

Mathematics B (MEI) (Two Tier)

General Certificate of Secondary Education **GCSE J519**

Mark Schemes for the Units

June 2009

J519/MS/R/09

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B291 (Foundation – Modular) Paper 1

Section A

1		kite	1	
		rectangle	1	
		trapezium	1	
		parallelogram	1	
		square	1	
2	(a)	455	1	
	(b)	544	1	
	(c)	3234	2	B1 for 2310 or 924 or 2800 or 420 seen M1 rep addition
3	(a)	0.03	1	
	(b)	0.09, 0.38, 0.6	1	
4	(a)	(i) acute	1	
		(ii) opposite (angle)	1	
	(b)	(i) 11.5 – 11.9 (cm)	1	
		(ii) 111 – 115	1	
5	(a)	2	1	
	(b)	10	1	
	(c)	No five on 1 st spinner	1	
	(d)	(1,6) (2,5) (3,4) (4,3)	1	

6	(a)	20	1	
	(b)	20	1	
	(c)	Returning home	1	
7	(a)	60 a factor of (goes into) 360 oe, 6° per student	1	
	(b)	3 correct sectors (+2°)	3	B2 for 2 correct sectors, B1 1 correct sector If no marks scored, SC1 for list of angles: 150, 30, 60, 120
		4 labels	1	Condone 1 error
8	(a)	(i) $8x$	1	
		(ii) $12y$	1	
	(b)	6	2	M1 for 5×4 or $7 \times (-2)$ soi by 20 or -14
	(c)	(i) $4x - 12 (= 14)$ $4x = 14 + 12$ $(x =) \frac{26}{4}$ oe	3	M1 Multiply out bracket (or $x - 3 = \frac{14}{4}$) M1 Correct step ($x = 3 + \frac{14}{4}$)
(ii) $\frac{x}{4} = 7 + 1$ $(x =) 32$		2	M1 Correct step (or $x - 4 = 28$) or SC1 ($x =$) 29 or 32 seen embedded	

Section B

9	(a)	15073	1	
	(b)	Three thousand two hundred and five	1	
	(c)	4000	1	
	(d)	(i) (£) 406 (ii) (£) 308	1 1	
10	(a)	(i) 33, 90 (ii) 14.10	1 2	M1 for 40×33 soi figs 132(0)
	(b)	1.44	2	M1 for £5 – <i>their</i> 4×89 or B1 for 356 or 3.56
11	(a)	Correct plot	1	
	(b)	Correct plot	1	
12	(a)	6 7 8 8 9 10 10 10 11	1	
		Mode 10	1	
		Median 9	1	
		Range 5	1	
	(b)	12 is bigger than any of the numbers oe	1	

13		Dimensions of a rectangle. P and A worked out Any correct rectangle Correct P and A	M1 A1 M1 A1	(includes squares) Correct example earns all marks
14	(a)	571.787 isw	1	
	(b)	13.96	1	
	(c)	450 (or 2950)	2	M1 for 0.06×2500 (oe) soi by 150 (or 2650)
15	(a)	6	3	M1 Division by 39 soi A1 Anything rounding to 5.2
	(b)	11.06 or 11.10	3	M1 Division by 190 soi A1 11.05...
16	(a)	3926.99(...) or 3927 or 3930	2	M1 $\frac{1}{2} \pi \times 50^2$ soi 3900 - 3950 SC1 anything rounding to 7850
	(b)	257.(...)	3	B2 for 157.(...) If B0, M1 for $\pi \times 50$ or $\pi \times 100$ soi

B292 (Foundation – Terminal) Paper 2

Section A

1		$\frac{1}{2}$ $\frac{1}{4}$ 0.25 0.1(0) 10%	1 1+1 1+1	oe oe
2	(a)	different width bars scale/graph starts at 23	1 1	or scale/graph does not start from zero
	(b)	Valid reason	1	eg " 28 banana and 49 other "
	(c)	suitable y scale and label	1	
		3 labelled equal-width bars correct heights	1 1	
3	(a)	(i) 210 mm	1	
		(ii) 3 mm	1	
	(b)	70	1	
4	(a)	line 9cm long (or other side) arc of 7cm centre A or arc of 6cm centre B other sides drawn	1 1 1	1mm acc 1 mm acc SC1 both arcs cross with 5mm acc both 1mm acc
	(b)	(i) correct circle (ii) correct shaded area	1 1	
5	(a)	14	1	
	(b)	34	1	
	(c)	$4 \times (5 - 3 \times 2) = -4$ $4 \times (5 - 3) \times 2 = 16$	3	1 ea for correct positions of brackets 1 for two correct calculations allow alternative $4 \times 5 - (3 \times 2) = -120$
6	(a)	$\frac{2}{7}$	2	M1 for $\frac{4 \times 1}{7 \times 2}$ soi
	(b)	$\frac{1}{14}$	2	M1 for $\frac{8}{14}$ or $\frac{7}{14}$ seen or for equivalent answer.

