

Mathematics B (MEI)

General Certificate of Secondary Education

Unit **B294**: Paper 4 (Higher – Terminal)

Mark Scheme for January 2011

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If answers clearly come from totally incorrect working, do not award the marks.

Section A

1	(a)	two of 0.4 or 0.5, 690 or 700, and 30 or 28 seen 280 or 350 or 345 or 276 or 23 Conclusion e.g about 10 so 10.49...	M1 A1 A1	accept 350	
	(b)	10.5	1ft	ft figs 105 with appropriate dp for their (a)	
2	(a)	Correct diagram with compass arcs at B	3	B2 for correct, but no compass arcs B1 for AD and DC correct	
	(b)	Perpendicular bisector of BD with arcs Circle centre A radius 6.5 cm Correct line segment	2 1 1ft	± 2 mm, $\pm 1^\circ$ B1 without arcs ± 2 mm compass drawn ft from reasonable attempts at correct loci	
3	(a)	Rectangle (1, 2), (3, 2), (3, 3), (1, 3)	2	SC1 enlargement sf 2 centre (0,0) SC1 sf $\frac{1}{2}$ with wrong centre.	
	(b)	Rectangle (4, - 3), (8, -3), (8, -1), (4, -1)	2	SC1 for x-movement or y-movement correct	
4	(a)	5^8	2	B1 for 5^{11} or $5^1 \times 5^7$ or $5^4 \times 5^4$ seen	
	(b)	5^{-1}	1		
	(c)	$5^{\frac{3}{2}}$	1	Accept $5^{1\frac{1}{2}}$ or $5^{1.5}$	

5	$3x + 5(x + 2) = 126$ or better $x = 14.50$	2	M1 for $5(x + 2)$ B3 M1ft for $3x + 5x + 10 (= 126)$ or $126 - 10$ seen ft their $ax + b(x + 2)$ + M1ft for $8x = 126 - 10$ or <i>their</i> $116/8$	
6	(a) $\frac{6}{9}$ and 2nd card probabilities $\frac{x}{8}$ $\frac{2}{8}, \frac{6}{8}, \frac{3}{8}, \frac{5}{8}$	1 1		
	(b) $\frac{66}{72}$ oe cao	3	M2 ft for $1 - \frac{3}{9} \times$ their $\frac{2}{8}$ oe M1 ft $\frac{3}{9} \times$ their $\frac{2}{8}$	Their $\frac{3}{9} \times \frac{6}{8} + \frac{6}{9} \times \frac{3}{8} + \frac{6}{9} \times \frac{5}{8}$ Or two of their $\frac{3}{9} \times \frac{6}{8}, \frac{6}{9} \times \frac{3}{8}, \frac{6}{9} \times \frac{5}{8}$
7	(a) (8), 23, 43, 60, 74, (80)	1		
	(b) Plotting 5 or 6 pts at 3, 3.25, 3.5 etc joined by st lines or curve	1 1 ft	$\pm \frac{1}{2}$ small square ft dep on cumulative graph (ignore to left of $t = 3$)	$\frac{1}{2}$ small square of pts
	(c) (i) graph read off at cf = 40 (ii) their 3.75 – their graph read off at cf = 20	1 ft 2 ft	strict ft from their cumulative graph strict ft from their cumulative graph M1 for clear read offs at 20 and 60	In (c) if no joins only eligible for M1
	(d) On average train slower oe Train more consistent oe	1 ft 1 ft	SC1 ft for train greater median oe and road greater iqr oe with no interpretation	BOD for eg wider range more constant, smaller distribution

8	(a)	AO = BO and CO = DO $\angle AOC = \angle BOD$ (Vert) Opposite angles + conclusion + SAS	1 1 1	Condone angles at O equal	
	(b)	$\angle ACO = \angle BDO$ or $\angle CAO = \angle DBO$ Alternate angles + conclusion	1 1	Accept single letter angles Accept Z angles	
9	(a)	graph through $(-2, 0)$, $(0, 8)$ and $(2, 0)$	1	ignore outside $-2 \leq x \leq 2$	
	(b)	graph through $(-1, 0)$, $(0, 4)$ and $(1, 0)$	1	ignore outside $-1 \leq x \leq 1$	
	(c)	graph through $(0, 0)$, $(2, 4)$ and $(4, 0)$	1	ignore outside $0 \leq x \leq 4$	
10	(a)	23	2	M1 for $5^2 - (\sqrt{2})^2$ or $5^2 - 5\sqrt{2} + 5\sqrt{2} - \sqrt{2}\sqrt{2}$	allow 1 error
	(b)	$18 + 11\sqrt{3}$	3	B2 for $18 + k\sqrt{3}$ or $k + 11\sqrt{3}$ or M1 for $6 + 3\sqrt{3} + 8\sqrt{3} + 4\sqrt{3}\sqrt{3}$	allow 1 error

