

Mathematics B (MEI) (Two Tier)

General Certificate of Secondary Education J518

Mark Schemes for the Units

January 2009

J518/MS/R/09J

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B261 (Foundation – Modular) Paper 1

Section A

1	(a) 50	1		5
	(b) Food	1		
	(c) 5.75	2ft	M1 <i>their</i> (£6.50 –75p) or $11.5 \times (a)$	
	(d) Symbol can't be divided up that accurately.	1		
2	(a) (i) 20 (ii) 13	1 1		5
	(b) 12-16	2	M1 for any evidence of correct method	
	(c) 10	1		
3	impossible	1		2
	likely	1		
4	(a) 900	1	100 seen oe	10
	(b) any multiple of 9	1	including 9	
	(c) 57 and 66	1		
	(d) 36	2	B1 for 4 or figs 36 or M1 complete method	
	(e) $\frac{3}{10}$	2	B1 for $\frac{9}{30}$ isw	
	(f) (i) square (ii) Square root	1 1		
	(g) $15 - (5 + 2) + 1$	1		

5	<p>(a) (4, 2)</p> <p>(b) Correct line</p>	1		2
6	18.2 - 19 m	B2	<p>B1 for 9.1 – 9.5 cm seen</p> <p>M1 for $\times 2$ (may be imp by 18)</p>	2
7	535	4	<p>M1 for $\frac{7}{12} \times 300$ or $\frac{9}{20} \times 800$</p> <p>or 25 and 40 seen</p> <p>A1 175</p> <p>A1 360</p>	4
8	<p>(a) $2x = 8 + 5$ (x =) 6.5 oe</p> <p>(b) $x^3 - 5x^2$ final answer</p> <p>(c) (i) a^7</p> <p>(ii) m^6</p>	<p>M1</p> <p>A1</p> <p>2</p> <p>B1</p> <p>B1</p>	<p>or $x - 2.5 = 4$ oe</p> <p>SC1 for $2 \times 6.5 - 5 = 8$ oe</p> <p>B1 $x^3 - 5x^2$ seen or final answer with one term correct</p>	6

Section B

9	<p>(a) 7.2 – 7.6</p> <p>(b) (i) Cuboid</p> <p>(ii) A correct vertex labelled X</p> <p>(iii) Correct arrow</p>	<p>B1</p> <p>B1</p> <p>B1</p> <p>B1</p>		4
10	<p>$\frac{43}{100}$</p> <p>0.25, 25%</p> <p>$\frac{3}{100}$, 3%</p>	<p>B1</p> <p>B1,1</p> <p>B1,1</p>		5
11	<p>(a) n has factor of 2 \Rightarrow 3n has factor of 2</p> <p>(b) 2n even \Rightarrow 2n + 1 is odd</p>	<p>1</p> <p>1</p> <p>1</p>		3
12	<p>Height of man est at 1.5 – 2.0 m</p> <p><i>Their</i> ht \times 8 soi</p> <p>10.5 – 16</p>	<p>B1</p> <p>M1</p> <p>A1</p>	<p>Condone \times7 or 7.5</p>	3
13	95	2	M1 for 5×3 or 8×10 soi by 15 or 80	2
14	<p>(a) 20</p> <p>(b) 1.2</p>	<p>B2</p> <p>2</p>	<p>B1 for 0.05(0) seen or 2 or 200</p> <p>B1 for 1.44</p>	4
15	<p>(a) 4</p> <p>(b) 3.2 WWW</p>	<p>B1</p> <p>3</p>	<p>M1 for $0 \times 2 + 1 \times 3 + 2 \times 2 + 3 \times 5 + 4 \times 8 + 5 \times 4 + 6 \times 1$ (at least 3 correctly shown, + implied)</p> <p>M1 for <i>their</i> $80 \div 25$</p>	4

