# Mark Scheme (Results)

# January 2012

International GCSE Mathematics (4MA0) Paper 3H

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# January 2012 International GCSE Mathematics (4MA0) Paper 3H Mark Scheme

| Question | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| **1.** (a) | 7/32 x 100 oe | 21.9 | 2 | M1 <br> A1 (21.875) accept awrt to 21.9 |
| (b) | 4/100 x 32 (=1.28)   or  4/100 x 32000000 (=1280000) <br> 32 + "1.28"   or  32000000 + "1280000") | 33 | 3 | M1  M2 for 32 x 1.04 oe or 32000000 x 1.04 oe <br> M1  (dep) <br> A1  (33.28) accept 33.3,  33000000,  33300000,  33280000 |
| | | | | **Total 5 marks** |

| | | | | |
|---|---|---|---|---|
| **2.** | 2/5 x 30 | 12 | 2 | M1 <br> A1  12 out of 30 = M1A1    12/30 = M1A0 |
| | | | | **Total 2 marks** |

| | | | | |
|---|---|---|---|---|
| **3.** | $\pi$ x $7.5^2$ x 26 | 4590 | 3 | M2  M1 for $\pi$ x $15^2$ x 26 or 18369 → 18386 inc <br> A1  (4594.579....) accept answers 4592 →4597 inc |
| | | | | **Total 3 marks** |

| | | | | |
|---|---|---|---|---|
| **4.** | Arcs of  length 6cm from A **and** B | | | M1 |
| | Arc of  length 10 cm from A **or** B | | | M1 |
| | Arc of  length 6 cm from correct top vertex | | | M1 |
| | Correct rhombus within overlay tolerance | | 4 | A1    Dependent on M3 <br> sc  B1 for correct rhombus with no construction lines. |
| | | | | **Total 4 marks** |

| | | | | |
|---|---|---|---|---|
| **5.** (a) | | a(5 – 3a) | 2 | B2  B1 for factors which when expanded & simplified give 2 terms for which one is correct. |
| (b) (i) | | 8 – 6w | 1 | B1 |
| (ii) | | $y^3 + 10y^2$ | 2 | B2  B1 for $y^3$ or $10y^2$ |
| (c) | 7.168 / 0.64 | 11.2 | 2 | B2  B1 for 7.168 or 0.64 |
| | | | | **Total 7 marks** |

| | | | | | | |
|---|---|---|---|---|---|---|
| **6.** (a) (i) | | Does not study Maths<br>No student studies (both) German **and** Maths<br>Students who study German do not study Maths<br>etc | | 1 | B1 | Accept general answers (e.g. no student belongs in both sets). |
| (ii) | | (Preety) does not study French<br>(Preety) is not a member of (set) F | | 1 | B1 | Accept she /he in place of Preety or omission of name. Penalise extra incorrect statements (e.g. Preety studies Maths and German but not French) |
| (b) | | | 1,2,3,4 | 2 | B2 | B1 for any 3 correct with no repetitions or additions. |
| | | | | | | **Total 4 marks** |

| | | | | | | |
|---|---|---|---|---|---|---|
| **7.** (a) | | | 9 to 11 | 1 | B1 | |
| (b) (i) | (1 x 3) + (4 x 6) + (7 x 10) + (10 x 15) + (13 x 5) + (16 x 1)<br>(=328)<br><br><br>"328" ÷ ("3+6+10+15+5+1") | | 8.2 | 4 | M2<br><br><br><br><br>M1<br>A1 | All products, $t$ x f using ½ way points correctly, and intention to add.<br>Award M1 if all products, $t$ x f using their ½ way points consistently, from 6 to 8 interval onwards and intention to add.<br>(dep on one at least M1)<br>Accept 8 with working. 8 without working = M0A0 |
| (ii) | | Mid-points used as actual data is unknown | | 1 | B1 | Mention of mid-points or exact (actual) data is unknown. |
| | | | | | | **Total 6 marks** |

| | | | | | | |
|---|---|---|---|---|---|---|
| **8.** (a) | | | $x/60$ oe | 1 | B1 | Must be a fraction or 0.016 rec $x$ |
| (b) (i) | 2("$x/60$") = (x+20)/80<br>16(0) $x$ = 6(0)( $x$ + 20)<br>or 80 $x$ = 30( $x$ + 20)<br>or 2x/3 = (x + 20)/4 | | | 3 | M2 ( must be an equation)   M1 for either 2("$x/60$") or (x+20)/80<br>A1 dep Correct removal of denominators.<br>Correct removal of denominators.<br>Simplifying denominators. |
| (ii) | 8x = 3x + 60 or 5x = 60 or 60÷ 5 | | 12 | 2 | M1<br>A1 | Dependent on M1. Can be marked if seen in b(i) |
| | | | | | | **Total 6 marks** |

