N(A)-Level Mathematics (Syllabus A) 4045

Paper 1

Monday 5 October 2026 · 2 hours · 70 marks

Suggested worked answers by Math Vigilante. Unofficial.

How to read this document

Each question is referred to by its number and topic. The questions themselves are not reproduced: read this beside your copy of the paper.

The final answer to each part is in red.

M1, A1 and B1 mark where each mark is earned, in our suggested allocation; the official mark scheme may differ.

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TOPICS TESTED

- S1 C1: Prime, HCF LCM
- S1 C3: Approx & Estimation
- S1 C4: Basic Algebraic Manipulations
- S1 C5: Linear Equations
- S1 C6: Linear Functions & Graphs
- S1 C7: Number Patterns
- S1 C8: Percentages
- S1 C9: Ratio & Rate
- S1 C11B: Geo Constructions
- S1 C13: Vol & Surface Area of Prisms & Cylinders
- S1 C14: Statistical Data Handling
- S2 C2: Linear Inequalities
- S2 C4: Special Algebraic Identities
- S2 C5: Quadratic Equations & Graphs
- S2 C6: Algebraic Fractions
- S2 C7: Proportions
- S2 C8A: Congruence & Similarity
- S2 C8B: Map Scale
- S2 C9: Pythagoras Theorem
- S2 C13: Statistical Diagrams
- S2 C14: Averages of Stats Diagram
- S3 C1: Quadratic Eqns
- S3 C3: Indices
- S3 C4: Coordinate Geometry
- S3 C5: Graphs of Functions
- S3 C6: Further Trigo

Our worked solution to every question, by number. The questions themselves are not reproduced: read this beside your copy of the paper. 70 marks, 23 questions.

This document consists of **11** printed pages.

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1 **[Significant figures; standard form]**

(a)

Marking codes at the step that earns each mark: M1 = method, A1 = accuracy (needs the M mark before it), B1 = independent mark.

$123\,769.2 \approx 123\,800$ (to 4 s. f.) **[B1]**

Answer **123 800**..... [1]

(b)

$0.000\,78 = 7.8 \times 10^{-4}$ **[B1]**

Answer $\mathbf{7.8 \times 10^{-4}}$ ..... [1]

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2 **[Enlargement – reduction]**

(drawing not reproduced in this copy)

Every side half the length of the original **[B1]** same shape, same orientation (any position on the grid) **[B1]**

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3 **[Ratio]**

(a)

$$\text{Fraction} = \frac{7}{7+3}$$
$$= \frac{\mathbf{7}}{\mathbf{10}} \quad \textbf{[B1]}$$

Answer $\frac{7}{10}$ ..... [1]

(b)

$$\text{Difference} = \frac{7-3}{10} \times \$1000 \quad \textbf{[M1]}$$
$$= \mathbf{\$400} \quad \textbf{[A1]}$$

Answer \$ **400**..... [2]

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4 **[Linear inequalities]**

$4x > -48$

$\boldsymbol{x > -12}$ **[B1]**

Answer $\boldsymbol{x > -12}$ ..... [1]

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5 **[Algebraic expressions; linear equations]**

(a)

Number of students in the group $= 3x$, and 10 are chosen, so the number not chosen is $3x - 10$. **[B1]**

Answer $\mathbf{3x - 10}$ ..... [1]

(b)

$$3x - 10 = 26$$
$$3x = 36$$
$$\boldsymbol{x = 12} \quad \textbf{[B1]}$$

Answer $x = \mathbf{12}$ ..... [1]

---

6 **[Map scale – area]**

$$\text{Actual length} = 3 \times 0.25 = 0.75 \text{ km}$$
$$\text{Actual breadth} = 2 \times 0.25 = 0.5 \text{ km} \quad \textbf{[M1]}$$
$$\text{Actual area} = 0.75 \times 0.5$$
$$= \mathbf{0.375\ km^2} \quad \textbf{[A1]}$$

Answer **0.375**..... km^2 [2]

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7 **[Number sequences]**

(a)

Every term is a multiple of 7 (nth term $= 7n$), but $500 \div 7 = 71$ remainder 3.

500 is not a multiple of 7, so it is not a term of this sequence. **[B1]**

[1]

(b)

First term 25, common difference -10:

$$n\text{th term} = 25 - 10(n - 1)$$
$$= 35 - 10n \quad \textbf{[M1]}$$
$$1000\text{th term} = 35 - 10(1000)$$
$$= \mathbf{-9965} \quad \textbf{[A1]}$$

Answer **−9965** ..... [2]

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8 **[Bar chart; stem-and-leaf diagram; averages]**

(a)

The vertical axis starts at 4, not 0: the rabbit bar (4 pets) does not show at all, and the dog bar looks 6 times as tall as the cat bar though there are only twice as many dogs. **[B1]**

[1]

(b)

(i)

Stem 9, leaf 8. **[B1]**

Answer $ **98**..... [1]

(ii)

Ivan has used the mode, $60, as the average. $60 is the lowest cost, so none of the costs is below it. **[B1]**

[1]

[Note: the mean ($76) and median ($78.50) both have costs below them, so Ivan's "average" must be the mode.]

