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Boost Your Skills & Grades in Grade 9 Maths

4MA1 June 2027 Paper 1H Best Guess Paper

Higher · Target 9 · Model Answers

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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.

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Model Answers

Step-by-step worked answers.

Use with the matching question paper.

Calculator allowed · 22 questions · 100 marks · Suggested time: 2 hours.

Video walkthrough playlist

Paper 1H · Target 9 · Worked Solutions

Question 1 · Algebra · 6 marks

Part (a)

Expand both brackets: $6x - 15 - 2x - 8$.

Collect terms: $(6x - 2x) - 15 - 8 = 4x - 23$.

Answer: $4x - 23$

Part (b)

The greatest common factor of $18a^2b$ and $12ab^2$ is $6ab$.

Divide each term by $6ab$ to obtain $6ab(3a - 2b)$.

Answer: $6ab(3a - 2b)$

Part (c)

$5y - 3 > 2y + 12$ gives $3y > 15$.

Divide by positive 3; the inequality stays in the same direction: $y > 5$.

Answer: $y > 5$

Question 2 · Straight-line equation · 3 marks

Gradient $m = (17 - 5) \div (6 - 2) = 12 \div 4 = 3$.

Substitute $(2, 5)$ into $y = 3x + c$: $5 = 6 + c$, so $c = -1$.

The equation is $y = 3x - 1$; it also gives $y = 17$ when $x = 6$.

Answer: $y = 3x - 1$

Question 3 · Ratio and mass · 4 marks

There are $7 + 5 = 12$ parts, so one part represents $180 \div 12 = 15$ bags.

Small bags: $7 \times 15 = 105$. Large bags: $5 \times 15 = 75$.

Total mass $= 105 \times 65 + 75 \times 145 = 6825 + 10875 = 17700$ grams.

$17700 \div 1000 = 17.7$ kg. This is more than 17 kg, so Zoe is not correct.

Answer: No; 17.7 kg of beads are needed.

Question 4 · Direct proportion · 3 marks

Direct proportionality gives $y = kx^3$.

Use $x = 2$, $y = 40$: $40 = 8k$, so $k = 5$.

When $y = 1080$, $1080 = 5x^3$, giving $x^3 = 216$. Take the real cube root: $x = 6$.

Answer: $x = 6$

Paper 1H · Target 9 · Worked Solutions

Question 5 · Probability without replacement · 3 marks

Different colours can occur in two orders: red then blue, or blue then red.

$\text{P(RB)} = \frac{7}{12} \times \frac{5}{11}$ and $\text{P(BR)} = \frac{5}{12} \times \frac{7}{11}$.

Add the mutually exclusive probabilities: $\frac{35 + 35}{132} = \frac{35}{66}$.

Answer: $\frac{35}{66}$

Question 6 · Circle theorems · 4 marks

Part (a)

Angle ABC and the 130° central angle stand on the same minor arc AC.

The angle at the centre is twice the angle at the circumference, so ABC = 130° ÷ 2 = 65°.

Answer: 65°

Part (b)

ABCD is cyclic; opposite angles ABC and ADC sum to 180°.

ADC = 180° − 65° = 115°. Alternatively, halve the reflex central angle 230°.

Answer: 115°

Question 7 · Quadratic sequences · 5 marks

Part (a)

Substitute n = 1 and n = 2: 1 − 3 + 5 = 3 and 4 − 6 + 5 = 3.

For n = 3: 9 − 9 + 5 = 5. The first three terms are 3, 3, 5.

Answer: 3, 3, 5

Part (b)

Set $n^2 - 3n + 5 = 113$, giving $n^2 - 3n - 108 = 0$.

Factorise: $(n - 12)(n + 9) = 0$, so n = 12 or n = −9.

A term position must be a positive integer, so n = 12 is valid. Check: 144 − 36 + 5 = 113.

Answer: Yes; 113 is the 12th term.

Paper 1H · Target 9 · Worked Solutions

Question 8 · Algebraic fraction simplification · 3 marks

Factorise the numerator: $2x^2 + 5x - 12 = (2x - 3)(x + 4)$.

Factorise the denominator: $2x^2 + 7x - 4 = (2x - 1)(x + 4)$.