7	(a)	$\frac{200 \times 60}{50 - 20}$ 400	M1 A1	Condone 1 error or $52 - 19 = 33$ rounded to 30
	(b)	Karen 27 Jasmine 9	2	M1 for $36 \div 4$ soi by 9 or SC1 for reversed answers
8	(a)	$(5 - 2)180$ oe or $360/5$ their $540/5$ or $180 -$ their 72	1 1	
	(b)	(i) (0)90	1	
		(ii) (0)54	2	M1 for $(180 - 108) / 2$ or $108/2$
		(iii) 162	FT1	ft 108 + their 54. Must be less than 180
9	(a)	17 20	1 1	Allow ft for their $17 + 3$
	(b)	add 3	1	
	(c)	$3n + 2$	2	B1 for $3n$ seen
	(d)	Yes because eg 630 divides by 3	2	soi by 210 M1 for their $3n + 2 = 632$
10	(a)	0.17, 0.33, 0.31, 0.19 oe	2	Accept in working. Condone incorrect attempt to cancel or change to decimals Give B1 for 3 correct or denominator = their sum of frequencies.
	(b)	large number of selections	1	Accept because they made 200 selections
	(c)	1240	2	M1 for $4000 \times$ their 0.31 or $(4000/200) \times 62$ oe or SC1 for 124 or $\frac{1240}{4000}$

11	(a)	correct reflection	2	M1 for one correct line, or any reflection
	(b)	correct line	1	
	(c)	A and F	1	
12	(a)	arrow close to or on evens	1	accept impossible
	(b)	close to, but not on, certain	1	
	(c)	close to impossible	1	
13	(a)	2 group tickets: £40 soi 3 adults 4 children: £39.25 3 adults and 4 children is cheaper	1 1 1	Allow dep ft if both shown and 1 correct M1 for $20 + 6.75 + 2 \times (4 \text{ or } 4.75)$
	(b)	1 group, 1 adult and 2 (additional) children	2	
14	(a)	(1,-3) (-1,-1)	1 1	
	(b)	point marked at (-3,1)	1	
15	(a)	12/29	2	M1 for 29 seen or $12/x$ where $x > 17$
	(b)	13/31	1	
	(c)	eg all names in hat not look/ shaken up	1 1	
16	(a)	kite	1	
	(b)	diagonals cross at right angles	1	
	(c)	square	1	

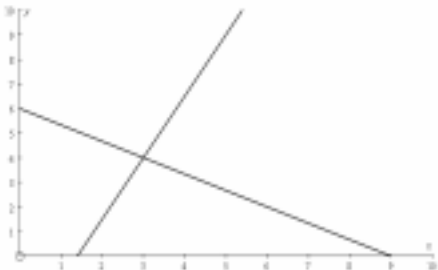
17	(a)	37	2	M1 for 74 or their 74 /2
	(b)	143	FT1	ft for 180 – ‘their 37’ but not 106 unless supported by workings
18	(a)	(i) odd (ii) negative	1 1	
	(b)	$3x + y$ oe	2	M1 for $3x$ oe or for $+ y$
19	(a)	two primes (under 20)	1 1	SC1 for 2 primes > 20
	(b)	two primes added	1	
	(c)	odd odd even even prime	2	B1 for row 2 or 3 correct. SC1 for all statements correct but not proof.
20	(a)	$a(a - 6)$	1	Allow $(a + 0)(a - 6)$
	(b)	$x = 4\frac{1}{2}$ or 4.5 or $9/2$	3	M1 $5x = 3x + 7 + 2$ oe M1 $5x - 3x =$ their $7 + 2$ Steps can be reversed or done in one
	(c)	p^8	1	

21	(a) (b) (c)	60p or £0.60 $y = 1.1x$ (i) straight line with positive gradient that would go through (0, 0) that would go through (1000, 1100) (ii) 380 to 420	1 1 1 1 2	Must have units, not £0.6 Or 4 correct points plotted For 2 it must cross the other line and be ruled dep on graphs intersecting in range. M1 for clear intention to read off x at intersection. SC1 for 400 calculated
22		Total Tiles by £0.88 (per m ²)	4	Condone £0.88p M2 24.35×1.175 oe Or M1 for 24.35×0.175 oe or 24.35×1.17 or 1.18 oe A1 for £28.61..... B1 FT decision <u>and</u> 'their 28.61' – 27.73 calculated

