancels. Original exclusions $x \neq -2, 5$ are not extra marks.

Paper 1H · Standard Higher · Mark Scheme

Question 20 · 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 $x \neq 2$.

Question 21 · Vectors in a parallelogram · 4 marks

Part	Answer	Marks	Marking guidance
21	$\frac{3}{4}a + \frac{1}{4}c$	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: $OX = \frac{3}{4}a + \frac{1}{4}c$.

Paper 1H · Standard Higher · Mark Scheme

Question 22 · Overlapping Squares and Rectangles · 5 marks

Part	Answer	Marks	Marking guidance
22	$\frac{125}{8}\text{ cm}^2$	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 = $\frac{1}{2} \times \frac{25}{4} \times 3 = \frac{75}{8}\text{ cm}^2$. A1: Shaded overlap = square area − triangle area = $25 - \frac{75}{8} = \frac{125}{8}\text{ cm}^2 = 15.625\text{ cm}^2$.

Question 23 · Equation of a tangent to a circle · 4 marks

Part	Answer	Marks	Marking guidance
23	$4x + 3y = 43$	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 $4x + 3y = 43$.

Paper 1H · Standard Higher · Mark Scheme

Question 24 · Advanced Indices and Prime Bases · 5 marks

Part	Answer	Marks	Marking guidance
24	$n = 4$ 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 $n = -1$.

Question 25 · Cone and exact values · 6 marks

Part	Answer	Marks	Marking guidance
25	$h = 4\sqrt{3}$ 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.