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Mark Scheme (Results)

January 2013

International GCSE Mathematics A (4MA0) Paper 3H

Level 1 / Level 2 Certificate in Mathematics (KMA0) Paper 3H

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme.

  Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.
- **Types of mark**
  - M marks: method marks
  - A marks: accuracy marks
  - B marks: unconditional accuracy marks (independent of M marks)
- **Abbreviations**
  - cao – correct answer only
  - ft – follow through
  - isw – ignore subsequent working
  - SC - special case
  - oe – or equivalent (and appropriate)
  - dep – dependent
  - indep – independent
  - eeoo – each error or omission
- **No working**

  If no working is shown then correct answers normally score full marks

  If no working is shown then incorrect (even though nearly correct)

  answers score no marks.

- **With working**

  If there is a wrong answer indicated on the answer line always check the working in the body of the script (and on any diagrams), and award any marks appropriate from the mark scheme.

  If it is clear from the working that the "correct" answer has been obtained from incorrect working, award 0 marks.

  Any case of suspected misread loses A (and B) marks on that part, but can gain the M marks.

  If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.

  If there is a choice of methods shown, then no marks should be awarded, unless the answer on the answer line makes clear the method that has been used.

  If there is no answer on the answer line then check the working for an obvious answer.

- **Follow through marks**

  Follow through marks which involve a single stage calculation can be awarded without working since you can check the answer yourself, but if ambiguous do not award.

  Follow through marks which involve more than one stage of calculation can only be awarded on sight of the relevant working, even if it appears obvious that there is only one way you could get the answer given.

- **Ignoring subsequent work**

  It is appropriate to ignore subsequent work when the additional work does not change the answer in a way that is inappropriate for the question: eg. Incorrect cancelling of a fraction that would otherwise be correct.

  It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect eg algebra.

  Transcription errors occur when candidates present a correct answer in working, and write it incorrectly on the answer line; mark the correct answer.

- **Parts of questions**

  Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded in another.

Q	Working	Answer	Mark	Notes
1. (a)	1 – (0.18 + 0.2 + 0.23 + 0.22)	0.17	2	M1 1 – 0.83 A1
1. (b)	40 x 0.2	8	2	M1 A1 8 out of 40 = M1A1 8/40 = M1A0
				Total 4 marks

2. (i)		$2x + 2(x+2) = 2 \times 2x + 2 \times 4x$ or $4x + 4 = 12x$ or $x + (x+2) = 2x + 4x$ or $2x + 2 = 6x$	2	B2 Must be an equation based on perimeter or semi-perimeter with x's on both sides of equation If not B2 then B1 for $\{2x + 2(x+2)\}$ or $\{2 \times 2x + 2 \times 4x\}$ or $\{4x + 4\}$ or $12x$ i.e correct perimeter of A or B or $\{x + (x+2)\}$ or $\{2x + 4x\}$ or $\{2x + 2\}$ or $6x$ i.e correct semi-perimeter of A or B
2. (ii)	$4x + 4 = 12x$ or $2x + 2 = 6x$ $4 = 8x$ or $2 = 4x$	0.5	2	M1 One step from co A1 Allow numerical methods. Correct answer only = M1A1
				Total 4 marks

3. (a)	45/625 x 100	7.2	2	M1 A1
3. (b)	8/100 x 45 (= 3.6) 45 + "3.6"	48.6(0)	3	M1 or M2 for 45 x 1.08 M1 dep A1
3. (c)	640 – 625 (= 15) "15" / 625 or "15" / 640	2.4	3	M1 640/625 (= 1.024) 625/640 (= 0.976.. or 0.977) M1 dep "1.024" – 1 (= 0.024) 1 – "0.976" (= 0.0234) A1
3. (d)	18 ÷ 1 1/3 or 18 ÷ 1.33 (2dp or better) or 18 ÷ 80 x 60	13.5	3	M2 M1 for 1 1/3 or 18 ÷1.2 (=15) or 18 ÷ 1.3 (13.8..) or 18 ÷ 80 (=0.225) A1 cao
				Total 11 marks

4. (a)		**Q** correct	3	B3 Bottom LH corner goes to (4, –2) If not B3 then B2 for correct size T shape in wrong position but with correct orientation If not B2 then B1 for T shape with 2 or more sides of correct length and correct orientation
4. (b)		**R** correct	2	B2 Bottom LH corner goes to (–11,3) If not B2 then B1 for rotation of ± 90° (wrong position)
				Total 5 marks