B293 (Higher – Modular) Paper 1

Section A

1	(a)	$8.2 \text{ cm} \pm 0.2 \text{ cm}$ $\Rightarrow (8.2 \pm 0.2) \times 500$ $= 4100 \pm 100 \text{ metres}$ or $4.1 \pm 0.1 \text{ km}$	3	B1 For measurement M1 For mult by 500 oe A1 Answer plus units
	(b)	$247^0 \pm 2^0$	1	Range 245 - 249
2	(a)	= 99	2	M1 for $n = 50 + (10 - 3)7$
	(b)	n will become negative (which is meaningless)	1	
3		$\frac{x}{4} = 7 + 1$ $(x =) 32$	2	M1 Correct step (or $x - 4 = 28$) or SC1 $x = 29$ or 32 seen embedded
4	(a)	(i) $11 + 5 + 2 = 18$ So probability = $\frac{11}{18}$	2	M1 sight of adding nos in ratio (in words or numbers) A1 taking cars for numerator
	(b)	(ii) It would be reasonable to assume that the mix of traffic on Friday was the same all the other days of the week, but it would not be reasonable to make the same assumption for Saturday.	1	
			1	
5	(a)	$60 = 2^2 \times 3 \times 5$ $72 = 2^3 \times 3^2$	4	B2 Correct, B1 at least 2 correct prime factors seen in correct product B2 correct, B1 at least 2 correct prime factors seen in correct product
	(b)	$2^3 \times 3^2 \times 5$	2	M1 presence of 2, 3 and 5 only and at least one power of 2 or 3 correct SC1 360 as final answer
	(c)	Using LCM: $\frac{21}{40} = \frac{189}{360}$, $\frac{29}{60} = \frac{174}{360}$, $\frac{35}{72} = \frac{175}{360}$ Also $\frac{1}{2} = \frac{180}{360}$ So $\frac{175}{360} = \frac{35}{72}$ is nearest	M1 A1 2	Attempt to compare all three using a common denominator (includes long division)

<p>6</p>	<p>(a)</p> <p>$\times 2: 2x + 3y = 18 \Rightarrow 4x + 6y = 36$ $\times 3: 5x - 2y = 7 \Rightarrow 15x - 6y = 21$ Add $\Rightarrow 19x = 57$ $\Rightarrow x = 3$ $\Rightarrow y = 4$</p> <p>(b)(i)</p>  <p>(ii)</p>	<p>The solution is the intersection of the lines.</p>	<p>M1 M1 A1 A1 4 2 1</p>	<p>Multiply both</p> <p>Add or subtract appropriately</p> <p>for x</p> <p>for y</p> <p>SC1 for correct answer without supporting algebra</p> <p>B2 for correct line B1 for wrong line with negative gradient</p>
<p>7</p>		<p>Surface area is an area 1st term has dimensions L², but 2nd term has dimensions L³</p>	<p>2</p>	<p>B2 for saying that 2nd term is a volume (or 3D) B1 for giving a correct alternative 2nd term without mentioning volume.</p>
<p>8</p>		<p>B A D C</p>	<p>3</p>	<p>B3 All 4 correct B2 2 correct B1 1 correct</p>
<p>9</p>		<p>Numbers in blocks = $2 \times 5 + 1 \times 20 + 1 \times 15 + 3 \times 2$ = 51</p>	<p>M1 A1 A1 3</p>	<p>Sight of ht \times width (seen in 1st or last blocks)</p> <p>SC2 for 510</p>

Section B

10	(a)	6	3	M1 division by 39 soi A1 Anything rounding to 5.2 A1 rounding correct answer to 6
	(b)	11.06 or 11.10 www	3	M1 division by 190 soi A1 11.05...
11	(a)	Take midpoints: 45, 55, etc $45 \times 102 + 55 \times 251 + \dots$ Divide by 450 $= 55.22\dots$	4	M1 for taking midpoints M1 for multiplying and adding M1 divide sum of products by 450 (dep on 2 nd M mark) A1
	(b)	Because we do not have individual speeds so have put them all at midpoint of group	1	Need ref to both pieces of information
	(c)	Less because the added speeds would all be less than 40.	2	B1 for less B1 for explanation
12	(a)(i)	$4(x - 3) = 14$ $\Rightarrow 4x - 12 = 14$ $\Rightarrow 4x = 26$ $\Rightarrow (x =) \frac{13}{2}$	3	M1 Expand or divide by 4 M1 Collect
	(ii)	$6x - 5 < 7$ $\Rightarrow 6x < 12$ $\Rightarrow x < 2$	2	M1 Collect A1 Answer
	(iii)	$x^2 + 6x - 7 = 0$ $\Rightarrow (x + 7)(x - 1) = 0$ $\Rightarrow x = 1$ and -7	3	M1 Factorise to give $(x \pm 7)(x \pm 1)$ A1 brackets soi A1 both answers
	(b)	$3x^2 - 9xy$ $= 3x(x - 3y)$	2	B1 $3x$ B1 $x - 3y$