16	<p>(a) 150×75 11250</p> <p>(b) Sub $r = 60$ into πr^2 11300 to 11315</p> <p>(c) 100×100 soi 25000</p>	<p>M1 A1</p> <p>M1 A1</p> <p>M1 A1</p>		6
17	<p>$2 \times 3 \times 5^2$ or $2 \times 3 \times 5 \times 5$ in any order.</p>	2	M1 one factor pair seen or 2,3,5,5	2
18	<p>(a) $(x =) 20$</p> <p>(b) subtract 8 or divide by 9 $t = \frac{s-8}{9}$</p>	<p>B1</p> <p>M1 A1</p>	Or for correct second step	3

B262 Foundation - Terminal

Section A

1	(a)	40	1		
	(b)	six sectors shaded.	1		
	(c)	120	2	M1 for 1% is 6 or (10%) is 60 seen	4
2	(a)	(i) correct point marked (ii) correct angle drawn (iii) their length	1 1 1	± 1 mm $\pm 2^\circ$ ± 1 mm	
	(b)	(i) 1200 (ii) 1.2	1 1		5
3	(a)	(i) bar 4 high (ii) 7	1 1		
	(b)	1/7	2 ft	Condone 3/21 ft for 3/(14 + their answer to aiii) M1 for unsimplified fraction < 1 with correct numerator or denominator	4
4	(a)	60	1		
	(b)	Isosceles	1		
	(c)	Angle ABD = 30° b = 120° 2 reasons from opposite	M1 A1 R1 R1	Condone 30 seen in workings. ABD is 30 because perpendicular is 90 Equal angles because isosceles Angles in triangle total 180.	6
5	(a)	correct diagram	1		
	(b)	18 22	1 1 ft	ft 4 more than first answer	
	(c)	goes up in 4's	1	oe	
	(d)	34	1		
	(e)	11	1		6
6	(a)	four correct points plotted	P1	Joined or not	
	(b)	one correct comparison	1		
	(c)	Feb	1	Condone $19 - 4 = 15$	3

7	(a) 2	1	M1 for $1 + 4^2 = 17$ soi or (their 17) x 3 SC1 for answer of 147	4
	(b) 8	1		
	(c) 51	2		
8	(a) 12/16	1	cao	3
	(b) 5/8, 11/16, $\frac{3}{4}$ 5/8 = 10/16 seen	B1 M1	or equivalent method	
9	(a) 45	1		3
	(b) 52	1		
	(c) 9	1		
10	(a) (i) $8 \leq \text{answer} < 8.5$ (ii) any two of the figures rounded to 1SF 32 or 40	1 M1 A1	Or for 3200 seen Or for 4000/100 seen	6
	(b) (i) 46.592	1		
	(ii) 465.92	1		
	(iii) 56	1		
11	(a) $7(2a - 1)$	1	B1 for either term correct in answer or both correct seen	4
	(b) $3p + 15$	1		
	(c) $2x^3 + 5x$	2		
12	Reflection $y = 3$	1 1	Accept reflect but not mirror, flip etc Indep SC1 for equiv combination of transformations	2

Section B

13	(a) 6	2	M1 for $247 \div 36$ soi by 6.8... or 7	7
	(b) 7	2	M1 for $160 \div 25$ soi by 6.4 or 6	
	(c) £ 29.45 or £29.46	3	M1 for 2095.83 or 20.9583 M1 for their $2095(\dots) + 850$	
14	(a) Rectangle Square	1 1	Ignore additional <u>correct</u> info.	4
	(b) all sides equal	1		
	(c) sketch of kite, isosceles trapezium or symmetric arrowhead	1		
15	(a) (i) D (ii) B (iii) A	1 1 1		4
	(b) Arrow drawn between D and E	1		
16	(a) 246.50	1		4
	(b) $(36 \times 2.49 =) 89.64$ $246.50 - (\text{their } 89.40 + 135)$ £21.86	M1 M1 A1		
17	(a) 56.7%	2	M1 for $17/30$ soi by figs 56...	4
	(b) £4.20	2	M1 for $17.5 \times 24/100$ oe seen SC1 for £4.2 or £4.08 or £28.2(0)	
18	(a) (i) 23 (ii) 26	1 1	e.g. Simone's site gets a wider spread of daily visits Simone's site gets fewer visits on average. e.g. small sample, visits may be same person.	5
	(b) valid comparison valid comparison	1 1		
	(c) valid reason	R1		
19	(a) 375 (g)	2	M1 for $150 \times 15/6$ oe	4
	(b) 10	2	M1 for $6 \times 125/75$ oe	

