OCR
RECOGNISING ACHIEVEMENT

GCSE

Mathematics B (MEI) (Two Tier)

General Certificate of Secondary Education **J518**

Mark Schemes for the Units

June 2008

J518/MS/R/08

Oxford Cambridge and RSA Examinations

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GCSE Mathematics B MEI Two Tier (J518)

MARK SCHEME FOR THE UNITS

B261 Foundation – Modular

Section A

1	(a) 5704	**1**		
	(b) Sixty thousand two hundred (and) forty three	**1**		
	(c) 5630	**1**		
	(d) (i) 754	**1**		
	(ii) 272	**1**		
	(e) (i) 7	**1**		
	(ii) 8 or 12	**1**		7
2	(a) R	**1**		
	(b) P	**1**		
	(c) T	**1**		
	(d) Any right angle marked unambiguously	**1**		4
3	(a) (i) 9421	**1**		
	(ii) Put the largest no. first oe	**R1**		
	(b) (i) 7	**1**		
	(ii) Nearest square no. is 49	**R1**	49 or 7^2 mentioned in explanation	4
4	(a) 174 - 182	**2**	**B1** for 8.7 to 9.1 soi, **M1** ×20 evaluated Or **SC1** 188-196	
	(b) 68 - 72	**1**		3
5	(a) (i) 4	**1**		
	(ii) 5.5	**2**	**M1** $2x = 5 + 6$ or better, or $x - 2.5 = 3$	5
	(b) $7c - d$, final answer	**2**	**B1** for $7c$ or $-d$ seen, or correct answer spoilt	
6	(a) 12	**1**		
	(b) 8	**2**	**M1** for 2×4	
	m^2	**1**		4

7	(a) 0.12 oe (b) 1 (c) 881.64	**1** **2** **1**	**M1** for 9 and 8 seen	4
8	2 | 3 5 8 8 3 | 0 4 6 7 4 | 1 2 3 Key correct	**B2** **B1**	Allow B1 if one error or omission, or unordered	3
9	$10t = v - u$ or $\frac{v}{10} = \frac{u}{10} + t$ $t = \frac{v-u}{10}$	**B1** **B1ft**		2

Section B

10	(a) kilometre	**1**	Accept abbreviations, ignore numbers	
	(b) gram	**1**		
	(c) metre	**1**		
	(d) litre	**1**		4
11	(a) 3600 isw	**2**	**M1** × 0.15 or good attempt at 10% + 5%	
	(b) 1440	**2**	**SC2** 20400 **B1** for 360 or 7200 or digits 144	
	(c) 49 isw	**2**	Condone 0.49. **M1** for × 0.175 or full alternative method **SC2** £3.29	6
12	(a) Tallies plus 6,3,3,1,7	**1+1ft**	Condone 1 error in tallies	
	(b) Correct heights	**1ft**		
	(c) 22	**2**	**M1** At least 3 heights added, or answer 20-24	
	(d) Robin	**1**		
	(e) 0.8	**1**		7
13	(a) 10	**1**		
	(b) -11	**1**		
	(c) 7	**2**	**B1** for 21 seen or attempt at -4 and ÷ 3 in wrong order. Accept clear embedded answer.	4
14	52	**1**		
	Angles on a straight line (sum to 180º)	**R1**	180º soi	2
15	(a) 60 20 (b) 4 hours (c) A by £20	**B1** **B1** **B1** **B1,B1**		5
16	11.6(0)	**1**		
	9.23	**1ft**		
	3.55	**2**	**M1** for ÷ 2.6 soi	4
17	$4.1^2 + 5.3^2$ or 44.9 seen	**M1**		
	$\sqrt{(4.1^2 + 5.3^2)}$	**DepM1**		
	6.7(.....)	**A1**		

	16.1(…..)	**A1 ft**	Dependent on both M marks	4

B262 Foundation – Terminal

Section A

1	(a) (i) Parallelogram (ii) Zero (b) A and D or B and C	**B1** **B1** **B1**		3
2	3/4 , 90% , 99/100	**M1** **A1**	For one correct conversion seen, either way.	2
3	(a) (i) 10% (ii) 300 × 90/100 270 (b) 200 × 10 2000 www (c) 1½ + ¾ 3 - (their 2¼) ¾ hr	**B1** **M1** **A1** **M1** **A1** **M1** **M1** **A1**	oe Allow M1 for 30 seen or attempts 3 × 90 Allow one unrounded Allow 2080, 1980, 1990, 2100 soi by e.g. 2 hr 15min ALT. in minutes/hours even if wrong decimal or 45 mins	8
4	(a) i) (3 , 2) ii) marks point at (1 , 2) iii) marks point at (6 , 0) iv) correct reflection of their shape v) sides or angles unequal because (gives two comparable measurements) (b) correct drawn regular hexagon	**B1** **B1** **B1** **B1** **R1** **R1** **B3**	cao 3.6 and 4 cm to 1mm or 67º and 146º to 2º **B2** for 3 correct points **B1** for 1 correct point	9
5	(a) Correct sketch (b) 9,11 (c) Goes up in twos. (d) 23	**B1** **B1** **B1** **B1**	 Both correct Condone “odd numbers” or “misses out one number each time” cao.	4
6	(a) 49 (b) i) increased ii) stayed the same	**B1** **B1** **B1**	 oe oe	3
7	Correct enlargement	**B2**	**B1** for 2 correct lines **SC1** for correct ×2, ×4 enlargement	2
8	(a) 20 (kg) (b) Sand 36 (kg), Cement 9 (kg)	**1** **2**	Condone 20:5 not 5:20 **B1** for either or **M1** for 45 ÷ 5 seen **SC1** for reversed answers	3

