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# Mark Scheme (Results)

## Summer 2012

## International GCSE Mathematics (4MA0) Paper 4H

## Level 1 / Level 2 Certificate in Mathematics (KMA0) Paper 4H

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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
- awrt – anything which rounds to
- eeoo – each error or omission

- **No working**
  If no working is shown then correct answers normally score full marks – the mark scheme will make it clear when this does not apply.
  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 the lower mark should be awarded, unless it is clear which method the candidate has chosen.
  If there is no answer on the answer line then check the working for an answer.
- **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.

| Question Number | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| Apart from questions 5, 7, 13c, 16b, 20, 21 and 22 (where the mark scheme states otherwise) the correct answer, unless clearly obtained by an incorrect method, should be taken to imply a correct method. | | | | |
| **1.** | 7.92 ÷ 1.65 | 4.8 oe | 2 | M1 M1 for 7.92 or 1.65<br>A1 Accept $\frac{24}{5}$ |
| | | | | **Total 2 marks** |
| **2.** | (12 x 18) + (8 x 16.5) (=348)<br>"348" ÷ 20 | 17.4 | 4 | M2 M1 for 12 x 18 (=216) or 8 x 16.5 (=132)<br>M1 dep on at least 1 previous M1<br>A1 17.4<br>Alt Ratio method<br>M1: 12:8 = 3:2 or 6:4<br>M1: 18 x3 and 16.5 x 2 or 18 x 6 and 16.5 x 4<br>M1: (18 x 3 + 16.5 x 2) ÷ 5 or (18 x 6 + 16.5 x 4) ÷ 10<br>A1: 17.4<br>Alt Proportion method<br>M1 60 % boys and 40% girls stated or implied<br>M2 (0.6 x 18) + (0.4 x 16.5) (= 10.8 + 6.6)<br>M1 for 0.6 x 18 or 0.4 x 16.5<br>A1 17.4 |
| | | | | SC B1 for 17.1 (from {(8 x 18) + (12 x 16.5)}÷20) |
| | | | | **Total 4 marks** |

| Question Number | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| **3.** (a) (i) | | 30 | 1 | B1 |
| (ii) | | 21 | 1 | B1 |
| (b) | Horizontal line from (1400,39) to (1600,39)<br>Line from ("1600", 39) to (1715, 0) | | 2 | B1<br>B1ft ft if line finishes at (17 15, 0) (± 5 mins) and starts at height 39km |
| (c) | | 13 25to 1330<br>1625 to 1630 | 2 | B1 Accept 1 25 pm to 1 30 pm<br>B1 Accept 4 25 pm to 4 30 pm<br>or ft if line finishes at (17 15, 0) (± 5 mins) and starts at height 39 km |
| (d) | 39 ÷ 1.25 oe (39 ÷ 75 x 60) | 31.2 | 3 | M2 M1 for 39 ÷ 1.15 (=33.9..) or 39 ÷ 75 (= 0.52)<br>A1 |
| | | | | **Total 9 marks** |

| | | | | |
|---|---|---|---|---|
| **4.** (a) | | reflection in line $x = 1$<br>(rotation (90° {anticlockwise} oe ) about (1 , 1) | 2 | B1 B1 must be a single transformation oe for $x = 1$<br>B1 B1 must be a single transformation |
| (b) | flag at (4, – 1) (5, –1) (6, – 1) (5, – 2)<br>or triangle at (5, –1) (6, –1) (5, – 2) | | 2 | B2 B1 for correct orientation of flag, or triangle but in wrong position |
| | | | | **Total 4 marks** |

| Question Number | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| **5.** (a) | 4/5 x 15/7 | 12/7 oe | 2 | M1 or 12a/15a ÷ 7a/15a (denominators the same and a multiple of 15)<br>A1 dep on M1. Improper fraction equivalent to 1 5/7 required produced directly from M1 |
| (b) | 21/4 – 5/3<br>63a/12a – 20a/12a | 43/12 oe | 3 | M1 Correct improper fractions<br>M1 Correct fractions with a common denominator a multiple of 12<br>A1 dep on M2 Improper fraction required.<br>Alt method<br>M1 (5) 3/12 – (1) 8/12 (i.e. can ignore integer parts)<br>M1 – 5/12<br>A1 Improper fraction required or 4 – 5/12. Ans dep on M2.<br>Alt method<br>M1 (4) 5/4 – (1) 2/3 (i.e. can ignore integer parts)<br>M1 (4) 15/12 – (1) 8/12 (i.e. can ignore integer parts)<br>A1 (3 +) 7/12 or improper fraction Ans dep on M2 |
| | | | | NB: Follow one strand that gives most marks. |
| | | | | **Total 5 marks** |

