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

Paper 2

Wednesday 7 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 C2: Integers, Rational, Real Numbers
- S1 C3: Approx & Estimation
- S1 C4: Basic Algebraic Manipulations
- S1 C8: Percentages
- S1 C10: Basic Geometry
- S1 C12: Perimeter & Area of Plane Figures
- S1 C13: Vol & Surface Area of Prisms & Cylinders
- S1 C14: Statistical Data Handling
- S2 C1: Simul Eqns
- S2 C10: Trigo Ratios
- S2 C12: Probability
- S2 C13: Statistical Diagrams
- S2 C14: Averages of Stats Diagram
- S3 C3: Indices
- S3 C5: Graphs of Functions
- S3 C7: Apps of Trigo
- S3 C8: Arc, Sector, Radian
- S3 C11: Geometrical Properties of Circles
- S4 C2: Probability
- S4 C3: Statistics

Our worked solution to every question, by number. The questions themselves are not reproduced: read this beside your copy of the paper. 70 marks, 12 questions: Section A (62 marks) and both Section B options (candidates answer one, 8 marks). S3 C7, S3 C11, S4 C2 and S4 C3 are Section B only.

This document consists of **12** printed pages.

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Section A (62 marks)

1 **[Calculator work; ordering numbers]**

(a)

(i)

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

$(\sin 76°)^2 + (\cos 76°)^2 = 1$ **[B1]**

(It is 1 for every angle: $\sin^2\theta + \cos^2\theta = 1$.)

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

(ii)

$$\frac{14.7 + 6.23}{5.2(6.14 - 2.37)} = \frac{20.93}{19.604}$$
$$= 1.0676\ldots$$
$$\approx 1.07\ (3\text{ s.f.})$$ **[B1]**

Answer **1.07**..... [1]

(b)

As decimals: $3\% = 0.03,\ 0.318,\ 0.32,\ \frac{1}{3} = 0.333\ldots,\ \sqrt{0.3} = 0.548\ldots$

3%, 0.318, 0.32, $\frac{1}{3}$, $\sqrt{0.3}$ **[B1]**

[1]

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2 **[Pie chart]**

(a)

The right-angle mark shows the bus sector is 90°. **[B1]**

Car angle $= 360° - 120° - 84° - 90°$ **[M1]**
$= 66°$

By car $= \frac{66}{360} \times 120$
$= \mathbf{22}$ **[A1]**

Answer **22**..... [3]

(b)

$$\frac{\mathbf{90}}{\mathbf{360}} \times \mathbf{100\%} = \mathbf{25\%}$$ **[B1]**

Answer **25%**..... [1]

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3 **[Angles and parallel lines]**

(a)

$\angle BCF = 180° - 56°$
$= \mathbf{124°}$ **[B1]**

Reason: co-interior angles, BE // CF **[B1]**

[Note: "Interior angles" or "allied angles" also names the same rule. Name the parallel lines.]

Answer **124°**..... [2]

(b)

$\boldsymbol{\angle DCF = \angle EBC = 56°}$ **[B1]**

(corresponding angles, BE // CF)

Answer **56°**..... [1]

---

4 **[Sector: area and perimeter]**

(a)

$\text{Area} = \frac{145}{360} \times \pi \times 6^2$ **[M1]**
$= 45.553 \ldots$
$\approx 45.6 \text{ cm}^2 \text{ (3 s.f.)}$ **[A1]**

Answer **45.6**..... cm² [2]

(b)

$\text{Arc } AB = \frac{145}{360} \times 2\pi \times 6$ **[M1]**
$= 15.184 \ldots$
$\text{Perimeter} = 15.184 \ldots + 6 + 6$
$\approx 27.2 \text{ cm (3 s.f.)}$ **[A1]**

[Note: The perimeter of a sector includes both radii.]

Answer **27.2**..... cm [2]

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5 **[Algebra: expanding, indices, simultaneous equations]**

(a)

(i)

$5(2x+3)-4(x-5)=10x+15-4x+20$ **[M1]**

$=\mathbf{6x+35}$ **[A1]**

Answer $\mathbf{6x+35}$ ..... [2]

(ii)

$\dfrac{a^5\times a^4}{a^3}=a^{5+4-3}$

$=\boldsymbol{a^6}$ **[B1]**

Answer $\boldsymbol{a^6}$ ..... [1]

(iii)

$\left(\dfrac{16p^6}{q^2}\right)^{-\frac{1}{2}}=\left(\dfrac{q^2}{16p^6}\right)^{\frac{1}{2}}$ **[M1]**

$=\dfrac{\boldsymbol{q}}{\boldsymbol{4p^3}}$ **[A1]**

Answer $\dfrac{\boldsymbol{q}}{\boldsymbol{4p^3}}$ ..... [2]

(b)

$5x+2y=4$ ——(1)

$2x-3y=13$ ——(2)