9	(a) 3/10 www oe	**3**	**B1** for 3/4 seen + **M1** for 2/5 × 3/4, 2/5 of 3/4 not sufficient Or using assumed total (e.g. 100) **M1** for 2/5 × their 75 oe + **M1** for their answer/100 oe going on from 3/10 gets B1 only	
	(b) 40 www	**2**	**M1** for 12 ÷ their 3/10 oe soi by answer line or **B1** for 30 seen. **M1** for 120, 20, 16 as ft from 1/10, 3/5, 3/4	5
100	(a) $3x + 21$	**B1**		
	(b) $2(y + 6)$	**B1**		
	(c) (i) $(x =) 6$	**B1**		
	(ii) $12y – 18 + 14 – 2y$ (= 9) $10y = 13$ $(y =) 1.3$ oe	**M1** **M1** **A1**	or better. Condone 3 out of 4 terms correct. ft from 4 terms on LHS. Allow 1 further calculation error.	6
111	(a) 12 45	**B1** **B1**		
	(b) points curve	**P1ft** **C1**	Condone 5 correct points (1mm accuracy) correct curve only, 1 mm accuracy	
	(c) from their curved graph	**B1**	1 mm accuracy	5

Section B

12	0.46	**B2**	or 46cm **M1** for 0.4583...rot	2
13	(a) i) 25 ii) 75 (b) i) 1.7 ii) 1700 (c) (i) 3.89 (ii) mark at 4.01 on scale	**B1** **B1ft** **B1** **B1ft** **1** **1**	Accept 24 – 26	6
14	(a) $2 \times 3.7 + 2 \times 5.2$ oe 17.8 (b) Even	**M1** **A1** **B1**		3
15	(a) Bar graph correctly drawn (b) mild and dry (c) More days are not "mild and dry" than are. (d) (i) 12/31oe isw (ii) 1 valid comment	**B3** **B1** **R1** **B2** **R1**	Axes scale and labels **B1** each Correct bars **B1** (allow 1 error) **M1** for fraction less than 1 with 12 numerator OR 31 denominator. e.g. more data from e.g: 1sts of Mar, other 'Marchs', etc.	8
16	3×78 (= 234) 1.30 / 2 (= 0.65) 10 - (... +... + 1.89) 5.12	**M1** **M1** **M1** **A1**	All soi Methods can be pounds or pence, answer in pounds only	4
17	(a) 180 - (90 + 57) 33 (b) 180 degrees in triangle minus 90 for right angle leaves only 90 for remaining 2 angles, so none will be over 90 in size.	**M1** **A1** **R2**	**R1** for Obtuse is >90 soi, or for stating that two non-right angles total 90	4
18	(a) 45 (b) 32 (c) straight line from (14,42) to (16,42). Line joining (16,42) to (17,0)	**B1** **B1** **B1** **B1**	 ft from reasonable first line drawn.	4

19	(a)	Only asking top Maths set who are bound to be good at Maths	**B1**	Must have something that says or implies not typical of whole school. Or suggestion that they should use random/stratified sample	
	(b)	(i) Positive correlation	**B1**	Accept equivalent e.g. those that are good at maths are also good at English	
		(ii) suitable line	**B1**	Ruled, going between (30, 30) and (30, 46) and between (60, 58) and (60,66) and between (90, 100) and (100, 90)	
		(iii) Strict ft from their line (+ve gradient)	**B1**	± ½ small square.	4
20	(a)	(i) (7, 3, 1)	**B1**	-1 once for consistent wrong order, e.g. (*x, z, y*)	
		(ii) (4, 0, 1)	**B1**	-1 once for wrong notation e.g. (7*x*, 3*y*, 1*z*)	
	(b)	Rectangle 7cm by 3 cm Line splitting rectangle in correct position (splitting 7 into 4, 3)	**M1** **A1**	**B1** for length or width wrong, but dividing line correct relative to one end of the rectangle.	
	(c)	i) 11	**B2**	**M1** for $4 \times 2 + 1 \times 3$ or alternate method (allow 1 error)	
		ii) 33 cm^3	**B1** **U1**	ft from (c)(i)	8
21	(a)	(i) 4.5	**B2**	**M1** for 4.47....rot	7
		(ii) - 1.4	**B1**		
	(b)	4	**B1**		
	(c)	(i) 2^8	**B1**		
		(ii) 2^5 www	**B2**	**M1** for 2^9 or 2^2 seen **SC1** 2x2x2x2x2 www	

B263 Higher – Modular Paper

Section A

1	$\frac{86}{200}\times 100$ 43	**M1** **A1**		2
2	2 [3 5 8 8 3 [0 4 6 7 4 [1 2 3 Key correct	 **B2** **B1**	 Allow B1 if one error or omission or unordered.	3
3	Front correct Length correct	**M1** **A1**	Any isometric drawing. All correct.	2
4a **b**	881.64 Uses 20 and 80 with 390 or 400 100	**B1** **M1** **A1**		3
5a **b** **c**	$2x-14$ or $x-7=\frac{5}{2}$ $2x=19$ or $x=\frac{5}{2}+7$ 9.5 or 19/2 $4y<24$ $y<6$ $10t=v-u$ or $\frac{v}{10}=\frac{u}{10}+t$ $t=\frac{v-u}{10}$	**B1** **B1 ft** **B1** **B1** **B1** **B1** **B1 ft**	 **SC1** for 6 seen.	7
6	Marks higher on average in science Marks more spread in science	**B1** **B1**		2
7a **b**	Converts to twelfths o.e. Evidence of $\frac{77}{12}$ or $\frac{17}{12}$ $6\frac{5}{12}$ o.e. Deals with mixed numbers Inverts and multiplies or converts to eighths and divides. $2\frac{4}{5}$ o.e.	**M1** **A1** **A1** **M1** **M1** **A1**	At least one correct At least one correct	6
8	Complete correct method 120	**M1** **A1**		2
9a **b**	Multiplies by 2^2 200 Divides by 2^3 500	**M1** **A1** **M1** **A1**		4