| | | | | |
|---|---|---|---|---|
| **6.** | tan 72 or tan 18 selected<br>(*MN*=) 34 x tan 72 | 105<br><br>105 | 3 | M1<br>M1 or (*MN* =) 34 ÷ tan 18<br>A1 104.64.... awrt 105<br>Alt Sine rule method<br>M1 34/sin 18 = "MN"/sin 72<br>M1 (*MN*=) (34 x sin 72) ÷ sin 18<br>A1 104.64.... awrt 105 |
| | | | | **Total 3 marks** |

| | | | | |
|---|---|---|---|---|
| **7.** | 2*a* = – 4 or 4*b* = 14 | *a* = – 2 *b* = 3.5 | 3 | M1 Correctly eliminate 1 variable:<br>Accept 3(5 – 2*b*) + 2*b* = 1 oe<br>A1 A1 Ans dep on M1 Ans only or T&E = M0A0A0 |
| | | | | **Total 3 marks** |

| Question Number | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| **8.** | A product of 3 or more factors of 300 of which at least 2 are different primes (i.e. from 2, 3 or 5) | | | M1 e.g 2 x 3 x 50 (must multiply to 300) could be implied from a factor tree or division ladder |
| | All 5 correct prime factors & no extras (ignore 1's) | 2, 2, 3, 5, 5 (with/without 1's) or $2^2$ x 3 x $5^2$ x 1 or $2^2 + 3 + 5^2$ | | M1 could be implied from a factor tree or division ladder $2 \times 2 \equiv 2^2$ $5 \times 5 \equiv 5^2$ |
| | | 2 x 2 x 3 x 5 x 5 | 3 | A1 any order, do not accept inclusion of 1's accept . in place of x |
| | | | | **Total 3 marks** |

| | | | | |
|---|---|---|---|---|
| **9.** | (19 x1)(=19) + (8x3)(=24) + (3x5)(=15) + (1x 9) (=9) | 67 | 3 | M2 for freq x all correct midpoint values correctly evaluated (condone omission of $4^{th}$ interval) {do not have to see intention to add} if not M2 then M1 for freq x consistent point in each interval or M1 for 1 error in list of 19, 24, 15, (0), 9<br>A1 isw if 67 calculated correctly. (2.16.. = M2A1) |
| | | | | **Total 3 marks** |

| | | | | |
|---|---|---|---|---|
| **10.** (a) (i) | $10x + 5 - 9x + 3$ | $x + 8$ | 2 | B2 B1 for 3 correct terms with correct signs or 4 correct terms ignoring signs |
| (ii) | $y^2 + 5y - 7y - 35$ | $y^2 - 2y - 35$ | 2 | B2 B1 for 3 correct terms with correct signs or 4 correct terms ignoring signs N.B. $-2y$ (with no more $y$ terms) implies $+5y - 7y$ |
| (b) | $V / \pi h = r^2$ (oe) | $\sqrt{\frac{v}{\pi h}}$ oe | 2 | M1 isolating $r^2$ (must be correct equation).<br>A1 condone ± Allow $\sqrt{v} \div \sqrt{\pi} \div \sqrt{h}$ etc |
| | | | | **Total 6 marks** |

| | | | | |
|---|---|---|---|---|
| **11.** (a) | | 78000 | 1 | B1 |
| (b) | $(4.62 \times 10^5) + (7.8 \times 10^4)$ | $5.4 \times 10^5$ | 2 | M1 Intention to add correct values or digits 54<br>A1 Answer must be in standard form |
| | | | | **Total 3 marks** |

