MATHEMATICS B J567/03

Paper 3 (Higher Tier)

Additional Specimen Mark Scheme

The maximum mark for this paper is **100**.

This document consists of **9** printed pages and **1** blank page.

Marking Instructions

1.   Mark strictly to the mark scheme.

2.   Make no deduction for omission of units except as indicated on the mark scheme.

3.   Work crossed out but not replaced should be marked.

4.   M (method) marks are not lost for purely numerical errors.
        A (accuracy) marks depend on preceding M (method) marks. Therefore M0 A1 cannot be awarded.
        B (independent) marks are independent of M (method) marks and are awarded for a correct final answer or a correct intermediate stage.

5.   Subject to 4, two situations may be indicated on the mark scheme conditioning the award of A marks or independent marks:
        • Correct answer obtained without wrong working
        • Follows correctly from a previous answer whether correct or not ("ft").

6.   As a general principle, if two or more methods are offered, mark only the method that leads to the answer on the answer line. If two (or more) answers are offered, mark the poorer (poorest).

7.   Always mark the greatest number of significant figures seen, even if this is then rounded or truncated on the answer line, unless the question asks for a specific degree of accuracy.

8.   If the correct answer is seen in the body and the answer given in the answer space is a clear transcription error allow full marks unless the mark scheme says 'mark final answer' or 'cao'. If the answer is missing but the correct answer is seen in the body allow full marks. If the correct answer is seen in the working but a completely different answer is seen in the answer space then accuracy marks for the answer are lost. Method marks would normally be given.

9.   Where there is clear evidence of a misread, and this does not affect the nature or difficulty of the question, a penalty of 1 mark is generally appropriate. This may be achieved by awarding M marks but not an A mark, or awarding one mark less than the maximum.

10.   For methods not provided for in the mark scheme give as far as possible equivalent marks for equivalent work.

11.   For answers scoring no marks, you must either award NR (no response) or 0, as follows:

        Award NR if:

        • Nothing is written at all in the answer space
        • There is any comment which does not in any way relate to the question being asked ("can't do", "don't know", etc.)
        • There is any sort of mark that is not an attempt at the question (a dash, a question mark, etc.)

Award 0 if:

- There is any attempt that earns no credit. This could, for example, include the candidate copying all or some of the question, or any working that does not earn any marks, whether crossed out or not.

12. Where a follow through (ft) mark is indicated on the mark scheme for a particular part question, you must ensure that you refer back to the answer of the previous part question.

13. In cases where there is clear evidence that a calculator has been used in this paper, mark the script as normal and then raise an exception (suspected malpractice).

14. Anything in the mark scheme which is in square brackets […] is not required for the mark to be earned, but if present it must be correct.

Abbreviations

The following abbreviations are commonly found in GCSE Mathematics mark schemes.

- Where you see **oe** in the mark scheme it means **or equivalent.**

- Where you see **isw** in the mark scheme it means **ignore subsequent working.**

- Where you see **www** in the mark scheme it means **without wrong working.**

- Where you see **cao** in the mark scheme it means **correct answer only.**

- Where you see **soi** in the mark scheme it means **seen or implied.**

- Where you see **rot** in the mark scheme it means **rounded or truncated.**

- Where you see **seen** in the mark scheme it means that you should award the mark if that number/expression is seen anywhere in the answer space, including on the answer line, even if it is not in the method leading to the final answer.

- Where you see **figs 237**, for example, this means any answer with only these digits. You should ignore leading or trailing zeros and any decimal point e.g. 237000, 2·37, 2·370, 0·00237 would be acceptable but 23070 or 2374 would not

1	(a)	∠CDA drawn as 53°(±2°) <u>and</u> DA drawn as 5 cm (±0·1 cm)	1	
		∠ADC drawn as 76° (±2°)	1	
		AB completed, from correct A, with ∠DAB drawn as 127° (±2°)	2dep	Dependent on first two marks earned **M1** for ∠DAB = 180 − 53 [= 127°] soi or for a recognisable attempt to construct a line parallel to CD at A
	(b)	*Their* ⊥height measured ±0·1 cm	1	In a correct drawing this is 4 cm (±0·1) This mark can be earned through use of the measured ⊥height in the formula
		$\dfrac{their\ AB + 12}{2} \times their \perp height$	1	In a correct drawing AB = 8 cm (±0·1)
		40	1ft	ft *their* measurements
		cm²	1	Allow **W3** for 40 or **W4** for 40 cm² www
2	(a)	(i) 5·2 8·8 16	1	
		(ii) Points plotted Correct line drawn	M1ft A1	ft *their table* Correct line only
	(b)	Ready To Go by £0·60 to £0·80 (or 60p to 80p)	2	ft *their* Ready To Go line **M1** for reading from mileage 9 implied by 15·50 or 14·80 seen
3	(a)	0·15	2	**M1** for 1 − (0·2 + 0·15 + 0·15 + 0·2) or 0·3 seen
	(b)	12	2	**M1** for 0·2 × 60
4	(a)	54 40 94 26 30 56 80 70 150 <u>and</u> 54 on answer line	3	**M2** for 6 or more of own entries correct Or **M1** for 3 to 5 of own entries correct
	(b)	20%	2	**M1** for 30/150 or ft *their* 'No, No'
5	(a)	Eg, people outside cinema likely to be biased (in favour of cinema)	1	
	(b)	Suitable question <u>and</u> at least 4 response boxes with non-overlapping categories covering all possibilities eg How many films do you watch in a year? 0-10, 11-20, 21-30, more than 30 with boxes	2	**M1** for suitable question and 3 appropriate response boxes or question <u>and</u> 4 boxes with overlapping categories/not covering all possibilities