10a	Completes square or multiplies out $p = 4$ $q = 5$	**M1** **A1** **A1**		
b	$(x+4)^2 = -5$ cannot find square root of negative 5	**M1** **A1**	**SC1** for accurate use of formula to identify root of a negative.	5

Section B

11a	Uses $\pi \times 5.2^2$	**M1**	Allow A1 for answers between 84.9 and 85	
	84.9 or 85.0 or 85	**A2**		
b	Uses $\pi R^2 - \pi r^2$	**M1**		
	Evidence of 120.7……or 120.8	**B1**		
	35.8 to 35.9	**A1**		6
12a	60	**B1**		
	20	**B1**		
b	4 hours	**B1**		
c	A by £20	**B1,B1**		5
13	$5.3^2 + 4.1^2$ or 44.9 seen	**M1**		
	$\sqrt{(5.3^2 + 4.1^2)}$	**DepM1**		
	6.7…..	**A1**		
	16.1…..	**A1 ft**	Dependent on both M marks.	4
14a	120 to 140	**B1**		
	uses midpoints	**M1**		
	calculates $\sum fx$ =(6120)	**M1**	Sum of products of frequency and 'their' midpoints (within class interval).	
	divides $\sum fx$ by 50	**M1**		
	122.4	**A1**		
b	$\frac{3}{50}$ o.e.	**B1**		6
15a	8	**B1**		
b	p^{10}	**B1**		
c	$5x = 25$ or $5y = -10$	**B1**		
	$x = 5$, $y = -2$	**B1**		
d	$2x^2 + 3xy - 10xy - 15y^2$	**B2**	Allow B1 if one error or omission	
	$2x^2 - 7xy - 15y^2$	**B1 ft**		7
16a	$\cos x = \frac{1.3}{3.2}$	**M1**		
	uses inverse cosine	**M1**		
	66· ….	**A1**		
b	$\frac{AC}{4.3} = \sin 62$	**M1**		
	$4.3 \times \sin 62 = 3.8$	**A1**		5

17	Uses 1435 and 185 Divides height by sheets. 0.129	**B1** **M1** **A1**	 Condone 0.1289.	 3

B264 Higher – Terminal Paper

Section A

1	(a) 20 kg	**1**	Condone 20 : 5 not 5 : 20	
	(b) Sand 36 (kg), Cement 9 kg	**B2**	**B1** for either or **M1** for 45 ÷ 5 seen Or **SC1** for reversed answers	3
2	(a) -1, 3, 7	**2**	**B1** for 2 correct, e.g. -5, -1, 3	
	(b) No	**1**	Dependant on some attempt at explanation.	
	Any correct explanation	**1**	e.g. 201 + 5 not divisible by 4 oe or 4 × 51 - 5 = 199 next term = 203	4
3	(a) 3/10 oe www	**3**	**B1** for 3/4 seen +**M1** for 2/5 × ¾ , 2/5 of ¾ not sufficient OR using assumed total (eg 100) **M1** for 2/5 × 75 oe + **M1** for their answer / 100 oe going on from 3/10 gets B1 only	
	(b) 40 www	**2**	**M1** for 12 ÷ their 3/10 soi by answer line or **B1** for 30 seen	5
4	(a) Odd + Even = Odd	**1**	Or equivalent e.g. all 6 combinations worked out with comment	
	(b) (i) (1, 4) and (3, 2)	**1**	ignore repeats	
	(ii) 7/20 www	**3**	**M2** for 1/5 x ¼ + 2/5 × ¾ or **M1** for either product OR **M1** for possibility space or list of at least 18 out comes + **M1** for 7/(their total no of outcomes) -1 for wrong notation e.g. 7:20, 7 in 20.	5
5	(a) 16 to 17	**1**		
	(b) Left of box at 26 Right of box at 36 Vertical line through box at 31 Horizontal lines from middle of box to 10, 60	**1** **1** **1** **1**	All ± ½ small square Accept not on grid if aligned with scale **SC2** for box plot, not aligned but labelled 10, 26, 31, 36, 60	5
6	Circle centre C radius 6 cm Perpendicular bisector of BC Correct region	**1** **1** **1ft**	± 2 mm compass drawn ruled, ± 2°,± 2 mm ft dependant on circle centre C (attempt) and attempt at perpendicular bisector.	3