20	(a) £40	1		
	(b) £125	1		
	(c) straight line with positive gradient from (400, 35) to (1000, their 125)	1		
		1 ft	'their 125' or correct, SC1 for non ruled line through both	
	(d) 430 – 440	1	ft from their graph $\pm \frac{1}{2}$ small square (± 10)	
	1100	1	ft from their graph $\pm \frac{1}{2}$ small square (± 10)	
(e) Plan B cao	1	ft from their graph $\pm \frac{1}{2}$ small square ($\pm \text{£}1$)		
	£15	1 ft		8
21	$x = 36$	2	M1 $x/3 = 12$ or $x + 39 = 75$	2
22	(a) $(60 - 40) \div 2$	1	Accept argument starting with 10	
	(b) $\sqrt{(26^2 - 10^2)}$ (h =) 24	M2 A1	square root can be implied by later work M1 for $26^2 \pm 10^2$	
	(c) $A = \frac{1}{2}(60 + 40) \times \text{their } 24$ oe $\times 80$ 96 000 cm^3	M1 M1 A1 ft U1	If splitting up must be full method for A Indep, must have correct volume dimensions ft 4000 \times their (b) Indep ISW attempts to change units to eg m^3	8

B263 (Higher – Modular) Paper 1

Section A

1	$\frac{19}{30}, \frac{2}{3}, \frac{7}{10}, \frac{11}{15}$	M1 A1	for sight of LCM all correct	2
2	(a) $x = 80$ (b) $x^3 - 5x^2$ final answer	1 2	 B1 $x^3 - 5x^2$ seen or final answer with one term correct	3
3	(a) 1, 4 2, 4 3, 4 1, 5 2, 5 3, 5 1, 6 2, 6 3, 6 (b) (i) Sums: 5 6 7 6 7 8 7 8 9 $P(6) = \frac{2}{9}$ (ii) $\frac{6}{9} \left(= \frac{2}{3} \right)$ i.s.w	2 1ft 1ft	B1 one error or omission	4
4	$\frac{7}{12} \times 300 + \frac{9}{20} \times 800$ $= 175 + 360$ $= 535$	4	M1 for $\frac{7}{12} \times 300$ or $\frac{9}{20} \times 800$ Or 25 and 40 seen A1, A1 A1	4
5	(a) Sum is greater than 1 (b) Because the outcomes are not mutually exclusive	1 1		2
6	(a) (7, 6) (b) $\frac{11-1}{17--3} = \frac{1}{2}$	2 M1 A1	B1+B1 Correct y step / correct x step	4
7	(a) $\frac{18}{12} \times 10$ $= 15$ (b) $AC = \frac{12}{18} \times 24$ $= 16$ $\Rightarrow CE = 24 - 16 = 8$	M1 A1 M1 M1 A1	for ratio correct M1 Ratio to find AC subtracts	5

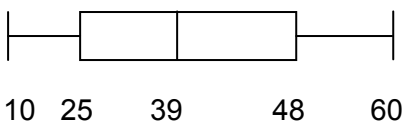
8	<p>(a) E.g. $4x + 3y = 9 \Rightarrow 8x + 6y = 18$ $3x - 2y = 28 \Rightarrow 9x - 6y = 84$ Add: $17x = 102$ $\Rightarrow x = 6, y = -5$</p> <p>(b) (i) a^7 (ii) m^6 (iii) $64x^3y^6$</p>	<p>4 1 1 2</p>	<p>M1 equates one of the coefficients M1 Adds to get one variable A1 + A1 B1 for 2 out of 64 or 3 or 6</p>	<p>8</p>
9	<p>$X^2 = 48$ $Y^2 = 50$ $\Rightarrow A^2 = 98$ $\Rightarrow A = 7\sqrt{2}$</p>	<p>4</p>	<p>B1 or $16\sqrt{9}$ B1 or $25\sqrt{4}$ B1 B1</p>	<p>4</p>