Cancel the common factor $x + 4$: $\dfrac{(2x - 3)(x + 4)}{(2x - 1)(x + 4)} = \dfrac{2x - 3}{2x - 1}$.

Answer: $\dfrac{2x - 3}{2x - 1}$, with $x \neq -4, 1/2$.

Question 9 · Quadratic inequality · 4 marks

Factorise $3x^2 - 14x - 5 = (3x + 1)(x - 5)$.

The critical values are $x = -1/3$ and $x = 5$.

The quadratic has positive leading coefficient, so it is positive outside the roots.

The inequality is strict: $\{x : x < -1/3\} \cup \{x : x > 5\}$. Neither endpoint is included.

Answer: $\{x : x < -1/3\} \cup \{x : x > 5\}$

Question 10 · Proportion and percentage change · 4 marks

An increase of 20% multiplies q by 1.2; a decrease of 36% multiplies r by 0.64.

The multiplier for $P = kq^3/\sqrt{r}$ is $1.2^3/\sqrt{0.64}$.

This equals $1.728/0.8 = 2.16$.

The percentage increase is $(2.16 - 1) \times 100 = 116\%$.

Answer: 116% increase

Question 11 · Similar Triangles and Sightlines · 4 marks

Measure both heights above Katie's eye level: $2 - 1.6 = 0.4$ m and $400 - 1.6 = 398.4$ m.

Similar triangles give total distance to the mountain $\div 15 = 398.4 \div 0.4 = 996$.

The total distance from Katie is $996 \times 15 = 14{,}940$ m.

The question asks for the distance beyond the tree: $14{,}940 - 15 = 14{,}925$ m.

Answer: 14,925 m

Paper 1H · Target 9 · Worked Solutions

Question 12 · Histogram interpretation · 4 marks

The known class has width $120 - 100 = 20$, so its frequency density is $30 \div 20 = 1.5$.

The last bar is 8 fifteenths of the known bar's height, so its density is $1.5 \times \frac{8}{15} = 0.8$.

The last class has width $150 - 120 = 30$.

Frequency = density $\times$ class width $= 0.8 \times 30 = 24$ apples.

Answer: 24 apples

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

The radius from (3, 2) to A(7, 5) has gradient $\frac{5 - 2}{7 - 3} = \frac{3}{4}$.

The tangent is perpendicular to the radius, so its gradient is $-\frac{4}{3}$.

Using A(7, 5), its equation is $y - 5 = -\frac{4}{3}(x - 7)$.

Multiply by 3 and rearrange: $3y - 15 = -4x + 28$, so $4x + 3y = 43$.

Answer: $4x + 3y = 43$

Question 14 · Vectors in a parallelogram · 4 marks

$\mathrm{AC} = \mathrm{OC} - \mathrm{OA} = \mathrm{c} - \mathrm{a}$.

$\mathrm{AX} : \mathrm{XC} = 1 : 3$ means $\mathrm{AX} = \frac{1}{4}\mathrm{AC} = \frac{1}{4}(\mathrm{c} - \mathrm{a})$.

$\mathrm{OX} = \mathrm{OA} + \mathrm{AX} = \mathrm{a} + \frac{1}{4}(\mathrm{c} - \mathrm{a})$.

Collect the vectors: $\mathrm{OX} = \frac{3}{4}\mathrm{a} + \frac{1}{4}\mathrm{c}$.

Answer: $\frac{3}{4}\mathrm{a} + \frac{1}{4}\mathrm{c}$

Paper 1H · Target 9 · Worked Solutions

Question 15 · Venn diagram and quadratic · 4 marks

Add all four disjoint regions: $x^2 + 5x + (2x + 10) + 12 = 100$.

Rearrange to $x^2 + 7x - 78 = 0$ and factorise: $(x + 13)(x - 6) = 0$.

$x = 6$ or $x = -13$. Reject -13 because it makes the intersection $5x$ negative. Club A has $6^2 + 5(6) = 66$ students.

$$P(A) = \frac{66}{100} = \frac{33}{50}.$$

Answer: $\frac{33}{50}$

Question 16 · Functions and inverses · 7 marks

Part (a)

$$f(4) = \frac{2 \times 4 + 1}{4 - 3} = 9.$$

Answer: 9

Part (b)

Compose the functions: $fg(x) = \frac{2(x^2 - 4) + 1}{(x^2 - 4) - 3} = \frac{2x^2 - 7}{x^2 - 7}$.