7	(a) (i) $(x) = cv$ (ii) $(y) = kv^2$ (iii) $(d) = cv + kv^2$ (b) (i) $40 = 20c + 20^2 \times k$ (ii) $120 = 40c + 1600k$ ISW or better (c) c = 1 , k = 1/20 ISW	**1** **1** **1ft** **1** **1** **3**	Their (i) + (ii) ft must be f(v,c,k) d = 40 and $v^2 = 20^2$ must be substituted **B2** for either following correct algebra **M1**ft for equating coefficients and subtracting	8
8	basic sin/cosine wave amplitude 4 Through (0, 4), (3, 0), (6, -4), (9, 0), (12, 4), (15, 0), (18, -4), (21,0), (24, 4)	**B1** **B1** **B1**	Minimum 1 cycle	3
9	(a) $3y + 4y$ oe $ax - 5x$ oe $\frac{ax - 5x}{7}$ oe (b) $2(2x + 1) + 3(x - 5) = (4/3) \times 6$ or a multiple of this $4x + 2 + 3x - 15 = 8$ (or multiple) $x = 3$ (c) $\frac{x + 1}{x - 7}$ www final answer	**M1** **M1** **A1** **M2** **A1** **A1** **3**	) Must be within equation and consistent) or B3 for correct ans www Clearly multiplying each term by 6 or **M1** for $\frac{2(2x + 1) + 3(x - 5)}{6}$ implies **M2** **SC1** for $x = 3$ with no algebra **B1** for $(x + 7)(x + 1)$ seen + **B1** for $(x + 7)(x - 7)$ seen	10
10	Any numerical indication of Pythagoras $(7 - \sqrt{3})^2 - 4^2$ for $49 - 7\sqrt{3} - 7\sqrt{3} + \sqrt{3}.\sqrt{3}$ $36 - 14\sqrt{3}$ final answer	**M1** **A1** **A1** **A1**	accept 1 error accept a = 36, b = – 14	4

Section B

11	(a) Only asking top Maths set who are bound to be good at Maths	**1**	In addition to maths set highlighted or implied must have something that says or implies not typical of whole school. Or suggestion that they should use random/stratified sample	
	(b) (i) Positive correlation	**1**	accept equivalent e.g. those that are good at maths are also good at English	
	(ii) suitable line	**1**	Ruled, going between (30, 30) and (30, 46) ; (60, 58) and (60, 66) ; (90, 100) and (100, 90)	4
	(iii) Strict ft from their line (+ve gradient)	**1ft**	± ½ small square	
12	(a) 450 × 0.4 oe £180	**M2** **A1**	Or **M1** for 450 × 0.6 oe soi by 270 going on from 180 to 270 gets M1 only	
	(b) (i) 22 ÷ 0.4 oe seen £55	**M2** **A1**	or **M1** for 40% (of x) = £22 seen or **SC1** for 22/0.6 soi by 36.67	
	(ii) 30x + 120 oe final answer	**2**	**M1** for (22 + 8)x oe or 22x + 120 or 8x + 120 seen	
	(iii) 30x + 120 = 1425 30x = 1425 – 120 x = 43.5	**M1ft** **M1ft** **B1**	Their (ii) = 1425 (ii) must be a f(x) rearranging to $ax = b$ (rearrangement must be necessary). Condone x = (1425 – 120)/30 as eq'n	11
13	(a) (7, 3, 1)	**1**	-1 once for consistent wrong order e.g. (x, z, y)	
	(b) (4, 0, 1)	**1**	-1 once for wrong notation e.g. (7x, 3y, 1z)	
	(c) (4, 1.5, 2)	**1**		3
14	(a) 10.75, 10.75 22	**1** **1**		
	(b) plotting 9 points fairly smooth curve	**P1ft** **C1ft**	± ½ small square, Be reasonably generous but lost if excessively "thick or hairy" or if misses more than 1 point by > ½ small square radially. Dep on approximate parabola shape	
	(c) (i) Reading off 2 roots at h = 15	**1ft**	Strict ft ± ½ small square	
	(ii) time(s) when stone is at height of 15 m	**1**	Accept e.g. times between which height is > 15	

	(d) Extending graph (must be seen) and reading of solution when h = 0	**1ft**	Any reasonable extension (4 < t ≤ 4.3) Strict ft ± ½ small square	
15	(a) 2^5 www	**2**	**B1** for 2^9 seen	
	(b) (i) 6.04×10^7	**1**		
	(ii) 247 or 248 or 250 WWW (or standard form equiv)	**3**	**B2** for 247.5..... or **M1** for figs 604 ÷ figs 2.44 soi by figs 247 to 248 after 0 or M1 give **SC1** for <u>seeing</u> a rounding of their answer to 2 or 3 s.f.	6
16	(a) 54˚	**1**		
	(Tri)angle in semi-circle	**1**	Any equiv must use words semi-circle or diameter	
	Angle sum of triangle	**1**	Both dep on correct method for 54. Nothing wrong. Longer methods need all reasons for 2 marks or 1 reason for 1 mark.	
	(b) 54˚or their (a)	**1ft**		
	Angles in same segment	**1**	ft dep on x ≠ 90 Or angles at <u>circumference</u> from <u>same</u> chord/arc/points. Dep on *y* = *x* soi	5
17	(a) Answer rounding to 35.6	**B3**	**M1** for $20^2 + 45^2 - 2 \times 20 \times 45 \times \cos 50$ **A1** for 1267 - 1268	
	(b) sin70 × 15/45	**M2**	or **M1** for 15/(sin *A*) = 45/(sin 70) oe	
	18 or 18.2 to 18.3	**A1**	correct ans + 15/(sin *A*) = 45/(sin 70) implies M2	
	110 + their DAC	**A1ft**	dep on their DAC < 90	7
18	(a) 2/5**a** + 3/5**b** oe	**3**	**M1** for $\overrightarrow{BA}$ = **a** – **b** oe e.g. = $\overrightarrow{AB}$ – **a** + **b** + **M1** for **b** + 2/5 (their $\overrightarrow{BA}$) oe or a + 2/5(their $\overrightarrow{AB}$)	
	(b) 3/2 **b**	**2**	**M1** ft for – **a** + k (their $\overrightarrow{OP}$) oe k ≠ 1 M marks dep on vectors in terms of **a** and/or **b** and vectorially correct	
	(c) Trapezium	**1**		7
	$\overrightarrow{AQ}$ = 3/2 $\overrightarrow{OB}$ oe	**1**	Both dep on (b) correct	

B266 – Part One

MARKING GUIDE Mirrors

This guide gives **some** of the examples of evidence that candidates **may** produce. The examples are not exhaustive neither are they minimum requirements.