Section B

10	<p>(a) Sub 60 into πr^2 = 11300 to 11315</p> <p>(b) $\times 3.7 = 41850$ or 41810</p> <p>(c) $\times 0.54 = 22597$</p>	<p>M1 A1 1 M1 A1</p>	<p>for sub correct</p> <p>Anything in range 41810 - 41850 multiply their (b) by 0.54 anything in range 22577 - 22600</p>	5
11	<p>(a) (11.5, 7) ringed</p> <p>(b) Both points correct</p> <p>(c) (i) Line within range (ii) Their value from their line (iii) Extrapolation not wise</p>	<p>1 1 1 1 1</p>	<p>ft $\pm \frac{1}{2}$ square</p>	5
12	<p>(a) $8x + 7 = 3x + 22$ $\Rightarrow 5x = 15$ $\Rightarrow x = 3$</p> <p>(b) $3y + 7 \leq 25$ $\Rightarrow 3y \leq 18$ $\Rightarrow y \leq 6$</p>	<p>M1 A1 A1 M1 A1</p>	<p>Reduction to $ax = b$</p> <p>Reduction to $ay \leq b$</p>	5
13	<p>(a) 12360×1.025 = 12669</p> <p>(b) $26450 \times 0.98 \times 1.014$ = 26280 to 26300</p>	<p>M2 A1 M1 M1 M1</p>	<p>Accept 12670 or 12700 $\times 0.98$ $\times 1.014$</p>	6
14	<p>(a) 5 and 17</p> <p>(b) Points plotted correctly Cubic curve through points.</p> <p>(c) Roots from their graph (-2.2, 0.5, 1.7)</p>	<p>2 2 2</p>	<p>B1 + B1 B1 ft B1 ft B1 for one correct value or 2 right and one wrong (or missing)</p>	4
15	<p>$= \frac{-7 \pm \sqrt{49 - 20}}{2}$</p> <p>= -0.81 and -6.19</p>	<p>3</p>	<p>M1 attempt to sub into correct formula A1 soi A1 Must be 2 d.p.</p>	3
16	<p>Circumference of base = $2\pi \times 10 \times \frac{288}{360}$ (= 5.027)</p> <p>$\Rightarrow 2\pi r = 2\pi \times 10 \times \frac{288}{360}$</p> <p>$\Rightarrow r = 8$</p> <p>Use pythagoras</p> <p>$\Rightarrow h = \sqrt{100 - 64} = 6$</p> <p>$\Rightarrow \text{Vol} = \frac{1}{3} \pi r^2 h = 402.1\dots$</p>	<p>6</p>	<p>M1 to get circum (soi)</p> <p>M1 to get r</p> <p>M1 A1 DM1 A1</p>	6

B264 Higher -Terminal

Section A

1	(a) 46.592 (b) 465.92 (c) 56	1 1 1		3
2	$x + 5 + x + 30 + x + x - 25 = 360$ oe Collecting terms $(5x + 10)$ soi Isolating x and numbers $(5x = 360 - 10)$ $x = 70$ WWW	M1 M1ft M1ft B1	Condone 1 slip ft provided at least 3 angles these steps can be reversed	4
3	(a) $168 = 2 \times 2 \times 2 \times 3 \times 7$ (b) 4200 (c) 45	2 2 2	B1 for correct start to factor tree or factor ladder or a pair of factors eg 2×84 M1 for 600×7 or $168 \times 5 \times 5$ oe SC1 for any common multiple M1 for $3 \times 3 \times 5$	6
4	(a) $7(2a - 1)$ (b) $2x^3 + 5x$ final answer	1 2	B1 for either term correct in answer or both correct seen	3
5	(a) Reflection $y = 3$ (b) Correct enlargement (6, 4), (9, 4), (6, 10)	1 1 3	Accept reflect but not mirror, flip etc Indep SC1 for equiv combination of transformations B1 for each correct vertex, ± 1 mm SC2 for enlargement centre (0, 4) with a wrong s.f., or enlargement s.f. 3 with wrong centre	5
6	(a)  10 25 39 48 60 (b) (i) A more consistent, reliable etc (ii) B higher on average, median greater etc	3 1 1	B2 for one error, B1 for two errors Or SC1 for $UQ = 48$ soi or 10, 23, 25, 39, 60 Accept comparison of range, iqr, box width, min. Accept alternative answers if fully justified Accept comparison of max	5