(1) × 3: $15x+6y=12$

(2) × 2: $4x-6y=26$

Add: $19x=38$ **[M1]**

$x=2$ **[A1]**

Sub into (1): $10+2y=4$ **[M1]**

$y=-3$ **[A1]**

Check in (2): $2(2)-3(-3)=4+9=13$ ✓

Answer $\boldsymbol{x=2,\ y=-3}$ ..... [4]

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6 **[Simple and compound interest]**

(a)

$$\text{Interest} = \frac{2400 \times 2.4 \times 5}{100} \quad \textbf{[M1]}$$
$$= 288 \quad \textbf{[A1]}$$
$$\text{Amount} = 2400 + 288$$
$$= \$\mathbf{2688} \quad \textbf{[A1]}$$

Answer **$2688**..... [3]

(b)

$$\text{Amount} = 4000\left(1 + \frac{1.9}{100}\right)^5 \quad \textbf{[M1]}$$
$$= 4394.716\ldots$$
$$\approx \$\mathbf{4394.72} \quad \textbf{[A1]}$$

Answer **$4394.72**..... [2]

(c)

$$3800\left(1 + \frac{r}{100}\right)^6 = 4330 \quad \textbf{[M1]}$$
$$1 + \frac{r}{100} = \sqrt[6]{\frac{4330}{3800}} \quad \textbf{[M1]}$$
$$= 1.021\,999\ldots$$
$$r \approx 2.20\ (3\text{ s.f.}) \quad \textbf{[A1]}$$

[Note: Keep the full value of the sixth root before subtracting 1; rounding it early changes r.]

Answer $\boldsymbol{r = 2.20}$ ..... [3]

7 **[Grouped data: histogram, median, mean, probability]**

(a)

A histogram shows the shape (distribution) of continuous data, with no gaps between the classes. **[B1]**

[1]

(b)

With 50 people the median is the mean of the 25th and 26th values. The cumulative frequency is 12 up to t = 15 and 27 up to t = 20, so both lie in $15 < t \leq 20$, not in $20 < t \leq 25$. The middle group is not the median group because the groups have different frequencies. **[B1]**

[1]

(c)

Use the mid-values 12.5, 17.5, 22.5, 27.5, 32.5.

$$\text{Mean} = \frac{12.5(12) + 17.5(15) + 22.5(11) + 27.5(9) + 32.5(3)}{50} \quad \textbf{[M1]}$$

$$= \frac{1005}{50}$$

$$= \textbf{20.1 min} \quad \textbf{[A1]}$$

Answer **20.1**..... min [2]

(d)

$$P(t > 25) = \frac{9 + 3}{50}$$

$$= \frac{\mathbf{6}}{\mathbf{25}} \quad \textbf{[B1]}$$

Answer $\frac{6}{25}$ ..... [1]

8 **[Trigonometry; trapezium; volume of a prism]**

(a)

Drop perpendiculars from D and C to AB. Each end piece of AB has length x.

$x = 7\cos 72°$ **[M1]**

$DC = 12 - 2(7\cos 72°)$ **[M1]**

$= 7.6738\ldots$ **[A1]**

≈ 7.67 cm (2 d. p.) (shown)

[3]

(b)

Height $= 7\sin 72°$ **[M1]**

$= 6.6574\ldots$

Area $= \frac{1}{2}(7.6738\ldots + 12)(6.6574\ldots)$ **[M1]**

$= 65.488\ldots$

≈ 65.5 cm^2 (3 s. f.) **[A1]**

Answer **65.5**..... cm² [3]

(c)

Volume $= 65.488\ldots \times 15$

$= 982.32\ldots$

≈ 982 cm^3 (3 s. f.) **[B1]**

[Note: Use the unrounded area. 65.5 × 15 = 982.5 would round to 983, which is wrong.]

Answer **982**..... cm³ [1]

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9 **[Cubic graph]**

(a)

$x = -2: y = (-2)^3 - 5(-2)^2 + 7 = -21$ **[B1]**

$x = 5: y = 5^3 - 5(5)^2 + 7 = 7$ **[B1]**

(b)

(drawing not reproduced in this copy)

All ten points plotted correctly **[B2]** smooth curve through them **[B1]**

[Note: B2 drops to B1 if one or two points are plotted wrongly. Join the points with one smooth curve, never straight segments.]

[3]

(c)

Lowest point of the curve for x > 0 (near x = 3.3):

$\boldsymbol{y \approx -11.5}$ **[B1]**

[Note: Exact value −11.52; readings from −11.6 to −11.4 are accepted.]

[1]

9 *(continued)*

(d)

The curve falls from the maximum at x = 0 to the minimum at x ≈ 3.3.

$\boldsymbol{0 < x < 3.3}$ **[B1]**

[1]

(e)

Draw the line y = 4. It cuts the curve three times.