In the examples stated a = length and b = width of mirror, t = thickness of the border

MARK FOR EACH STRAND	Strategy	Communication	Reasoning
1	• **Candidates try different approaches and find ways of overcoming difficulties that arise when they are solving problems. They are beginning to organise their work and check results.** Finds the correct result for any mirror E.g. F/H 5 by 5 =24	• **Candidates discuss their mathematical work and are beginning to explain their thinking. They use and interpret mathematical symbols and diagrams.** Records the result for any mirror	• **Candidates show that they understand a general statement by finding particular examples that match it.** Finds the result for a mirror OTHER than 5 by 5.
2	• **Candidates are developing their own strategies for solving problems and are using these strategies both in working within mathematics and applying mathematics to practical contexts.** Finds a further, correct, result for any mirror OTHER than 5 by 5	• **Candidates present information and results in a clear way, explaining the reasons for their presentation.** Produces a clear set of drawings showing related mirrors and borders and/or a list of number of tiles needed.	• **Candidates search for a pattern by trying out ideas of their own.** Produces a list of three or more related results and intends to find a pattern. E.g. 1 by 1, 2 by 2, 3 by3, …..
3	• **In order to carry through tasks and solve mathematical problems, candidates identify and obtain necessary information; they check their results, considering whether these are sensible.** Finds ALL (must be more than 2) related results from which a generalisation may be made. Any non algebraic generalisation may be made. E.g. F/H The numbers of tiles goes up in fours.	• **Candidates show understanding of situations by describing them mathematically using symbols, words and diagrams.** Records the work in tables, with headings, or in organised lists with comments such as "I have done…" "I found that …"	• **Candidates make general statements of their own, based on evidence they have produced, and give an explanation of their reasoning.** Makes a (simple) generalisation that is correct for their results. This may be in words or symbols. E.g. F/H The numbers of tiles goes up in fours. $T_a = 4a + 4$

4	• **Candidates carry through substantial tasks and solve quite complex problems by breaking them down into smaller, more manageable tasks.** Systematic production of related results leading to a correct algebraic generalisation for one situation. E.g. F/H $T_a = 4a + 4$	• **Candidates interpret, discuss and synthesise information presented in a variety of mathematical forms. Their writing explains and informs their use of diagrams.** Candidate links the methods of presentation (diagrams and tables) through using a commentary that tells the story of the work that has been done and unites the forms of presentation and recording.	• **Candidates are beginning to give a mathematical justification for their generalisations; they test them by checking particular cases.** Candidate tests the generalisation in R3 with new data. E.g. Predicts (using the generalisation) the number of tiles for any sized mirror, not used for the generalisation, and checks this by drawing the mirror and counting tiles.
5	• **Starting from problems or contexts that have been presented to them, candidates introduce questions of their own, which generate fuller solutions.** The candidate changes a variable and generates sufficient evidence so that a further generalisation may be made. E.g. Changes to a rectangular mirror. Changes the thickness of the border. Considers number of different coloured tiles such as in alternating patterns. Changes to a triangular mirror with triangular tiles. The candidate's intention must be clear.	• **Candidates examine critically and justify their choice of mathematical presentation, considering alternative approaches and explaining improvements they have made.** Shows C4 and then uses algebra to represent a generalisation, which must then show substitution E.g.; ➢ C4 and $T_a = 4a + 4$ and substitutes a = 13 to find T_a **OR** Decides to improve presentation in a way which is followed through to improve understanding E.g.; Deduces formula by plotting results on a graph **and** uses this to find gradient 4 and intercept 4; hence (t_a=) 4a + 4. NOT JUST A GRAPH FOR DECORATION.	• **Candidates justify their generalisations or solutions, showing some insight into the mathematical structure of the situation being investigated. They appreciate the difference between mathematical explanation and experimental evidence.** ***Clearly explains;*** (F/H) The number of tiles along any edge = length of edge (=a) and that there are 4 edges, hence 4a. Also that there are only four corners with one tile each. Hence, 4a+4. OR (H/F) The number of tiles in each "double row" on one edge = a, hence 2a. There are four edges, hence 8a and there are 4 corners, hence 8a + 4
6	• **Candidates develop and follow alternative approaches. They reflect on their own lines of enquiry when exploring mathematical tasks; in doing so they introduce and use a range of mathematical techniques.** Uses algebraic techniques (represents mirror length and thickness of border by variables and deduces the number of tiles for any border on mirror for their chosen development. **Demonstrates understanding of the methods used.** **GOES BEYOND COUNTING.** OR applies difference method to achieve a formula for the sum of the diagonals leading to a quadratic.	• **Candidates convey mathematical meaning through consistent use of symbols.** Candidate uses algebra with **two, clearly defined variables**, and manipulation of these, to find an answer. (Links to S6) E.g. Shows manipulation and simplification associated with the formulae for… Square mirrors with borders of any uniform thickness, OR With limited, tapering, thicknesses OR Rectangular mirrors with the uniform thicknesses	• **Candidates examine generalisations or solutions reached in an activity, commenting constructively on the reasoning and logic employed, and make further progress in the activity as a result.** Considers a related set of results and deduces (with reasoning) a general formula or predicts the algebraic coefficient of an overall formula. E.g. Considers rectangular mirrors with set widths (1 by …, 2 by …, 3 by ….) and deduces an overall formula by observing the change in coefficient. OR Considers formulae for square mirrors with borders of thickness1, 2, 3, 4, … and deduces an overall formula.