7	<p>(a) (i) R R - -</p> <p>(ii) 16 and 20 have prime factors 2 and 5 others have factors 3 and/or 7</p> <p>(b) 52/99</p> <p>(c) $5\sqrt{2}$</p>	<p>2</p> <p>2</p> <p>2</p> <p>2</p>	<p>Give B1 for 3 correct</p> <p>Give B1 for any mention of prime factors or 2 and 5 Or B2 for full decimal conversion of all 4 Or B1 for full decimal conversion of 3</p> <p>M1 for $100r = 52.5252\dots$</p> <p>M1 for $\times \sqrt{2}/\sqrt{2}$ soi by $10\sqrt{2}/2$ or $(5 \times 2) / \sqrt{2}$</p>	8
8	<p>(a) 1st bar width 5 – 10, height 13</p> <p>2nd and 3rd bars widths 10-20,20-30 heights 3.3 and 2 respectively</p> <p>(b) Reject Mode, It's lowest at 0 oe</p> <p>Reject Mean, too affected by 'giant' oe</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>13 should be on line</p> <p>$3.3 \pm \frac{1}{2}$ sm sq , 2 should be on line</p> <p>Ignore 'choose line', Accept good equivalents</p>	4
9	<p>(a) RC = BQ, CQ = BP Given, sides of a square (with equal amounts subtracted) SAS</p> <p>(b) All 4 Δs congruent so sides equal e.g. angle CQR + BQP = 90 \Rightarrow angle PQR = 90</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>B1 for 2 reasons</p> <p>dep on 1st mark or B1 for one pair of sides with reason</p>	5
10	<p>$x^2 + (3x - 2)^2 = 20$ $9x^2 - 12x + 4$ $10x^2 - 12x - 16 = 0$ $(5x + 4)(x - 2)$ oe</p> <p>$x = -4/5$ or 2</p> <p>$y = -22/5$, or 4</p>	<p>M1</p> <p>A1</p> <p>A1</p> <p>M2</p> <p>A1ft</p> <p>A1</p>	<p>M1ft for a pair of brackets giving 2 terms correct ft their brackets Or M2ft for complete substitution in quadratic formula, Or M1ft for substitution with 1 error</p>	7

Section B

11	(a) 375 (g)	2	M1 for $150 \times 15/6$ oe	4
	(b) 10	2	M1 for $6 \times 125/75$ oe	
12	(a) £40	1	‘their 125’ or correct, SC1 for non ruled line through both ft from their graph $\pm \frac{1}{2}$ small square (± 10) ft from their graph $\pm \frac{1}{2}$ small square (± 10) ft from their graph $\pm \frac{1}{2}$ small square (± 10) ft from their graph $\pm \frac{1}{2}$ small square (± 10) ft from their graph $\pm \frac{1}{2}$ small square (± 10) ft from their graph $\pm \frac{1}{2}$ small square (± 10)	8
	(b) £125	1		
	(c) straight line with positive gradient from (400, 35) to (1000, their 125)	1 1ft		
	(d) 430 – 440	1		
	1100	1		
	(e) Plan B cao £15	1 1ft		
13	(a) $1 \times 6 + 2 \times 4 + 3 \times 6 + 4 \times 7 + 5 \times 8 + 6 \times 9 \div 40$ or their $(6 + 4 + 6 + 7 + 8 + 9) \div 40$ 3.85	M1 M1 A1	condone 1 error dep Ans 3.85 WWW scores B3	4
	(b) Not enough throws or frequencies not very different	1		
14	(a) $(60 - 40) \div 2$	1	Accept argument starting with 10	8
	(b) $\sqrt{(26^2 - 10^2)}$ (h =) 24	M2 A1	square root can be implied by later work M1 for $26^2 \pm 10^2$	
	(c) $A = \frac{1}{2}(60 + 40) \times$ their 24 oe $\times 80$ 96 000 cm^3	M1 M1 A1ft U1	If splitting up must be full method for A Indep, must have correct volume dimensions ft 4000 \times their (b) Indep ISW attempts to change units to eg m^3	
15	$x \geq 2$	1	Condone strict inequalities. SC1 for $x + y = , > , \geq 6$	4
	$x + y \leq 6$	2		
	$y \geq \frac{1}{2}x$	1		
16	Line parallel to road Circle centre tree lines parallel to house Arc at corner of house compass drawn arc(s) and radii (2cm), 3 cm, Distances 1.5 cm, 2 cm shading	M1 M1 M1 B1 A1 1ft	ft, dep on 3 M1s	6