5.	$2y = 6$ or $4x = -6$	$x = -1.5$ $y = 3$	3	M1 Adding or subtracting correctly or correct substitution leading to one correct equation and one unknown. A1 A1 dep on M1 awarded otherwise M0A0
				Total 3 marks

6. (a)		$25 < d \leq 30$	1	B1 identifies 25 → 30 class
6. (b)	(12 x 2.5) + (6 x 7.5) + (4 x 12.5) + (6 x 17.5) + (14 x 22.5) + (18 x 27.5) (totals: 30, 45, 50, 105, 315, 495)	1040	3	M2 do not have to see intention to add If not M2 then M1 for freq x consistent interval value (890 = freq x lower limit, 1190 = freq x upper limit) or 3 or more correct products stated or evaluated A1 isw if 1040 calculated correctly and correct mean calculation follows (1040 ÷ 60 = 17.3 or better)
				Total 4 marks

7. (i)	$-2 - 2 < x$ and $x \leq 5 - 2$	$-4 < x \leq 3$	2	M1 condone omission/addition of "equals" in inequalities A1cao accept $x > -4$ and $x \leq 3$ (both present)
7. (ii)	-4 		2	B2 ft ft for an inequality where range lies between – 5 and +5 If not B2ft then B1ft for correct values but wrong shading of end circles
				Total 4 marks

8. (a)	7.9 x cos 38° or 7.9 x sin 52°	6.23	3	M2 M1 for cos 38° or sin 52° selected A1 6.2252.. awrt 6.23
8. (b) (i)		37.5	1	B1
8. (b)(ii)		38.5 or 38.49 rec	1	B1
				Total 5 marks

9. (a)		Mars	1	B1 Accept 6.8 x 10^3 oe
9. (b)	1.2 x 10^5 – 5.0 x 10^4 or 70000	7 x 10^4	2	M1 Correct values with intention to subtract A1 M1 A0 for 70000 with no working
9. (c)	(1.4 x 10^6) ÷ (3.5 x 10^3)	1:400 oe	2	M1 Correct values with intention to divide A1 M1 A0 for 400 or 400:1 with no working
				Total 5 marks

10. (a)	Correct $v \div h$	1.5 oe	2	M1 e.g. 6 ÷ 4 A1 accept improper fractions (e.g 3/2) N.B. 1.5x = M1A0
10. (b)		y = "1.5"x – 1oe	1	B1 ft from (a)
10. (c)	y = "1.5"x + c oe or "1.5"x + 3 or 0 = – 2 x gradient from (a) + c	y = "1.5"x + "c" oe	2	M1ft from (a) c ≠ – 1 (c must be a numeric value) (substituting y = 0 and x = – 2 into y = mx + c) A1ft "c" = follow through using numeric value of gradient in (a)
				Total 5 marks

11.	2.1 – 1.7 (= 0.4) 6^2 + "0.4"^{2} (= 36.16) √ "36.16"	6.01	4	M1 M1 dep M1 dep A1 awrt 6.01 N.B. Accept working in cms throughout for method marks
				Total 4 marks

12.	$\frac{A}{2\pi r} = r + h$ or $A = 2\pi r^2 + 2\pi rh$	$\frac{A}{2\pi r} - r = h$ oe	2	M1 Correct first step A1 e.g. $\frac{A-2\pi r2}{2\pi r}$ Give full credit to equivalent correct expressions
				Total 2 marks

13. (i)	5 x 8	40	2	M1 Or any correct fd marked on vertical axis (2, 4 etc) with no errors or 1 square = 4 students A1
13. (ii)	Missing blocks = 5cm, 6cm, 1.5cm		2	B2 3 correct blocks If not B2 then B1 for 1 or 2 correct blocks
				Total 4 marks

14. (a)	Black circle = 0.3 White region = 0.6 All values "correct" for second shot		3	B1 B1 B1ft Allow ft if each group of 3 branches on second arrow all sum to1 and are consistent with first arrow branches
14. (b)	Any one correct product in numerical form e.g. ("0.3" x 0.1) or (0.1 x "0.3") or ("0.6" x "0.6") ("0.3"x 0.1) + (0.1x "0.3") + ("0.6" x "0.6")	0.42oe	3	M1ft e.g. (Black, Miss) or (Miss, Black) or (White, White) M1ft 3 "correct" products with intention to add A1 cao
				Total 6 marks