Section B

11	(a)	Plotting 6 points	2	$\pm \frac{1}{2}$ small square B1 for at least 3 correct	
	(b)	line drawn	1	between 0.6 and 1.4, H = 80 and 145 and 155 at A = 11 and some points on either side	
	(c)	H value read off at age 7	1ft	strict ft $\pm \frac{1}{2}$ small square, dep on ruled straight line with positive gradient	
	(d)	No, too far out of range of data oe	1	Accept 'graph/points/table/data doesn't go that far Or 'change of rate of growth'	Not 'line'
12	(a)	- 40	1		
	(b)	(i) -4, 32, (68), 104 (ii) Correct ruled line	1 2	B1ft for 3 of their points plotted	
	(c)	10 ± 2	1		
13	(a)	$x = 1.8$ oe	2	M1 for $7x - 2x = 9$	
	(b)	$3x^3 - 15x$	2	B1 for $3x^3 - kx$ or $kx^3 - 15x$, $k \neq 0$	

14	(a)	£8	3	M2 for $320 \times .025$ oe or M1 for 320×0.175 oe or 320×0.15 oe	Soi by 56 or 48
	(b)	£646.25	5	M2 for $632.5 \div 1.15$ oe or M1 for $115\% = 632.50$ M2 for their 550×1.175 oe Or M1 for their 550×0.175 oe	
15	(a)	$2n + 1$	2	B1 for $2n$ seen	
	(b)	(i) $\frac{1}{2n+1}$ (ii) $\frac{1}{2(n+1)+1}$ (iii) $\frac{2}{(2n+1)(2n+3)}$ (iv) $\frac{2}{2703}$ oe	1 ft 1 3 1	ft 1/ their (a), but must be $f(n)$ Accept just looking at denominator M1 for common denominator $(2n+1)(2n+3)$ A1 for $2n+3 - (2n+1)$	Accept $4n^2 + 8n + 3$ Accept separate fractions Condone omission of brackets for A1

16	(a)	$13^2 + 11^2 \pm 2 \times 13 \times 11 \cos 63$ completion to 12.66 with no errors	M1 A1		
	(b)	BOC = 126 and Angle at centre = 2 × angle at circumf. ON bisects ∠BOC oe	1 1	Accept $126 \div 2 = 63$	
	(c)	7.10 (cm)	4	B1 for BN = 6.33 + M2 for $6.33 / \sin 63$ or M1 for $\sin 63 = r / 6.33$	B1 for 27° (if going on to use Sine Rule) M2 for $12.66 \sin 27 / \sin 126$ Or M1 for $12.66 / \sin 126 = r / \sin 27$ oe
	(d)	55.4 – 55.5(cm ²)	3 ft	ft $126/360 \times \pi \times \text{their } 7.10^2$ M2 for $126/360 \times \pi \times \text{their } 7.10^2$ M1 for 126/360 seen Or SC1 for 27.7 (cm ²)	
17	(a)	$2\pi x + 2y = 34$ $6x + 2y = 34$ and conclusion	1 1		Must be clear 3 has come from π
	(b)	$y = 17 - 3x$ $3x^2 + 2x(17 - 3x) = 75$ $3x^2 - 34x + 75$ $(3x - 25)(x - 3)$ $x = 3$ rejection of 25/3 because y is -ve $y = 8$	1 ft 1 ft A1 M1 ft A1 A1 A1 ft	making x (or y) the subject of (b) subst in (a) attempt to factorise their 3 term quadratic (2 terms correct) or substitute in formula (only sign errors) ft substituting their x into their (b)	Accept y becoming -ve without comment

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