6	(a)	Manchester temperature changed to 26·6°F or NY temperature changed to ⁻5°C	2	**M1** for evidence of substitution in correct formula
		NY colder	1ft	ft only
		Difference 2°C or 3·6°F	1ft	ft only - must include C or F but condone missing °
	(b)*	New York cheaper stated and supported by clear explanation and correct calculations. eg 1 US gallon costs $3 which is £2 or 1 US gallon is nearly 4 litres so 1 litre in NY costs roughly 50p which is cheaper than £1·15 per litre in Manchester Or 1 US gallon would cost £1·15 × 3·8 in Manchester which is about £4 1 US gallon costs $3 in NY which is £2, so NY is cheaper	3-2	**2** marks for NY with a correct solution but an inadequate/incomplete explanation. eg NY is cheaper because a litre costs about 50p (or in Manchester a US gallon would cost about $6) or NY with incomplete solution but clear calculation shown eg NY is cheaper because a litre costs $0·26 × 3 = $0·78 in NY
		1 mark for attempting to find the cost of a US gallon in Manchester (£1·15 × 3·80) or 1 litre in NY ($3 ÷ 3·80 or $3 × 0·26)	1-0	NY (or Manchester or no decision) with no relevant working
7	(a)	$3x(x + 4y)$	2	**M1** for $3(x^2 + 4y)$ or $x(3x + 12y)$
	(b)	10·5 www	3	**M1** for $4x + 3 = 45$ **M1** for $4x = 42$ ft 1st step **M1** for $x = 10·5$ ft 2nd step
8		Scale factor 3 Centre (1, 2)	1 2	**M1** for 2 pairs of corresponding points joined and extended
9		Multiplying 1st equation (eg by 5): $15x − 20y = 90$	M1	$9x − 12y = 54$ condone one error
		Multiplying 2nd equation (eg by 3): $15x + 9y = 3$	M1	$20x + 12y = 4$ condone one error
		Elimination of x or y: $⁻29y = 87$	M1	$29x = 58$
		$x = ⁻3, y = 2$	A1	**B1** for $x = ⁻3$ and $y = 2$

10	(a)	£41·60	3	**M1** for clear method for 35% eg 10% × 3 + 5% **M1** for 64 – *their* 35% **A1** for £41·60
	(b)	£90	3	**M2** for 36 ÷ 0·4 or equivalent eg 36 × 2·5 or 36 ÷ 4 × 10 or 36 ÷ 2 × 5 Or **M1** for 0·4 or for equating 36 to 40%
11*		Correct proof with clear use of algebraic notation eg $n(n + 4) = n^2 + 4n$ $(n + 2)^2 = n^2 + 2n + 2n + 4$ $n^2 + 4n + 4$ is 4 more than $n^2 + 4n$	4-3	For the lower mark, $n(n + 4) = n^2 + 4n$ and $(n + 2)^2 = n^2 + 2n + 2n + 4$ but no final statement Or full solution with poor notation, eg *nn* (not n^2) or $n \times n + 4 = n^2 + 4n$
		Expansion of $n(n + 4)$ <u>and</u> $(n + 2)^2$ attempted: condone 1 error	2-1	For the lower mark, either one expansion attempted: condone 1 error Or $n(n + 4)$ and $(n + 2)^2$ both seen but neither expansion attempted Algebraic communication may be weaker
		No relevant content, eg $2n + 4n$ and $n^2 + 4$	0	
12	(a)	(i) $2\frac{9}{10}$	3	**M2** for $3\frac{5}{10} - \frac{6}{10}$ or $\frac{29}{10}$ Or **M1** for attempt to subtract using common denominator with one correct fraction eg $\frac{5}{10}$ or $\frac{6}{10}$ or $\frac{45}{10}$ or $\frac{29}{10}$
		(ii) $5\frac{5}{12}$	3	**M2** for $\frac{65}{12}$ Or **M1** for $\frac{13}{4} \times \frac{5}{3}$
	(b)	(i) 0·15	1	
		(ii) $\frac{13}{33}$	3	**M2** for $\frac{39}{99}$ Or **M1** for 100r = 39·39...