15. (i)		18	1	B1
15. (ii)		15	1	B1
15. (iii)		9	1	B1
15. (iv)		22	1	B1
				Total 4 marks

16.	$7^2 = 9^2 + 13^2 - 2 \times 9 \times 13 \cos x$ oe $234 \cos x = 201$	30.8	3	M1 M1 or $\cos x = 0.86$ or better A1 30.798… awrt 30.8
				Total 3 marks

17.	$\frac{(2x-5)(2x+5)}{(2x+5)(3x-1)}$	$\frac{(2x-5)}{(3x-1)}$	3	M2 If not M2 then M1 for numerator or denominator correct A1
				Total 3 marks

18. (a) (i)		$16x$	1	B1
18. (a) (ii)	$2x^{-1}$	$-2x^{-2}$ oe	2	M1 A1
18. (b)	"$16x$" + "$-2/x^2$" = 0 $16x = 2/x^2$ $x^3 = 1/8$ $x = ½$	(½ , 6)	4	M1 M1 x^3 isolated A1, A1
				Total 7 marks

19. (a)	2 x 3 x x x = (x + 10)(3x + 20) or $6x^2$ = (x + 10)(3x + 20) $6x^2 = 3x^2 + 50x + 200$		3	M2 If not M2 then M1 for 2 x 3x x x or 2 x $3x^2$ or $6x^2$ or (x + 10)(3x + 20) A1 Dependent on at least M1
19. (b)	(3x +10)(x – 20) (=0) Marks can be awarded in b) if seen in a) 20 x 3 x 20	x =20 1200	5	M2 or $x = \frac{50 \pm \sqrt{2500+2400}}{6}$ If not M2 then M1 for (3x ±10)(x ±20) or $x = \frac{--50 \pm \sqrt{-50^2-4x3x-200}}{2 \times 3}$ condone 1 sign error A1 dep on M1 in b). Ignore negative root (– 3.3 rec) M1 A1 dep on 1st M1 in b)
				Total 8 marks

20. (a) (i)		$2\mathbf{a}$ oe	1	B1
20. (a) (ii)		$2\mathbf{a} + \mathbf{b}$ oe	1	B1
20. (a) (iii)		$-\mathbf{a} + \mathbf{b}$ oe	1	B1
20. (b)	$\overrightarrow{PN} = \mathbf{a} + 1/3$ ("$-\mathbf{a} + \mathbf{b}$") $\overrightarrow{PN} = 2\mathbf{a}/3 + \mathbf{b}/3$ {$= 1/3\ (2\mathbf{a} + \mathbf{b})$}	stating $\overrightarrow{PN} = \overrightarrow{PR}/3$	2	M1ft from (a)(iii) i.e. a valid path from P to N, or N to P, using lower case letters. A1 Arrows not necessary. Dependent on M1
	$\overrightarrow{NR} = 2/3$ ("$-\mathbf{a} + \mathbf{b}$") $+ 2\mathbf{a}$ $\overrightarrow{NR} = 4\mathbf{a}/3 + 2\mathbf{b}/3$ {$= 2/3\ (2\mathbf{a} + \mathbf{b})$}	stating $\overrightarrow{NR} = 2\overrightarrow{PR}/3$		Alt M1ft from (a)(iii) i.e. a valid path from N to R, or R to N, using lower case letters. A1 Arrows not necessary. Dependent on M1 NB: If both $\overrightarrow{PN}$ and $\overrightarrow{NR}$ worked out correctly, award M1A1 for stating $2\overrightarrow{PN} = \overrightarrow{NR}$ or stating or showing $\overrightarrow{PN} + \overrightarrow{NR} = \overrightarrow{PR}$
				Total 5 marks

21.	$\sqrt{(16^2 + 10^2)}$ (=18.9 or better) "18.867" ÷ 2 (=9.433) tan "x" = 15/ "9.433"	57.8	4	M1 or M2 for $\sqrt{(8^2 + 5^2)}$ (=9.43 or better) M1 dep on previous M1 M1 dep on M2 A1 57.832….. awrt 57.8
				Total 4 marks

				TOTAL = 100 marks

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