$\boldsymbol{x \approx -0.7}$ **[B1]** $\boldsymbol{x \approx 0.85}$ **[B1]** $\boldsymbol{x \approx 4.9}$ **[B1]**

[Note: Exact values −0.72, 0.85, 4.87. Accept each reading within about ±0.1 (for example 0.8 or 0.9 for the middle one).]

[3]

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10 **[Real-world problem: reservoirs]**

(a)

$15\,850\,000\ \text{m}^3 = 15\,850\,000 \times 1000\ \text{litres}$ **[M1]**

$= \mathbf{1.585 \times 10^{10}\ litres}$ **[A1]**

Answer **1.585×10^{10}**..... litres [2]

(b)

$304\ \text{hectares} = 304 \times 10\,000 = 3\,040\,000\ \text{m}^2$

$\text{Depth} = \dfrac{27\,800\,000}{3\,040\,000}$ **[M1]**

$= 9.1447\ldots$

$\approx 9.14\ \text{m (3 s.f.)}$ **[A1]**

Answer **9.14**..... m [2]

10 *(continued)*

(c)

(i)

$\text{Domestic} = 0.148 \times 6\,047\,000$ **[M1]**

$= 894\,956\ \text{m}^3$

$\text{Total} = 894\,956 \div 0.45$ **[M1]**

$= 1\,988\,791.1\ldots$

$\approx 1.99 \times 10^6\ \text{m}^3\ \text{(3 s.f.)}$ **[A1]**

[Note: Domestic use is 45% of the total, so divide by 0.45 (do not multiply).]

Answer **1.99×10^6** ..... m^3 [3]

(ii)

$\dfrac{1\,320\,000}{1\,988\,791.1\ldots} \times 100\% = 66.37\ldots$ **[M1]**

$\approx 66.4\%\ \text{(3 s.f.)}$ **[A1]**

[Note: Divide by the unrounded total from (i). Using 1.99×10^6 gives 66.3%, which loses the A1.]

Answer **66.4**..... % [2]

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Section B

11 **[Circle properties; sine rule (angles of elevation)]**

(a)

PA = PB, because tangents from an external point are equal. **[B1]**

So triangle PAB is isosceles, and the base angles of an isosceles triangle are equal: angle PAB = angle PBA. **[B1]**

[2]

11 *(continued)*

(b)

$$\angle ABC = \frac{108°}{2} = 54° \quad \textbf{[B1]}$$

(angle at centre = 2 × angle at circumference)

$$\angle ADC = 180° - 54°$$
$$= \mathbf{126°} \quad \textbf{[B1]}$$

(angles in opposite segments; ABCD is a cyclic quadrilateral)

Answer **126°** ..... [2]

11 *(continued)*

(c)

$$\angle PHQ = 180° - 32° - 65° = 83° \quad \textbf{[B1]}$$

$$\frac{PH}{\sin 65°} = \frac{4000}{\sin 83°} \quad \textbf{[M1]}$$

$$PH = \frac{4000 \sin 65°}{\sin 83°} \quad \textbf{[M1]}$$

$$= 3652.4 \ldots$$

$$\approx 3650 \text{ m (3 s.f.)} \quad \textbf{[A1]}$$

[Note: PH is opposite the 65° angle at Q, and PQ = 4000 m is opposite the 83° angle at H.]

Answer **3650** ..... m [4]

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12 **[Comparing distributions; standard deviation; probability]**

(a)

(i)

Athlete A. A's median time (53.2 s) is lower than B's (55.7 s), so A usually takes less time. **[B1]**

[1]

(ii)

Athlete B. B's interquartile range (4.7 s) is smaller than A's (5.2 s), so B's times are less spread out. **[B1]**

[1]

(b)

Mid-values 25, 32.5, 37.5, 42.5, 50: $\Sigma f = 100$, $\Sigma fx = 3585$, $\Sigma fx^2 = 133\,362.5$

$$\text{s.d.} = \sqrt{\frac{133\,362.5}{100} - \left(\frac{3585}{100}\right)^2} \qquad \textbf{[M1]}$$

$$= \sqrt{48.4025}$$

$$= 6.957\ldots$$

$$\approx 6.96 \text{ m (3 s.f.)} \qquad \textbf{[A1]}$$

Answer **6.96**..... m [2]

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12 *(continued)*

(c)

11 cards: 2 of them B, 1 O.

(i)

$$P(B,B) = \frac{2}{11} \times \frac{1}{10} \qquad \textbf{[M1]}$$
$$= \mathbf{\frac{1}{55}} \qquad \textbf{[A1]}$$

Answer $\mathbf{\frac{1}{55}}$ ..... [2]

(ii)

The three cards must be B, B and O, in any of 3 orders (BBO, BOB, OBB):

$$P = 3 \times \frac{2}{11} \times \frac{1}{10} \times \frac{1}{9} \qquad \textbf{[M1]}$$
$$= \mathbf{\frac{1}{165}} \qquad \textbf{[A1]}$$

Answer $\mathbf{\frac{1}{165}}$ ..... [2]

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