13	<p>(a) $\pi r^2 = 70685.8\dots$</p> <p>(b) 70686×60 $= 4241150.0\dots \text{ cm}^3$ $= 4241 \text{ litres}$</p> <p>(c) Volume of box = 27000 cm^3 Total volume = 4268150 Height = $\frac{\text{Their volume}}{\text{Their (a)}} = 60.38\dots$ $\Rightarrow \text{Increase in ht} = 0.38\dots$</p>	<p>2</p> <p>3</p> <p>4</p>	<p>M1 Sub in correct formula A1 Accept anything that rounds to 70700</p> <p>M1 Multiply (a) by 60 A1 Answer in cm^3 soi A1</p> <p>B1 volume of box M1 adding volumes</p> <p>M1 division</p> <p>A1 final answer. A0 for 60.38</p>
14	<p>By similar triangles the height of top cone = 30 cm</p> <p>Vol of total cone = $\frac{1}{3}\pi \times 50^2 \times 50$ (= 130899)</p> <p>Vol of discarded cone = $\frac{1}{3}\pi \times 30^2 \times 30$ (= 28274)</p> <p>\Rightarrow Vol of frustum = 102625 cm^3</p>	<p>4</p>	<p>B1 for 30 soi</p> <p>M1 for either total cone or discarded cone Anything that rounds to 130900</p> <p>A1 for either cone Anything that rounds to 28270</p> <p>A1 final answer Anything in range 102 000 – 103 000</p>

B294 (Higher – Terminal) Paper 4

Section A

1	(a)	$\frac{200 \times 60}{50 - 20}$ 400	M1 A1	Condone 1 error and $52 - 19 = 33$ rounded to 30
	(b)	Karen 27 Jasmine 9	2	M1 for $36 \div 4$ soi by 9 or SC1 for reversed answers
2	(a)	$(5 - 2)180$ oe or $360/5$ their $540/5$ or $180 -$ their 72	1 1	
	(b)	(i) $(0)54$ (ii) 162	2 FT1	M1 for $(180 - 108) / 2$ or $108/2$ ft $108 +$ their 54. Must be less than 180
3	(a)	(i) 1, 3, 6, 10 (ii) Triangle (numbers)	2 1	B1 for any 2 in correct place or 0,1,3, 6 or 3, 6, 10, 15
	(b)	(i) $3n + 2$ final answer (ii) Yes because eg 630 divides by 3	2 2	B1 for $3n$ seen soi by 210 M1 for their $3n + 2 = 632$
4	(a)	0.17, 0.33, 0.31, 0.19 oe	2	Accept in working, condone incorrect attempt to cancel or change to decimals Give B1 for 3 correct or denominator = their sum of frequencies
	(b)	large number of selections	1	Accept because they made 200 selections
	(c)	1240	2	M1 for $4000 \times$ their 0.31 or $(4000/200) \times 62$ oe or SC1 for 124 or $\frac{1240}{4000}$
	(d)	0.52 oe	FT2	ft their $0.33 + 0.19$ (provided < 1) M1 for their $0.33 + 0.19$ or $(66 + 38)/200$

Section B

10	(a)	$a(a - 6)$	1	Allow $(a + 0)(a - 6)$
	(b)	$x = 4\frac{1}{2}$ or 4.5 or $\frac{9}{2}$		M1 $5x = 3x + 7 + 2$ oe M1 $5x - 3x = \text{their } 7 + 2$
	(c)	(i) p^8	1	3 Steps can be reversed or done in one
		(ii) $4x^2y^2$ or $(2xy)^2$	2	B1 for ax^2y^2 or $4x^2y^b$ or $4x^cy^2$
11	(a)	60p or £0.60	1	Must have units, not £0.6
	(b)	$y = 1.1x$	1	
	(c)	(i) straight line with positive gradient that would go through (0, 0) that would go through (1000, 1100)	1	Or 4 correct points plotted
		(ii) 380 to 420	1	For 2, Must cross the other line and be ruled
			2	dep on graphs intersecting in range M1 for clear intention to read off x at intersection SC1 for 400 calculated
12	(a)	Total Tiles by £0.88 (per m ²)	4	Condone £0.88p M2 24.35×1.175 oe Or M1 for 24.35×0.175 oe or 24.35×1.17 or 1.18 oe A1 for £28.61..... B1 FT decision <u>and</u> their $28.61 - 27.73$ calculated
	(b)	£23.60	3	M2 $27.73 \div 1.175$ give B1 for 117.5% soi by 1.175 Condone £23.60p but not £23.6