7	• **Candidates analyse alternative approaches to problems involving a number of features or variables. They give detailed reasons for following or rejecting particular lines of enquiry.** **Uses appropriate** algebraic methods to find a formula for **a three variable** situation. E.g; ➢ Rectangular mirrors (a by b) and triangular borders ➢ Cubes with borders of thickness t.	• **Candidates use mathematical language and symbols accurately in presenting a convincing reasoned argument.** Presents clear working, with annotation, to support their development that goes **beyond S5**.	• **Candidates' reports include mathematical justifications, explaining their solutions to problems involving a number of features or variables.** **Deduces correct result for S7, outlining their understanding of the problem**.
8	• **Candidates consider and evaluate a number of approaches to a substantial task. They explore extensively a context or area of mathematics with which they are unfamiliar. They apply independently a range of appropriate mathematical techniques.** **Uses appropriate** algebraic methods to find a formula for **a three variable** situation. E.g; ➢ Rectangular mirrors (a by b) and trapezoidal borders ➢ Cuboids (boxes) with pyramidal stacks on each face.	• **Candidates use mathematical language and symbols efficiently in presenting a concise reasoned argument.** Presents a clear, elegant construction of the formula, properly annotated, to **support the S8 development, or very good S7. Concise algebra, without significant error.**	• **Candidates provide a mathematically rigorous justification or proof of their solution to a complex problem, considering the conditions under which it remains valid.** **S7 or better achieved**. This draws upon the same evidence as S8 and C8. If C8 is awarded then this mark will probably be awarded as well. Look for understanding of proof offered within the work.

B266 – Part Two

SPECIFY and PLAN

Reaction Timer

Notes: 1. In these criteria there is an intended approximate link between 7 marks and grade A, 5 marks and grade C and 3 marks and grade F.
2. Candidates must provide evidence of their plan being implemented.
3. If secondary data is provided it must be of sufficient quantity to allow sampling to take place.

		Minimum requirements	Examples
1	Candidates choose a simple well-defined problem. Their aims have some clarity. The appropriate data to collect are reasonably obvious. An overall plan is discernible and some attention is given to whether the plan will meet the aims. The structure of the report as a whole is loosely related to the aims.	• The candidate shows they understand a simple problem. • There is an implicit plan	**Implicit** plan and some further work. E.g. ➢ May select some of the data and attempt to average. ➢ May add up some the data or rank it. ➢ May draw a frequency diagram for some of the data
2			As for S1 but gives some structure to the write up. May aim to compare two simple samples possibly by finding two averages or drawing bar charts.
3	Candidates choose a problem involving routine use of simple statistical techniques and set out reasonably clear aims. Consideration is given to the collection of data. Candidates describe an overall plan largely designed to meet the aims and structure the project report so that results relating to some of the aims are brought out. Where appropriate, they use a sample of adequate size.	• Candidates set out reasonably clear aims (or the purpose). • Their planning is largely designed to meet the aims/purpose. • They use data appropriate to the problem	Writes a very brief outline plan and may intend calculation of the average reactions for two (or more) different groups. (Male, female or age 12 and age 15). States one simple aim. E.g. ➢ Compare the average (or spread) of the reaction times, or ➢ Tally the data into groups and draw a frequency diagram so that the most common time may be seen.
4			S3 and a clear structure to meet the stated aim. Indicates how the aim may be met through the way techniques will be used.
5	Candidates consider a more complex problem. They choose appropriate data to collect and state their aims in statistical terms with the selection of an appropriate plan. Their plan is designed to meet the aims and is well described. Candidates consider the practical problems of carrying out the survey or experiment. Where appropriate, they give reasons for choosing a particular sampling method. The project report is well structured so that the project can be seen as a whole.	• Candidates consider a **substantial** problem stating their initial aims clearly at the beginning of the report. • Their plan is explicitly stated to meet those aims. • They choose an appropriate sample.	States a clear plan with one or more aims in general terms (may involve design of an experiment). ➢ Aims to compare two or more RELATED factors that may affect reaction times (age, hand, time, area…) ➢ Selects appropriate data to complete the task.
6			S5 and the plan is well structured, with some reasoning for the plan, and uses statistical terms to state each subtask's aims. ➢ E.g. Compare Medians and IQRs for different genders with a view to determining more than a simple average comparison. The data is chosen with some thought to the avoidance of bias.

7	Candidates work on a problem requiring creative thinking and careful specification. They state their aims clearly in statistical terms and select and develop an appropriate plan to meet these aims giving reasons for their choice. They foresee and plan for practical problems in carrying out the survey or experiment.	• Candidates work on a **demanding** problem. They state their aims clearly in statistical terms and give valid reasons for their choice of planning. • They explain and act upon limitations of their chosen sample, (e.g. bias), where appropriate	Chooses three or more RELATED subtasks that explore Reaction times. (May involve design of an experiment) ➢ Eg Gender, Age, Time of day (type of stimulus). The strategy is well planned and utilizes appropriate techniques and choice of data. Statistical terms are used to state each subtask's aims. Plans to draw the results together.
8	Where appropriate, they consider the nature and size of sample to be used and take steps to avoid bias. Where appropriate, they use techniques such as control groups, or pre-tests or questionnaires or data sheets, and refine these to enhance the project. The project report is well structured and the conclusions are related to the initial aims.		S7 and there is an efficient plan to achieve the aims in each subtask. These are all designed to explore one, overarching, hypothesis. Eg "People react differently to different stimuli", OR "People react differently at different times of day". Choices and plans are justified and statistical language is consistently and accurately used