| Question Number | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| **12.** (a) | set B separate to A, set C within A | | 2 | B1 B1 Set C has to be a unique set |
| (b) | outer ring between A and C shaded | | 1 | B1ft Completely outside of C <u>and</u> within all of A. Set C has to be a unique set |
| | | | | **Total 3 marks** |
| **13.** (a) | | –3, (1), –1, –3, 1, 17 | 2 | B2 for all correct, B1 for 3 or 4 correct |
| (b) | All points plotted correctly from their table<br>Curve | | 1<br>1 | B1 ft if at least B1 scored in (a) Plotting tolerance ± ½ sq<br>B1 ft if B1 scored from plotting points.<br>Must be attempt at a smooth curve & not line segments |
| (c) | | Line segment at $y = 5$ drawn<br>2.2 → 2.5 inc | <br>2 | M1 M1 for $x^3 - 3x - 1 = 5$ stated or evidence of reading from $y = 5$ or y=5 stated<br>A1 dep on M1 |
| (d) (i) | | $3x^2 - 3$ | 2 | B2 B1 for $3x^2$ or – 3 |
| (ii) | | $3 \times 4^2 - 3$<br>45 | <br>2 | M1 ft for a quadratic in d i)<br>A1 cao |
| | | | | **Total 10 marks** |
| **14.** | (2) overlapping circles, 6 outside circles<br>10 in F only, 8 in S only, 7 in overlap | 18 | 4 | M1<br>M2 Venn diagram sets have to labelled if not M2 then M1 for any two values in correct place in union or 7 in overlap<br>A1 |
| | Alt Method<br>31 – 6 (=25) or (15+6) – 31 (=7) oe<br>"25"–17 (=8) {Sp} and "25"– 15 (=10) {Fr}<br>"10" + "8" | c. 7 – "7" (=10) {Fr}<br>a. 15 – "7" (=8) {Sp}<br>18 | <br><br><br>4 | M1 Identifies union <u>or</u> intersection<br>M1 dep Identifies components to add<br>M1 dep Adds components<br>A1 (Ans only = M3A1)<br>or M2 for "25" – "7" |
| | | | | **Total 4 marks** |

| Question Number | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| **15.** (a) | 180 – (90 + 58) (oe) | 32 | 2 | M1 i.e. 90 – 58<br>A1 |
| (b) (i) | | 122 | 1 | B1 |
| (ii) | Opposite angles in a cyclic quad ( =180°) | | 1 | B1 Accept abbreviations if meaning is clear.<br>B0 for incorrect statements |
| | | | | **Total 4 marks** |
| **16.** (a) | ("$AC^2$"=) $6^2 + (7+5)^2 - 2 \times 6 \times (7+5) \cos 28$<br>("$AC^2$"=)52.855... | 7.27 | 3 | M1<br>A1 awrt to 52.8 or 52.9<br>A1 awrt to 7.27 |
| (b) | 6 x "DX" = 12 x 5<br><br>"DX" = (12 x 5 ÷ 6) (=10)<br>"DC" = "10" – 6 | 4 | 3 | M1 M1 for an attempt to use intersecting chord theorem (external or internal case e.g 7 x 5 = 6 x "*x*")<br>M1 must see a correct justification for the value 10 seen<br>A1 Ans dependent on at least M1 |
| | | | | **Total 6 marks** |

| | | | | |
|---|---|---|---|---|
| **17.** (a) | 3.6 ÷ 20 x 100 oe (large squares or heights of bars)<br>or (6+6+6) ÷ (10+10+8+35+19+6+6+6) x 100<br>or 90 ÷ 500 x 100 (small squares) | 18 | 3 | M2 a full and correct calculation leading to correct ans<br>heights = 2+2+1.6+7+3.8+1.2+1.2+1.2 (=20)<br>or 10+10+8+35+19+6+6+6 (=100)<br><br>if not M2 then M1 for 3.6 and 20 (large sq or heights)<br>or 6+6+6 and 10+10+8+35+19+6+6+6 (heights)<br>or 12+12+12 and 20+20+16+70+38+12+12+12 (frequencies)<br>or 90 and 500 (small sq)<br>A1 Ans only = M2A1 |
| (b) | 20 x 10 | 200 | 2 | M1 or 1 (large) square = 10 (people)<br>or 1 (small) square = 0.4 (people)<br>or correct fd seen with no errors<br>or 16 ÷ 5 (= 3.2) {fd on 3rd bar}<br>or 20+20+16+70+38+12+12+12 (people in blocks)<br>A1 Ans only = M1A1 |
| | | | | **Total 5 marks** |