13	(a)	Reflection in $x = -1$	1 1	Reflect or Reflecting but not eg mirror, flip etc Give 0 for indication of second transformation
	(b)	Correct translation (4, 3), (6, 7), (4, 8)	2	Give B1 for x or y direction correct or translation $\begin{pmatrix} 3 \\ 4 \end{pmatrix}$
	(c)	(i) 63.4 (ii) $\sqrt{10^2 + 5^2}$ or $\sqrt{4^2 + 2^2}$ or $\sqrt{1^2 + 2^2}$ their $\sqrt{125/5}$ or $10 / \text{their } \sqrt{20}$ or $5/\text{their } \sqrt{5}$ answer $\sqrt{5}$	3 M1 M1 B1	M2 for $\tan^{-1}(\theta) = 4/2$ oe Or M1 for $\tan(\theta) = 4/2$ accept equiv sin and cos if hyp clearly calculated Look on diagram and in working for (i) Must not come from rounding eg 4.94
14	(a)	(190 + 328 + 365 + 330) ÷ 4 (= 303.25)	1	
	(b)	<u>Quarterly</u> valid comment eg higher Q1, lowest Q3 <u>Overall</u> valid comment eg steady rise	1 1	Must refer to quarters Must be about moving average graph SC1 for both correct answers reversed
	(c)	(i) line of best fit drawn answer read off line of best fit (ii) 4 x their (c)(i) – 1018	1 FT1 FT3	Can be scored for continuing from last 2 pts Must be at mid pt of Q3 and Q4 (2008) M1 for 4 x their (c)(i) M1 for – (338 + 270 + 410) If M0 give M1 for $(338 + 270 + 410 + x)/4 = \text{Their (ii)}$

15	(a)	$x^2 - 7x + 12$	2	B1 for $x^2 - 3x - 4x + 12$, allow 1 wrong term
	(b)	$y(3x - 1) = 5x + 2$ $3xy - 5x = 2 + y$ $x(3y - 5) = 2 + y$ $x = \frac{2+y}{3y-5}$ oe	1 M1 M1 1	attempt to multiply brackets and isolate x terms factorising their isolated x terms
16	(a)	stretch factor 2 from x axis	1	ignore outside range – 2 to 2
	(b)	translation left 2	1	ignore outside range – 4 to 0
17		$z = 2 - 3x$ or $\sqrt{y-1}$ $y = [\text{their}(2 - 3x)]^2 + 1$ or $3x$ $+\sqrt{y-1} = 2$ Correct squaring of their $(ax + b)$ $(y=) 9x^2 - 12x + 5$	1 1 1 1	

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) (J519)
 June 2009 Examination Series

Component Threshold Marks

Component	Max Mark	A*	A	B	C	D	E	F	G
B291	72	N/A	N/A	N/A	53	44	35	27	19
B292	100	N/A	N/A	N/A	65	54	43	33	23
B293	72	59	49	39	29	20	15	N/A	N/A
B294	100	74	60	46	33	23	18	N/A	N/A

Specification Options

Foundation Tier

	Max Mark	A*	A	B	C	D	E	F	G
Overall Threshold Marks	279	N/A	N/A	N/A	240	200	160	120	80
Percentage in Grade		N/A	N/A	N/A	33.9	22.0	15.9	11.3	10.0
Cumulative Percentage in Grade		N/A	N/A	N/A	33.9	55.9	71.8	83.1	93.1

The total entry for the examination was 978

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		25.0	21.6	25.3	21.2	4.9	0.8	N/A	N/A
Cumulative Percentage in Grade		25.0	46.5	71.8	93.0	97.9	98.7	N/A	N/A

The total entry for the examination was 936

Overall

	A*	A	B	C	D	E	F	G
Percentage in Grade	12.2	10.5	12.3	27.7	13.7	8.6	5.8	5.1
Cumulative Percentage in Grade	12.2	22.7	35.0	62.7	76.4	84.9	90.7	95.8

The total entry for the examination was 1914

Statistics are correct at the time of publication.

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