| 9. (a) | Use of sine or $\frac{\sin x}{3.4} = \frac{\sin 90}{5.8}$ | | | | M1 | Sine must be selected for use. |
|---|---|---|---|---|---|---|
| | sin "x" = 3.4 / 5.8 (=0.586..) | | | | M1 | |
| | | | 35.9 | 3 | A1 | (35.888...)Use isw on awrt 35.9 |
| (b) (i) | | | 5.85 | 1 | B1 | accept 5.849 rec |
| (ii) | | | 5.75 | 1 | B1 | |
| | | | | | | **Total 5 marks** |

| 10. | 6/100 x 7500 (=450) {Ist Year} or 1.06 x 7500 (=7950) | | | | M1 | M2 for $1.06^3$ x 7500 (=8932.62) |
|---|---|---|---|---|---|---|
| | "450" + "477" + "505.62" | | | | M1 | Calculating 6% of previous capital for another 2 years. |
| | | | 1432.62 | 3 | A1 | M1A0 for 1350 or 8850 |
| | | | | | | **Total 3 marks** |

| 11. | $3y + 6x - 3 = x + 5y$ | | | | M1 | Multiplying out brackets. |
|---|---|---|---|---|---|---|
| | $5x - 3 = 2y$ oe | | | | M1 dep | Correctly collecting like terms, (3 terms needed here). |
| | | | $(5x - 3)/2$ | 3 | A1 | oe |
| | | | | | | **Total 3 marks** |

| 12. (a) | 6/9 x 12 oe | | | | M1 e.g 12 ÷ 1.5 | |
|---|---|---|---|---|---|---|
| | | | 8 | 2 | A1 | |
| (b) | 9/6 (or 12/"8") x 5 | | | | M1 | |
| | | | 7.5 | 2 | A1 cao | |
| (c) | $1.5^2$ x 32 (=72) oe | | | | M1 | M1 for $1.5^2$ or $(2/3)^2$ |
| | "72" – 32 | | | | M1 dep | |
| | | | 40 | 3 | A1 | |
| | | | | | | **Total 7 marks** |

| 13. (a) (i) | | | 41º | | B1 | |
|---|---|---|---|---|---|---|
| (ii) | | Angles in same segment (are equal) | | 2 | B1 | Accept "from same chord", "on same arc". |
| (b) (i) | | | 75º | | B1 | |
| (ii) | | Angle at centre/middle is not 2 x angle at circumference / edge / perimeter / arc or Angle PQT ≠ QPT or PRS ≠ RSQ (oe) or 34 ≠ 41 | | 2 | B1 | Accept 75 ≠ 2 x 41 or 75 ≠ 2 x 34 or using idea of isosceles triangles but must mention angles. |
| | | | | | | **Total 4 marks** |

| 14. (a) | $y = 36 - x$ | | | | M2 | M1 for $x + y = 36$ oe or $2y = 72 - 2x$ |
|---|---|---|---|---|---|---|
| | | (Area =) $x$ $(36 - x)$ | 3 | | A1 | Must see x times $(36 - x)$ dep on M2 |
| (b) | | $(dA/dx) = 36 - 2x$ | 2 | | B1 B1 | B1 for 36   B1 for $- 2x$ |
| (c) | "$36 - 2x$" = 0 | | | | M1 | allow ft only on a + b$x$ ( $a,b \neq 0$) |
| | $x = 18$ | | | | A1ft | |
| | | (Area =) 324 | 3 | | A1ft | |
| | | | | | | **Total 8 marks** |

| 15. (a) | F = " k"/$d^2$ | | | | M1 | k= letter not number. |
|---|---|---|---|---|---|---|
| | $12 = k/2^2$ | | | | M1 | |
| | k = 48 | | | | | |
| | | F = 48/$d^2$ | 3 | | A1 | Award 3 marks for F = " k"/$d^2$ and k = 48 stated anywhere, unless contradicted by later work. |
| (b) | (F = ) "48"/ $5^2$ | 1.92 oe | 1 | | B1 ft k $\neq$ 1 | accept 48/25 as an answer. |
| (c) | 3 = "48"/ $d^2$ | | | | k $\neq$ 1 | |
| | $d^2$ = "48"/3 | | | | M1 | Rearrangement to make $d^2$ or $d$ the subject |
| | | 4 | 2 | | A1 | ignore $\pm$ |
| | | | | | | **Total 6 marks** |