17	<p>(a) $R = k/d^2$ substituting 0.25 and 8 $R = 0.5/d^2$ oe</p> <p>(b) 0.35 or 0.354</p>	<p>M1 M1ft A1</p> <p>3</p>	<p>ft from $R = kd^2$ or $R = k/d$ or $R = k/\sqrt{d}$</p> <p>M1ft for substituting $R = 4$ and 1 correct step in transposing their formula eg $4d^2 = \text{their } k$. dep on one of forms in (a) B1 for rounding their answer to 2 or 3 sf seen</p>	6
18	<p>(a) 17.4 to 17.5</p> <p>(b) (i) 162.5 to 162.6</p> <p>(ii) 197.4 to 197.5 342.5 to 342.6</p>	<p>1</p> <p>1ft</p> <p>1ft</p> <p>1ft</p>	<p>ft 180 – their (a), – 1 for extra solutions</p> <p>ft 180 + their (a)</p> <p>ft 360 – their (a) – 1 for extra solutions</p>	4
19	<p>(a) $(x - 3y)(x + 2)$</p> <p>(b) $\frac{x(3x + 4)}{(x + 1)(3x + 4)} - \frac{3x(x + 1)}{(x + 1)(3x + 4)}$ or better $3x^2 + 4x - 3x^2 - 3x$ seen</p>	<p>2</p> <p>2</p> <p>2</p>	<p>B1 for $2(x - 3y)$ or $x(x + 2) - 3y(x + 2)$</p> <p>B1 for common denominator and one numerator correct</p> <p>indep B1 for 1 error</p>	6

Grade Thresholds

General Certificate of Secondary Education
 Maths B (MEI) (Specification Code J518)
 January 2009 Examination Series

Component Threshold Marks

Component		Max Mark	A*	A	B	C	D	E	F	G
B261	Raw	72	N/A	N/A	N/A	50	42	35	28	21
	UMS	83	N/A	N/A	N/A	72	60	48	36	24
B262	Raw	100	N/A	N/A	N/A	67	56	45	35	25
	UMS	139	N/A	N/A	N/A	120	100	80	60	40
B263	Raw	72	64	53	42	31	19	14	N/A	N/A
	UMS	120	108	96	84	72	60	54	N/A	N/A
B264	Raw	100	77	62	47	32	20	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

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	36.4	45.1	15.9	1.3	1.3
Cumulative Percentage in Grade		N/A	N/A	N/A	36.4	81.5	97.4	98.7	100

The total entry for the examination was 266

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		2.5	25.0	45.0	15.0	10.0	0	N/A	N/A
Cumulative Percentage in Grade		2.5	27.5	72.5	87.5	97.5	97.5	N/A	N/A

The total entry for the examination was 43

Overall

	A*	A	B	C	D	E	F	G
Percentage in Grade	0.5	5.3	9.4	31.9	37.7	12.6	1.1	1.1
Cumulative Percentage in Grade	0.5	5.8	15.2	47.1	84.8	97.4	98.4	99.5

The total entry for the examination was 309

Statistics are correct at the time of publication.

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