Set $\frac{2x^2 - 7}{x^2 - 7} = \frac{11}{2}$ and cross-multiply: $2(2x^2 - 7) = 11(x^2 - 7)$.

Expand: $4x^2 - 14 = 11x^2 - 77$, so $7x^2 = 63$ and $x^2 = 9$.

Therefore $x = 3$ or $x = -3$. Both are valid because $x^2 - 7 = 2$, not zero.

Answer: $x = 3$ or $x = -3$

Part (c)

Write $y = \frac{2x + 1}{x - 3}$. Then $xy - 3y = 2x + 1$, so $x(y - 2) = 3y + 1$.

Interchange the variables: $f^{-1}(x) = \frac{3x + 1}{x - 2}$, with $x \neq 2$.

Answer: $f^{-1}(x) = \frac{3x + 1}{x - 2}$, $x \neq 2$.

Paper 1H · Target 9 · Worked Solutions

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

Part (a)

Multiply the side lengths: $(10 - x)(3x + 6) = 30x + 60 - 3x^2 - 6x$.

Collect the terms to obtain $A = 60 + 24x - 3x^2$.

Answer: $A = 60 + 24x - 3x^2$

Part (b)

Factor -3 from the x terms: $A = -3(x^2 - 8x) + 60$.

Complete the square: $x^2 - 8x = (x - 4)^2 - 16$.

Hence $A = -3(x - 4)^2 + 108$. The coefficient -3 makes this a maximum when the square is zero.

$x = 4$ is in the physical range $-2 < x < 10$, so the maximum area is 108 cm^2.

Answer: Maximum area 108 cm^2 at $x = 4$

Part (c)

The negative coefficient of x^2 gives a downward parabola with turning point (4, 108).

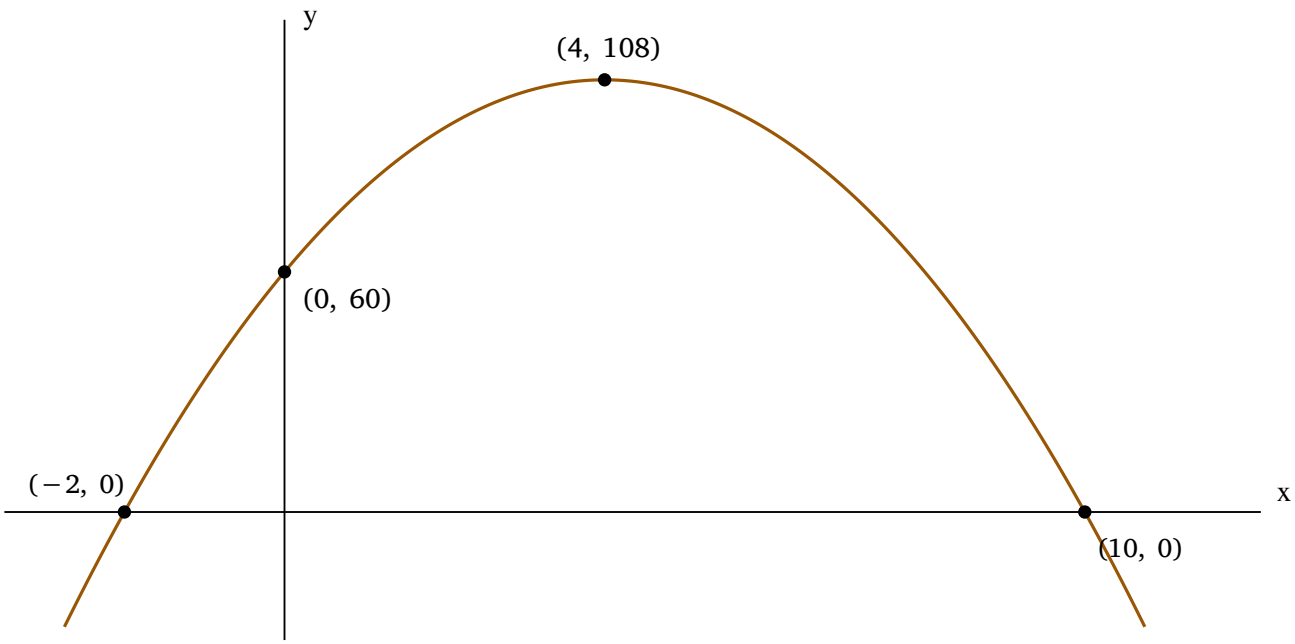
Substitute $x = 0$ to find the y-intercept (0, 60).

