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1MA1 June 2027 Paper 3H Best Guess Paper

Higher · Standard · Model Answers

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This independently compiled practice paper is for students preparing for Pearson Edexcel GCSE Mathematics (1MA1), Higher Tier, Paper 3H. A calculator may be used.

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Model Answers

Step-by-step worked answers.

Use with the matching question paper.

Calculator allowed · 20 questions · 80 marks · Suggested time: 1 hour 30 minutes.

Question 1 · Scale models · 3 marks

Convert the actual length to centimetres: $78 \times 100 = 7800$ cm.

A scale of 1:200 means the model is 200 times smaller: $7800 \div 200 = 39$ cm.

Answer: 39 cm

Question 2 · Upper and lower bounds · 2 marks

Part (a)

$1.6 + 0.05$

Answer: 1.65 m

Part (b)

$1.6 - 0.05$

Answer: 1.55 m

Question 3 · Reverse percentages · 2 marks

After a 20% reduction, the sale price represents 80% of the original price.

Original price $= £72 \div 0.8 = £90$.

Answer: £90

Question 4 · Expanding and factorising · 4 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: $6ab(3a - 2b)$

Question 5 · Median, mode and range · 3 marks

Step 1: The median is the middle value, which falls halfway between 10 and q.

$(10 + q)/2 = 11 \Rightarrow 10 + q = 22 \Rightarrow q = 12$.

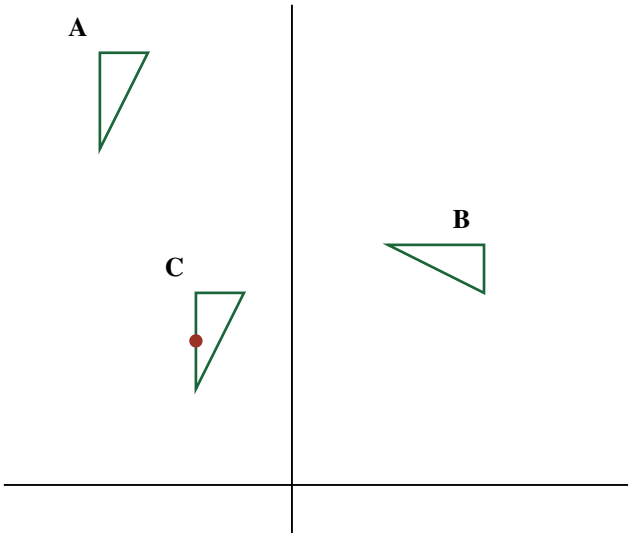
Step 2: The mode is the most frequent number (19). Because r appears twice, both r values must be 19.

Step 3: The range is 16. The range is the largest value (19) minus the smallest value (p).

$19 - p = 16 \Rightarrow p = 3$.

Answer: $p = 3 = 12 = 19$
$\quad\quad\quad

Rotation centre (−2, 3); translated triangle C shown.



Question 7 · Probability and ratio · 4 marks

54 orange counters represent probability 0.45, so there are 54 ÷ 0.45 = 120 counters.

Blue and yellow together have probability 1 − 0.15 − 0.45 = 0.4, so there are 120 × 0.4 = 48.

Blue:yellow = 3:5. Blue counters are 3/8 of the 48, giving 48 × 3/8 = 18.

Answer: 18 blue counters

Question 8 · Ratios, percentages and fractions · 5 marks

Combine the ratios: books : DVDs : records = 20 : 12 : 3.

Books left = 60% of 20 = 12 parts; DVDs left = 5/6 of 12 = 10 parts; records left = 3 parts.

The remaining 25 parts represent 150 items, so one part represents 150 ÷ 25 = 6 items.

Books sold = 8 parts and DVDs sold = 2 parts, giving 10 sold parts.

Number sold = 10 × 6 = 60 items.

Answer: 60 items

Question 9 · Product rule for counting · 3 marks

For a first digit of 5 or 7 there are $2 \times 4 \times 6 \times 5 = 240$ codes: four even final digits and six then five unused middle digits.

For a first digit of 6 or 8 there are $2 \times 3 \times 6 \times 5 = 180$ codes: only three even final digits remain.

Total $= 240 + 180 = 420$ codes.