| Question Number | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| **18.** (a) | | 0.3 on bottom LH branch<br>0.8, 0.2, 0.5, 0.5<br>0.5, 0.5, 0.8, 0.2 | 3 | B1<br>B1 Second game branches correct<br>B1 Third game branches correct |
| (b) | (0.7 x "0.8")+(0.7 x "0.2"x"0.5")+("0.3"x"0.5"x "0.8") | 0.75 oe | 3 | M2 ft M1 for 1 correct (ft) branch<br>A1 |
| | | | | Alt method (1 – Jo winning)<br>M2 1 – {(0.7x"0.2"x"0.5)+("0.3"x"0.5"x"0.2)+("0.3"x"0.5")<br>A1 |
| | | | | **Total 6 marks** |

| | | | | |
|---|---|---|---|---|
| **19.** (a) | $y = 3x - 2$<br>$y + 2 = 3x$ | $(x + 2)/3$ | 2 | or $x = 3y - 2$<br>M1 or $x + 2 = 3y$ must reach 2nd stage<br>A1 Ans only = M1A1 must be a function of $x$ |
| (b) | $\frac{10}{3x - 2 + 2}$ | $\frac{10}{3x}$ | 2 | M1<br>A1 cao Do not isw if correct answer is seen in body and extra incorrect operations take place. Ans only = M1A1 |
| | | | | **Total 4 marks** |

| | | | | |
|---|---|---|---|---|
| **20.** | $36 - 6\sqrt{8} - 6\sqrt{8} + 8$ or $36 - 12\sqrt{8} + 8$<br>$44 - 12\sqrt{(4 \times 2)}$<br>$44 - 12\sqrt{4} \times \sqrt{2}$ | $44 - 24\sqrt{2}$* | 3 | M2 M1 for $6^2 + (\sqrt{8})^2$ or $36 + 8$ or $6^2 + \sqrt{64}$ or $-12\sqrt{8}$ or $-6\sqrt{8} - 6\sqrt{8}$<br>M1 for $(-)12\sqrt{8} = (-)12 \times 2\sqrt{2}$ or $\sqrt{8} = 2\sqrt{2}$ or $6\sqrt{8} = 6 \times 2\sqrt{2}$ Must see $\sqrt{8}$ stated as $2\sqrt{2}$ for final M1 |
| | LHS = $(6 - 2\sqrt{2})^2$ or $\sqrt{8} = 2\sqrt{2}$<br>$6^2 - 12\sqrt{2} - 12\sqrt{2} + 4 \times 2$ or $36 - 24\sqrt{2} + 8$ | | | Alt:<br>M1<br>M2 M1 for $6^2 + 4 \times 2$ or $36 + 8$ |
| | | | | **Total 3 marks** |

| Question Number | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| **21.** | $\frac{5(x-2)+9(x+2)}{(x+2)(x-2)}$ (=2)<br><br>$14x + 8 = 2(x + 2)(x – 2)$ or $\frac{14x+8}{(x-2)(x+2)}$ (=2)<br>$2x^2 – 14x – 16$ (= 0) oe<br>$x^2 – 7x – 8$ (= 0) oe<br>$(x + 1)(x – 8)$ (= 0) oe | $x = – 1,\ x = 8$ | 5 | M1 correct expression with correct common denominator or $5(x – 2) + 9(x + 2) = 2(x + 2)(x – 2)$<br>M1 gather terms correctly. Accept $x^2 – 4$ for $(x + 2)(x – 2)$<br>A1 correct 3 part quadratic<br>M1 or $\frac{7\pm\sqrt{7^2-4x1x-8}}{2}$ oe condone 1 sign error<br>A1 dep on previous M1 |
| | | | | **Total 5 marks** |

| | | | | |
|---|---|---|---|---|
| **22.** | $\pi r^2 \times 4r – 2 \times 4\pi r^3/3 = 125\pi/6$ oe<br>$24 r^3 – 16 r^3 = 125$ oe<br><br>$r^3 = 125/8$ oe<br>$r = \sqrt[3]{(125/8)}$ | 2.5 | 5 | M2 Any equation based on cylinder – 2 spheres = space oe h = 4r must be implicit for award of M2 {decimal form: $12.6r^3 – 8.4r^3 = 65.4$ (1 dp or better)} If not M2 then M1 for $\pi r^2 \times 4r$ or better<br>M1 One occurrence of $r^3$ in correct equation.<br>M1<br>A1 awrt to 2.5 Ans dep on M3 |
| | | | | **Total 5 marks** |

| | | | | |
|---|---|---|---|---|
| | | | | **TOTAL FOR PAPER : 100 MARKS** |

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