Use $(10 - x)(3x + 6) = 0$ to obtain $x = 10$ and $x = -2$. Label both intercepts on the full quadratic graph.

Answer: Downward parabola; maximum (4, 108); y-intercept (0, 60); x-intercepts $(-2, 0)$ and (10, 0).

Paper 1H · Target 9 · Worked Solutions

Question 17(c) · Annotated sketch



Question 18 · Overlapping Squares and Rectangles · 5 marks

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.

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.

Similar triangles give BT ÷ RB = 3 ÷ 4, so BT = $\frac{3}{4}$ cm and PT = $7 - \frac{3}{4} = \frac{25}{4}$ cm.

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.

Shaded overlap = square area − triangle area = $25 - \frac{75}{8} = \frac{125}{8}$ cm^2 = 15.625 cm^2.

Answer: $\frac{125}{8}$ cm^2

Paper 1H · Target 9 · Worked Solutions

Question 19 · Kinematics (Calculus) · 5 marks

Part (a)

Velocity is the derivative of displacement with respect to time.

Differentiate $s = t^3 - 7.5t^2 + 12t + 4$ to obtain $v = 3t^2 - 15t + 12$.

Answer: $v = 3t^2 - 15t + 12$ m/s

Part (b)

Acceleration is the derivative of velocity: $a = 6t - 15$ m/s^2.

Set acceleration equal to zero: $6t - 15 = 0$.

Solve $6t = 15$ to obtain $t = 2.5$ seconds.

Answer: $t = 2.5$ seconds

Question 20 · Bearings and advanced trigonometry · 4 marks

The angle APB at the port is $118^\circ - 52^\circ = 66^\circ$.

Use the cosine rule: $AB^2 = 35^2 + 58^2 - 2(35)(58)\cos 66^\circ$. Hence AB = 54.200085… km.

Use the sine rule: $\sin(PAB)/58 = \sin 66^\circ/AB$, giving angle PAB = 77.848175…°. This is the acute solution; $58^2 < 35^2 + AB^2$.

The bearing of P from A is $052^\circ + 180^\circ = 232^\circ$. Subtract the internal angle: $232^\circ - 77.848175\ldots^\circ = 154.151825\ldots^\circ$. To the nearest degree the bearing of B from A is 154°.

Answer: 154°

Question 21 · Advanced Indices and Prime Bases · 5 marks

Use $10^{2n} = 2^{2n} \times 5^{2n}$ and $50^2 = 2^2 \times 5^4$.

Inside the bracket, combine powers and cancel 5^4: the expression becomes 2 raised to $(2n^2 - 6n - 2)$.

Raise to power $\frac{2}{3}$ and write $16 = 2^4$: $\frac{2}{3}(2n^2 - 6n - 2) = 4$.

Rearrange: $2n^2 - 6n - 2 = 6$, so $n^2 - 3n - 4 = 0 = (n - 4)(n + 1)$.

Both real solutions are valid: $n = 4$ or $n = -1$.

Answer: $n = 4$ or $n = -1$

Paper 1H · Target 9 · Worked Solutions

Question 22 · Cone and exact values · 6 marks

Total surface area is $\pi r^2 + \pi rl = 24\pi$.

Use $l = 3r$: $\pi r^2 + 3\pi r^2 = 24\pi$.

Hence $4r^2 = 24$, so $r^2 = 6$.

Pythagoras in the axial right triangle gives $h^2 = l^2 - r^2$.

Therefore $h^2 = 9r^2 - r^2 = 8r^2 = 48$.

As h is a length, $h = \sqrt{48} = 4\sqrt{3}$ cm.

Answer: $h = 4\sqrt{3}$ cm