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9 **[Prime factors, HCF and LCM]**

(a)

$6 \times 100 = 2 \times 3 \times 2^2 \times 5^2$
$= \mathbf{2^3 \times 3 \times 5^2}$ **[B1]**

Answer $\mathbf{2^3 \times 3 \times 5^2}$ ..... [1]

(b)

(i)

$600 = 2^3 \times 3 \times 5^2$
$168 = 2^3 \times 3 \times 7$

$\text{HCF} = 2^3 \times 3$
$= \mathbf{24}$ **[B1]**

Answer **24**..... [1]

(ii)

$\text{LCM} = 2^3 \times 3 \times 5^2 \times 7$
$= \mathbf{4200}$ **[B1]**

Answer **4200**..... [1]

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10 **[Mean; linear equations]**

Sum of the five values $= 14.4 \times 5$
$= 72$ **[B1]**

$15 + x + 2(x - 6) + 10 + 17 = 72$ **[M1]**
$3x + 30 = 72$
$3x = 42$
$\boldsymbol{x = 14}$ **[A1]**

$2(x - 6) = 2(14 - 6)$
$= \mathbf{16}$ **[A1]**

Answer **14**..... and **16**..... [4]

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11 **[Inverse proportion]**

$V = \dfrac{k}{d^3}$
$3 = \dfrac{k}{2^3}$ **[M1]**
$k = 24$

When $d = 0.1$,

$V = \dfrac{24}{0.1^3}$
$= \mathbf{24\,000}$ **[A1]**

Answer $V = \mathbf{24\,000}$..... [2]

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12 **[Pythagoras' theorem]**

3.9 cm is the longest side, so it is the hypotenuse.

$x^2 + 3.6^2 = 3.9^2$ **[M1]**
$x^2 = 3.9^2 - 3.6^2$
$= 2.25$ **[M1]**
$x = \sqrt{2.25}$
$= \mathbf{1.5}$ **[A1]**

Answer $x = \mathbf{1.5}$..... [3]

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13 **[Similar triangles]**

Matching vertices $A \leftrightarrow B$, $B \leftrightarrow D$, $C \leftrightarrow C$:

$$\frac{CD}{CB} = \frac{CB}{CA}$$

$$CD = \frac{4.8 \times 4.8}{3.2} \qquad \textbf{[M1]}$$

$$= \mathbf{7.2} \qquad \textbf{[A1]}$$

Answer $CD =$ **7.2** ..... cm [2]

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14 **[Reverse percentage]**

Sale price = 85% of the price before the sale.

$$\text{Price before the sale} = \frac{100}{85} \times \$1274.15 \qquad \textbf{[M1]}$$

$$= \$\mathbf{1499} \qquad \textbf{[A1]}$$

Answer $ **1499**..... [2]

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15 **[Volume of a cuboid; rate of flow]**

(a)

1.2 m = 120 cm, 1 m = 100 cm, 0.75 m = 75 cm

$$\text{Volume} = 120 \times 100 \times 75$$

$$= 900\,000 \text{ cm}^3 \text{ (shown)} \qquad \textbf{[B1]}$$

[1]

(b)

Rate of flow = 0.2 litres per second = 200 cm^3 per second.

$$\text{Time to empty} = \frac{900\,000}{200} \text{ s}$$

$$= 4500 \text{ s} \qquad \textbf{[M1]}$$

$$4500 \text{ s} = \frac{4500}{60} \text{ min}$$

$$= 75 \text{ min} \qquad \textbf{[A1]}$$

75 min = 1 h 15 min, so the tank is empty at 11.15 a.m.

11.15 a.m. is before 11.20 a.m., so Lihui is correct. **[A1]**

[3]

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16 **[Constructions – equilateral triangle, angle bisector, perpendicular bisector]**

(a)

(drawing not reproduced in this copy)

Arcs of radius $PQ = 5$ cm from P and Q meet at R; arcs left showing **[B1]**

[1]

16 **(b)**

(drawing not reproduced in this copy)

(i) [1]

Equal arcs from A cut AB and AD; equal arcs from those two points meet on the bisector **[B1]**

(ii) [1]

Equal arcs (radius more than half of BC) from B and C cross on both sides of BC **[B1]**

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17 **[Quadratic graphs – symmetry and roots]**

(a)

The line of symmetry is midway between the roots −3 and 2:

$$x = \frac{-3 + 2}{2}$$
$$= -\frac{\mathbf{1}}{\mathbf{2}} \quad \textbf{[B1]}$$

Answer $\boldsymbol{x = -\frac{1}{2}}$..... [1]

(b)

The roots are −3 and 2, and the coefficient of x^2 is −1:

$$y = -(x + 3)(x - 2)$$
$$= -(x^2 + x - 6)$$
$$= -x^2 - x + 6$$

Comparing with $y = -x^2 + ax + b$:

$\boldsymbol{a = -1}$ **[B1]** $\boldsymbol{b = 6}$ **[B1]**

Answer $a = \mathbf{-1}$ ..... $b = \mathbf{6}$..... [2]

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18 **[Coordinate geometry – midpoint, equation of a line]**

(a)

From the grid: $A(-2,8)$, $B(-4,6)$, $C(4,9)$, $D(-1,1)$.