COLLECT, PROCESS and REPRESENT

Notes: 1. In these criteria there is an intended approximate link between 7 marks and grade A, 5 marks and grade C and 3 marks and grade F.
2. The mark awarded to a particular technique should reflect the quality of use and understanding as well as its position within the Level Indicators.
3. The inclusion of statistical techniques outside the National Curriculum does not necessarily justify the award of higher marks.
4. 'Diagrams' include tables, charts and graphs. At 5-6 marks the diagrams used should be appropriate. At 7-8 marks the range of diagrams should be appropriate to the problem chosen and the statistical strategy chosen.
5. 'Redundancy" implies unnecessary and/or inappropriate diagrams or calculations. This includes techniques that are not used for any conclusion.

		Minimum requirements	Examples
1	Candidates collect data with limited relevance to the problem and plan. The data are collected or recorded with little thought given to processing. Candidates use calculations of the simplest kind. The results are frequently correct. Candidates present information and results in a clear	• Candidates collect or use data and record it.	Shows some working towards achieving a mean or mode or range from some the given data or some tally.
2	and organised way. The data presentation is sometimes related to their overall plan.		As C1 but with well organised working or drawing of a tally table for one subset of the data, with a "correct" result. May include one (or two) bar chart(s).
3	Candidates collect data with some relevance to the problem and plan. The data are collected or recorded with some consideration given to efficient processing. Candidates use straightforward and largely relevant calculations involving techniques meeting the level detailed in the handling data paragraph of the grade description for grade F. The results are generally correct. Candidates show understanding of situations by describing them using statistical concepts, words and diagrams. They synthesise information presented in a variety of forms. Their writing explains and informs their use of diagrams, which are usually related to their overall plan. They present their diagrams correctly, with suitable scales and titles	• Candidates collect or use data with some relevance to the problem. • They utilise statistical techniques/diagrams (see note 1 above) to process and represent the data. • Their results are generally correct.	Carries out their plan, showing table(s) and calculation(s), finding one (or more) of mean, mode or range for at least one subset of the data. May represent the subset of data in a frequency diagram, including some comment(s) to indicate what has been done.
4			C3 and there is a clear linking commentary that **synthesises** their results.
5	Candidates collect largely relevant and mainly reliable data. The data are collected in a form designed to ensure that they can be used. Candidates use a range of more demanding, largely relevant calculations that include techniques meeting the level detailed in the handling data paragraph of the grade description for grade C. The results are generally correct and no obviously relevant calculation is omitted. There is little redundancy in calculation or presentation. Candidates convey statistical meaning through precise and consistent	• Candidates collect/sample largely relevant data. • They utilise appropriate calculations/diagrams/ techniques (see note 1 above) within the problem. • Their results are generally correct.	Uses appropriate techniques linked to their S4 (at least) plan. These are likely to include mean and range for at least two subsets of data (given and collected). At least 30 reaction times considered. Data may be grouped, estimated mean may be calculated, comparative frequency diagrams or scatter charts may be used, spreadsheets may be used to perform calculations and generate appropriate graphs.
6	use of statistical concepts that is sustained throughout the work. They use appropriate diagrams for representing data and give a reason for their choice of presentation, explaining features they have selected.		As C5 but may include ogive, IQ range, box and whisker plots and these are used consistently and appropriately. Clear understanding is shown and there is some justification for the choice of diagrams and calculations.

7	Candidates collect reliable data relevant to the problem under consideration. They deal with practical problems such as non-response, missing data or ensuring secondary data are appropriate. Candidates use a range of relevant calculations that include techniques meeting the level detailed in the handling data paragraph of the grade description for grade A. These calculations are correct and no obviously relevant calculation is omitted. Numerical results are rounded appropriately. There is no redundancy in calculation or presentation. Candidates use language and statistical concepts effectively in presenting a convincing reasoned argument.	• Candidates collect/sample largely relevant data. • They utilise appropriate and necessary calculations/diagrams/ techniques (see note 1 above) consistently within the problem. • Their results are correct (***some minor errors may be condoned provided they do not detract from the quality of the argument***)	The candidate selects or gathers data that is reliable and relevant to the designated subtasks so that they may meet the aims of their S7 (or well structured S6) hypothesis. TWO or more grade B techniques have been appropriately applied and the outcomes of these correctly interpreted, in the light of the problem. Presentation justified.
8	They use an appropriate range of diagrams to summarise the data and show how variables are related.		As C7 but with **efficient** and also correct use a grade A technique and language to present an **argument**, in statistical terms, based upon the data analysis.

INTERPRET and DISCUSS

Notes:

1. **In these criteria there is an intended approximate link between 7 marks and grade A, 5 marks and grade C and 3 marks and grade F.**
2. **The number of marks awarded in this strand is unlikely to exceed the mark in strand 1 by more than 1 mark**