Answer: 420 codes

Question 10 · Cubic graphs · 6 marks

Part (a)

At $x = -2$: $y = -8 + 6 + 1 = -1$. At $x = 0$: $y = 1$. At $x = 2$: $y = 8 - 6 + 1 = 3$.

Answer: $-1,\ 1,\ 3$

Part (b)

Plot the table points and draw a smooth cubic. The exact values at $x = -0.5$ and 1.5 are 2.375 and -0.125; the table rounds them to 2.4 and -0.1.

Answer: Graph of $y = x^3 - 3x + 1$

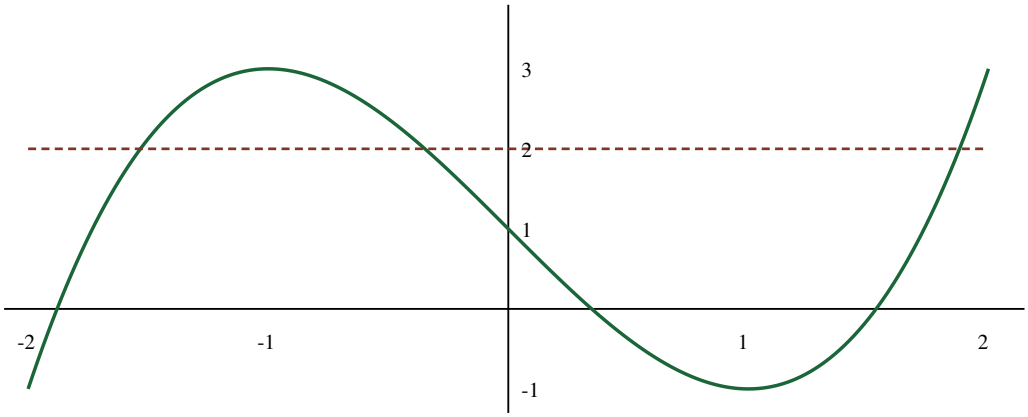
Part (c)

The equation $x^3 - 3x - 1 = 0$ is equivalent to $x^3 - 3x + 1 = 2$, so draw the horizontal line $y = 2$.

Read all three intersections: $x \approx -1.532\ldots,\ -0.347\ldots$ and $1.879\ldots$. Round each to one decimal place.

Answer: $x \approx -1.5,\ -0.3,\ 1.9$

$y = x^3 - 3x + 1$; horizontal line $y = 2$



Question 11 · 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.

Question 12 · 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

Question 13 · 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 14 · Iterative population decay · 3 marks

From the start of 2018 to the start of 2020 there are two annual transitions.

$P_{2020} = k^2 P_{2018}$, so $4050 = 5000k^2$.

$k^2 = 4050/5000 = 0.81$. The population multiplier is positive, so $k = \sqrt{0.81} = 0.9$.

Check: $5000 \times 0.9 = 4500$ after one year, then $4500 \times 0.9 = 4050$ after two.

Answer: $k = 0.9$

Question 15 · Quadratic inequalities · 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 16 · 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 17 · Composite and inverse functions · 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: $f^{-1}(x)=\frac{3x+1}{x-2}$, $x\neq 2$.

Question 18 · Algebraic compound increase · 4 marks

The successive multipliers are $1 + x/100$ and $1 + 2x/100$.

$(1 + x/100)(1 + 2x/100) = 1.4592$.

Expand and multiply by 10,000: $2x^2 + 300x - 4592 = 0$, so $x^2 + 150x - 2296 = 0$.

Factorise: $(x - 14)(x + 164) = 0$, giving $x = 14$ or $x = -164$. Both changes are increases, so reject the negative root. Therefore $x = 14$. Check: $1.14 \times 1.28 = 1.4592$.

Answer: $x = 14$

Question 19 · Bearings and 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: $232^\circ - 77.848175…^\circ = 154.151825…^\circ$. To the nearest degree the bearing of B from A is 154°.

Answer: 154°

Question 20 · 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 = $\frac{1}{2} \times \frac{25}{4} \times 3 = \frac{75}{8}$ cm².

Shaded overlap = square area − triangle area = $25 - \frac{75}{8} = \frac{125}{8}$ cm² = 15.625 cm².

Answer: $\frac{125}{8}$ cm²