| 16. (a) | 10 x 3 or 15 x 2 or 12 x 7.5/3 | | | | M1 | or any correct fd in correct position and no errors, or 1 sq = 2 (runners) indicated. |
|---|---|---|---|---|---|---|
| | | | 30 | 2 | A1 | |
| (b) | Missing blocks = 6cm, 10cm, 2cm | | | 2 | B2 | 3 correct blocks       B1   1 or 2 correct blocks |
| (c) | 0.6 x 20 + 0.8 x "30" or 3 x "4" + 8 x "3" or 450 x 0.08 | | | | M1 | (partitioning blocks) (time x fd's) {must see clear evidence that fd values used}. 450 small squares. |
| | | | 36 | 2 | A1 cao | |
| | | | | | | **Total 6 marks** |

| 17. | $x = 0.1777....$ and $10x = 1.777..$ | | | | See at least 3 sevens or recurring symbol. Condone omission of $x$. | |
|---|---|---|---|---|---|---|
| | $9x = 1.6$ | | | | M1 | Accept $10x = 1.777..$ and $100x= 17.77..$ |
| | | 16/90 oe | | | A1 | Must be integers in numerator and denominator but not 8 & 45 N.B for 0.1777 = 1/10 + 0.0777.. (0.777 <u>needs to be shown</u> to be 7/90 to gain first M1) |
| | | | | | | **Total 2 marks** |

| 18. | AOC = 70° <br> "70"/360 x π x 9² (=49.48..) <br> 0.5 x 9² x sin "70" = (38.057..) <br> 49.48.. or  38.057... <br> "49.48.." – "38.057.." <br><br> 11.4 | | 6 | B1 Could be marked on diagram. <br> M1ft Area of sector. <br> M1ft Area of triangle. Follow through angles must be the same. <br> A1 Either area correct to 3 sf <br> M1 dep on both previous M1's <br> A1 ( 11.42253...) awrt 11.4 |
|---|---|---|---|---|
| | | | | **Total 6 marks** |

| 19. | (√3 + 3√3)/√2 <br> 4√3/√2 <br> 2√6 or (√48 /√2) <br><br> 24 | | 3 | M1 Must see √27 reduce to 3√3   alternative $\frac{\sqrt{6}+\sqrt{54}}{2}$ (or better) <br><br> M1 dep on 1st M1 <br> A1cao dep on M2     Accept √24 if M2 awarded. |
|---|---|---|---|---|
| | | | | **Total 3 marks** |
| 20. | $\dfrac{4(2-x)+3x}{x(2-x)}$    oe <br><br> $\dfrac{8-4x+3x}{x(2-x)}$ | $\dfrac{8-x}{x(2-x)}$ | 3 | M1 <br><br><br><br> M1 <br><br> A1 Accept    $\dfrac{8-x}{2x-x^2}$    Single fraction needed as final answer. |
| | | | | **Total 3 marks** |

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| | | | | | |
|---|---|---|---|---|---|
| **21.** (a) | $0.5x[(x + 5) +(x +8)] = 42$ (trapezium formula)<br>or $x(x +5) + 0.5x \times (3) = 42$ (partitioning)<br>$x(2x +13) = 84$<br>or $x^2 +5x + 1.5x = 42$ | | | 2 | M1<br><br>M1  dep on 1$^{st}$ M1 then needs to develop on to quadratic given. |
| (b) | $(2x + 21)(x - 4)$  $(= 0)$ oe<br><br><br><br>$x = 4$<br><br>$(P=)$ "4" +"9" +"12" + $\sqrt{(3^2 + "4"^2)}$ | | 30 | 5 | B2  B1 for either factor correct or $(2x \pm 21)(x \pm 4)$<br>    or M1 for $x = \dfrac{-13\pm\sqrt{13^2-4\times2\times-84}}{4}$ (condone 1 sign error)<br>    then M1 for $x = \dfrac{-13\pm\sqrt{169+672}}{4}$<br>A1  dep on M1 or B2<br><br>M1  i.e $x + (x +5) + (x + 8) + \sqrt{(3^2 + x^2)}$ in numeric form.<br>A1cao (Last two marks independent)<br>N.B.  Working for solving quadratic could be seen in (a) if not<br>    contradicted in (b). |
| | | | | | **Total 7 marks** |

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