13	(a)	80	2	**M1** for 90[°] for B and 120[°] for C
	(b)	(i) Negative	1	Accept strong
		(ii) line of best fit	**M1**	Line must pass between 'gates' from (5000, 4600) to (5000, 5200) and (50000, 1600) to (50000, 2200)
		Reading from *their* line	**A1ft**	
	(c)	Frequency densities 1, 1·4, 0·8, 0·6, 0·15	1	Condone 1 error
		Axes labelled	1	Frequency density [cars per 1000 miles], Mileage [thousands] Condone missing units
		Axes scaled appropriately	1	eg vertical 1 cm = 0·25 or 0·2 and horizontal 1 cm = 5
		All bars correct height and width	1	
14		$\dfrac{4\pi}{3}+16$ oe www	4	**M1** for [Circmf. =] π × 16 **M1** for $\frac{30}{360}$ × *their* C **A2** for $\frac{4}{3}$π + 16 oe Or **A1** for $\frac{480}{360}$ π oe
15		∠PQR = 112° [Isosceles] Δ; [sum of angles] 180° x = 68° Opposite [angles in a] cyclic quadrilateral [add up to] 180°	1 1 1 1	<u>Similar alternative argument:</u> **1** for x = ∠QRP + ∠ RPQ (or 2 × 34) = 68° **1** for Opposite [angles in a] cyclic quadrilateral [add up to] 180° **1** for [Isosceles] Δ [sum of angles] 180° **1** for ∠PQR is common [to the quadrilateral and the Δ]
16	(a)	(1, 2) (2, 4) (3, 8) plotted (0, 1) (⁻1, 0·5) (⁻2, 0·25) (⁻3, 0·125) plotted Correct curve	1 1 1	By eye By eye; condone 1 error
	(b)	2·48 to 2·68	1	

17	(a)	(i) Right-angled triangle with 60°, 10 cm and 5 cm identified	1	
		$\cos 60° = 5/10$	1	
		(ii) Height$^2 = 10^2 − 5^2$	1	
		Height $= \sqrt{75}$	1	
		$\cos 30 = \frac{\sqrt{75}}{10}$	1	
		$= \frac{5\sqrt{3}}{10}$	1	
	(b)	A and E congruent because both triangles have right angle, hypotenuse length 6 and side opposite 30° length 3 with evidence calculation.	3	**M2** for missing side (or angle) found in 3 triangles Or **M1** for use of $\cos 60° = 0.5$ in any triangle
18		$x = 4, y = ^-5$ $x = ^-0.4, \; y = 8.2$ www	6	**M2** for $5x^2 −18x − 8 = 0$ Or **M1** for $7 − 3x = 5x^2 − 21x − 1$ AND **M2** for $(5x + 2)(x – 4)$ [=0] Or **M1** for $(5x ± 2)(x ± 4)$ AND **A1** for $x = 4$ and $^-0.4$ **A1** for $y = ^-5$ and 8.2

Paper Total: 100

Assessment Objectives and Functional Elements Grid

GCSE MATHEMATICS B

J567/03 - Paper 3 (Higher Tier)

	Topic	**Context**	**Ref**	**AO1**	**AO2**	**AO3**	**Functional**
1	Construction; parallel lines; Area of trapezium		HIG2 HIG1 HIG4	6		2	
2	Draw and interpret graphs	Minicabs	HBA5		5		5
3	Probability and relative frequency	Dice	HIS1 HBS2	2	2		
4	Two-way tables; percentages	School day trip	HIS4 HIN2		5		3
5	Survey	Films	HIS5		3		3
6	Conversions	Manchester and New York	HIA1			7	7
7	Factorisation; linear equation		HIA3 HSA1	5			
8	Enlargement		HBG7	3			
9	Simultaneous linear equations		HSA4	4			
10	Percentage changes	Shoe sale	HIN3 HSN1		6		6
11	Algebraic proof	Consecutive even numbers	HSA2			4	
12	Fraction arithmetic; conversion to decimal; recurring decimals		HIN1 HBN2 HBN3 HGN3	10			
13	Pie chart; scatter graph; histogram	Hire car company	HIS3 HBS3 HGS2	4	5		
14	Perimeter of a sector		HGG4	4			
15	Angles inside a circle		HSG1	4			
16	Exponential graph		HGA5	4			
17	Trigonometric ratios; congruent triangles		HSG4 HGG1 HGN2			9	
18	Simultaneous linear and quadratic equations		HGA3	6			
	TOTALS			**52**	**26**	**22**	**24**

Paper Total: 100 marks

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