$x_E = \frac{-2+(-4)}{2} = -3, \quad y_E = \frac{8+6}{2} = 7$ **[B1]**

Answer (**−3** ..... , **7**.....) [1]

(b)

$$\text{Gradient of } CD = \frac{9-1}{4-(-1)}$$
$$= \frac{8}{5} \quad \textbf{[M1]}$$

Substitute $C(4,9)$ into $y = \frac{8}{5}x + c$:

$9 = \frac{8}{5}(4) + c$ **[M1]**

$c = 9 - \frac{32}{5}$

$= \frac{13}{5}$

$\boldsymbol{y = \frac{8}{5}x + \frac{13}{5}}$ **[A1]**

Answer $\boldsymbol{y = \frac{8}{5}x + \frac{13}{5}}$..... [3]

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19 **[Changing the subject of a formula]**

$3a + 2x = n(a - x)$

$3a + 2x = na - nx$ **[M1]**

$2x + nx = na - 3a$

$x(2 + n) = na - 3a$ **[M1]**

$\boldsymbol{x = \frac{na - 3a}{n + 2}}$ **[A1]**

Answer $x = \frac{\boldsymbol{na-3a}}{\boldsymbol{n+2}}$..... [3]

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20 **[Completing the square]**

(a)

$$x^2 + 9x - 5 = \left(x + \frac{9}{2}\right)^2 - \left(\frac{9}{2}\right)^2 - 5$$
$$= \left(x + \frac{9}{2}\right)^2 - \frac{101}{4}$$

$\boldsymbol{p = \frac{9}{2}}$ **[B1]** $\boldsymbol{q = -\frac{101}{4}}$ **[B1]**

Answer $p =$ **$\frac{9}{2}$**..... $q =$ **$-\frac{101}{4}$**..... [2]

(b)

$$\left(x + \frac{9}{2}\right)^2 - \frac{101}{4} = -0.25$$
$$\left(x + \frac{9}{2}\right)^2 = \frac{101}{4} - \frac{1}{4}$$
$$= 25$$

$x + \frac{9}{2} = 5$ or $x + \frac{9}{2} = -5$

$\boldsymbol{x = \frac{1}{2}}$ **[B1]** **or** $\boldsymbol{x = -9\frac{1}{2}}$ **[B1]**

Answer $x =$ **$\frac{1}{2}$**..... or $x =$ **$-9\frac{1}{2}$**..... [2]

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21 **[Exponential graph; gradient by a tangent]**

(a)

The curve passes through (0, 0.5) and (1, 2).

$0.5 = ka^0$
$k = 0.5$ **[B1]**

$2 = 0.5a^1$
$a = 4$ **[B1]**

Answer $k =$ **0.5** ..... $a =$ **4**..... [2]

(b)

$$\text{Gradient} = \frac{4.8 - 2}{2 - 1}$$
$$= \mathbf{2.8} \quad \textbf{[B1]}$$

[Note: (1, 2) and (2, 4.8) read off L; answers from 2.6 to 3.0 are accepted.]

Answer **2.8**..... [1]

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22 **[Area of a triangle (½ab sin C); obtuse angles]**

$\frac{1}{2}(8)(7)\sin x° = 14$ **[M1]**

$28\sin x° = 14$

$\sin x° = \frac{1}{2}$ **[A1]**

$\boldsymbol{x = 30}$ **[A1]** **or** $\boldsymbol{x = 180 - 30 = 150}$ **[B1]**

[Note: sine is positive for an acute AND an obtuse angle, and both triangles exist.]

Answer $x =$ **30**..... and $x =$ **150**..... [4]

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23 **[Algebraic fractions – factorising; equations]**

(a)

$16x^2 - 9 = (4x + 3)(4x - 3)$ **[B1]**

$16x^2 - 24x + 9 = (4x - 3)^2$ **[B1]**

$\frac{16x^2 - 9}{16x^2 - 24x + 9} = \frac{(4x + 3)(4x - 3)}{(4x - 3)(4x - 3)}$ **[M1]**

$= \boldsymbol{\frac{4x + 3}{4x - 3}}$ **[A1]**

Answer $\frac{4x+3}{4x-3}$ ..... [4]

(b)

$\frac{3}{x - 1} - \frac{4}{x - 5} = 5$

$3(x - 5) - 4(x - 1) = 5(x - 1)(x - 5)$ **[M1]**

$3x - 15 - 4x + 4 = 5(x^2 - 6x + 5)$

$-x - 11 = 5x^2 - 30x + 25$

$0 = 5x^2 - 29x + 36$

$0 = (5x - 9)(x - 4)$ **[M1]**

$5x - 9 = 0$ or $x - 4 = 0$

$\boldsymbol{x = \frac{9}{5}}$ **[A1]** **or** $\boldsymbol{x = 4}$ **[A1]**

[Note: neither value makes a denominator zero ($x \neq 1$, $x \neq 5$), so both are kept.]

Answer $x = \frac{9}{5}$..... or $x =$ **4**..... [4]

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