		Minimum requirements	Examples
1	Candidates comment on patterns in the data. They summarise the results they have obtained but make little attempt to relate the results to the initial problem.	• Candidates comment on their data.	Very limited comments such as "The slowest reaction time is….."
2			Makes a comment based upon their results "The ten year olds were slower than the fifteen year olds."
3	Candidates comment on patterns in the data and any exceptions. They summarise and give a reasonably correct interpretation of their graphs and calculations. They attempt to relate the summarised data to the	• Candidates summarise some of their data. • They make a statement based on their diagrams or calculations, which is relevant to the problem.	Most likely linked to S3. May produce a table showing all the averages for two groups and writes a general comment related to these. "My results show that the fifteen year olds have lower average reaction times than the ten year olds."
4	initial problem, though some conclusions may be incorrect or irrelevant. They make some attempt to evaluate their strategy.		I3 and more specific statements that relate directly to the aims. E.g. "The mean for the fifteen year olds was 0.1 seconds lower than the mean for the ten year olds. This shows that …."
5	Candidates comment on patterns in the data and suggest reasons for exceptions. They summarise and correctly interpret their graphs and calculations, relate the summarised data to the initial problem and draw appropriate inferences. Candidates use summary statistics to make relevant comparisons and show an	• Candidates summarise **and** correctly interpret their diagrams and calculations. • They relate these interpretations back to the original problem. • They evaluate their strategy	**Provides a clear interpretation for their calculations and diagrams**. **Makes simple evaluative statements** that recognise strengths or weaknesses in **their** strategy. May clearly compare different groups through their means and ranges. May comment about the shape of grouped frequency (comparative) diagrams and link these to the means calculated.
6	informal appreciation that results may not be statistically significant. Where relevant, they allow for the nature of the sampling method in making inferences about the population. They evaluate the effectiveness of the overall strategy and make a simple assessment of limitations.		I5 and makes statements that involve reference to measures calculated within the task that relate to their aims. Makes statements of evaluation and begins to give reasons for WHY these would improve their strategy and the outcomes of the work.
7	Candidates comment on patterns and give plausible reasons for exceptions. They correctly summarise and interpret graphs and calculations. They make correct and detailed inferences from the data concerning the original problem using the vocabulary of probability. Candidates appreciate the significance of results they obtain. Where relevant, they allow for the nature and size of the sample and any possible	• Candidates summarise and correctly interpret their results. • They show an appreciation of the significance of these results. • They recognise possible limitations in their strategy and suggest improvements.	**Most likely S7 but a good case of S6 may be considered**. Correct statements of interpretation of the findings from techniques applied to their subtasks. These subtasks are drawn together and are not a series of separate components. Some statements of evaluation, relating to improvements that could be made, are included and these are justified.
8	bias in making inferences about the population. They evaluate the effectiveness of the overall strategy and recognise limitations of the work done, making suggestions for improvement. They comment constructively on the practical consequences of the work.		**S7 is expected but you may award on a good S6.** I7 and further analysis of the strategy. Suggests realistic improvements to the work and justifies these. Accounts for any bias in sampling. Sophisticated statements of interpretation and evaluation are made. Statistical language is used concisely to convey meaning.

List of Abbreviations

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

- Where you see **cao** in the mark scheme it means **correct answer only**.
- Where you see **ft** in the mark scheme it means **follow through**.
- Where you see **oe** in the mark scheme it means **or equivalent**.
- Where you see **rot** in the mark scheme it means **rounded or truncated**.
- Where you see **seen** in the mark scheme it means that the mark is earned if that number or 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 **soi** in the mark scheme it means **seen or implied**.
- Where you see **www** in the mark scheme it means **without wrong working**.
- Where you see **dep** in the mark scheme it means **dependent on.**

Grade Thresholds

General Certificate of Secondary Education
Mathematics B (MEI) (Two Tier) (Specification Code J518)
June 2008 Examination Series

Unit Threshold Marks

Unit		Max Mark	a*	a	b	c	d	e	f	g
B261	Raw	72	N/A	N/A	N/A	58	49	40	31	22
	UMS	83	N/A	N/A	N/A	72	60	48	36	24
B262	Raw	100	N/A	N/A	N/A	68	57	46	36	26
	UMS	139	N/A	N/A	N/A	120	100	80	60	40
B263	Raw	72	68	56	44	33	21	15	N/A	N/A
	UMS	120	108	96	84	72	60	54	N/A	N/A
B264	Raw	100	81	65	49	34	21	14	N/A	N/A
	UMS	200	180	160	140	120	100	90	N/A	N/A
B265	Raw	48	43	37	31	26	22	18	14	10
	UMS	80	72	64	56	48	40	32	24	16
B266	Raw	48	43	37	31	26	22	18	14	10
	UMS	80	72	64	56	48	40	32	24	16

Specification Options

Foundation Tier

	Max Mark	A*	A	B	C	D	E	F	G
Overall Threshold Marks in UMS(i.e. after conversion of raw marks to uniform marks)	279	N/A	N/A	N/A	240	200	160	120	80
Percentage in Grade		N/A	N/A	N/A	28.39	26.51	19.42	11.90	9.29
Cumulative Percentage in Grade		N/A	N/A	N/A	28.39	54.91	74.32	86.22	95.51

The total entry for the examination was 1126

Higher Tier

	Max Mark	A*	A	B	C	D	E	F	G
Overall Threshold Marks	400	360	320	280	240	200	160	N/A	N/A
Percentage in Grade		16.29	22.08	27.76	23.90	6.65	2.04	N/A	N/A
Cumulative Percentage in Grade		16.29	38.37	66.13	90.03	96.68	98.71	N/A	N/A

The total entry for the examination was 1012

Overall

	A*	A	B	C	D	E	F	G
Percentage in Grade	8.04	10.89	13.70	26.18	16.71	10.84	6.03	4.71
Cumulative Percentage in Grade	8.04	18.93	32.63	58.80	75.52	86.36	92.38	97.09

The total entry for the examination was 2138

For a description of how UMS marks are calculated see;
http://www.ocr.org.uk/learners/ums_results.html

Statistics are correct at the time of publication.

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