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# Mark Scheme (Results)

## Summer 2014

## Pearson Edexcel International GCSE Mathematics A (4MA0/4H) Paper 4H

## Pearson Edexcel Level 1/Level 2 Certificate Mathematics A (KMA0/4H) 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**
    - awrt – answers which round to
    - 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.

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

**Apart from Questions 9a, 15, 18a, 18b and 20, (where the mark scheme states otherwise) the correct answer, unless clearly obtained by an incorrect method, shown be taken to imply a correct method.**

**NB. All ranges given in the mark scheme are inclusive**

| Question | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 1 | $35 \div (3+2)$ **or** $35 \div 5$ **or** $\frac{2}{5} \times 35$ | | | M1 allow $\frac{3}{5} \times 35$ (=21) |
| | $7 \times 2$ | 14 | 2 | A1 NB 14 : 21 on answer line scores M1 A0 unless 14 identified |
| | | | | **Total 2 marks** |

| Question | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 2 (a) | $1 - (0.4 + 0.35 + 0.1)$ | | | M1 |
| | | 0.15 oe | 2 | A1 Accept as a decimal, fraction or percentage |
| (b) | $80 \times 0.35$ oe | | | M1 |
| | | 28 | 2 | A1 NB. $\frac{28}{80}$ oe gains M1 A0 |
| | | | | **Total 4 marks** |

| Question | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 3 (a) | $\pi \times 7.6^2$ **or** $\pi \times 57.76$ | | | M1 |
| | | 181 | 2 | A1 for 181 − 182 |
| (b) (i) | | 7.65 | 1 | B1 accept $7.64\dot{9}$ |
| (ii) | | 7.55 | 1 | B1 |
| | | | | **Total 4 marks** |

| Question | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 4 (a) | 0.15 × 270 oe (=40.5) | | | M1 M2 for 0.85 × 270 oe **or** (1 – 0.15) × 270 oe |
| | 270 − "40.5" | | | M1 dep |
| | | 229.50 | 3 | A1 accept 229.5 |
| (b) | 13.50 ÷ 15 (=0.9) **or** 100 ÷ 15 (=6.6….) | | | M1 M1 for 13.5 ÷ 3 (=4.5) (=5%) M2 for 13.5 ÷ 0.15 |
| | "0.9" × 100 (=90) **or** "6.6…" × 13.5(0) | | | M1 dep M1 for 4.5 × 20 |
| | | 90 | 3 | A1 |
| | | | | **Total 6 marks** |

| Question | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 5 | 360 ÷ 15 (=24) **or** $\frac{(15-2)\times 180}{15}$ (=156) | | | M1 |
| | | 24 | 2 | A1 |
| | | | | **Total 2 marks** |

| Question | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 6 | 126 × 0.89 (=112…)<br>112.14 | | | M1 M1 for 126 × 0.89 × 1.62 (=181.67) |
| | 165.24 ÷ 1.62 (=102) | | | M1 M1 for "181.67" – 165.24 (=16.43) |
| | "112.14" − "102" | | | M1 dep on at least **one** previous M mark ; accept "102" − "112.14" M1 for "16.43" ÷ 1.62 |
| | | 10.14 | 4 | A1 |
| | | | | **Total 4 marks** |

| Question | Working | | Mark | Notes |
|---|---|---|---|---|
| 7 | Arc centre *B* cutting *BA* and *BC* at *P* and *Q* where *BP* = *BQ* **and** arcs drawn from *P* and *Q* | | | M1 for all relevant arcs (those drawn from *P* and *Q* may fall outside guidelines) |
| | | correct bisector | 2 | A1 for angle bisector in guidelines with all necessary arcs |
| | | | | **Total 2 marks** |

| Question | Working | Answer | Mark | Notes | |
|---|---|---|---|---|---|
| 8 | $18.6^2 - 7.2^2$ (=294.12) | | | M1 for squaring **and** subtracting | M1 for correct method to find an angle and then correct trig ratio (or use of Sine rule) with a correct angle |
| | $\sqrt{"294.12"}$ **or** $\sqrt{18.6^2 - 7.2^2}$ | | | M1 (dep) for square root | M1 for isolating *AC* correctly |
| | | 17.1 | 3 | A1 for 17.1 – 17.15 | |
| | | | | | **Total 3 marks** |

| Question | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 9 (a) | eg. $5x = 17 + 6$<br>$7x - 2x = 23$<br>$5x = 23$ | | | M2 for correct rearrangement with $x$ terms on one side and numbers on the other **AND** correct collection of terms on at least one side or for $5x - 23 = 0$ or $23 - 5x = 0$<br><br>M1 for $7x - 2x = 17 + 6$ oe<br>ie correct rearrangement with $x$ terms on one side and numbers on the other<br>**or** $5x - 6 = 17$ **or** $7x = 2x + 23$ |
| | | $4\frac{3}{5}$ oe | 3 | A1 Award full marks for a correct answer if at least 1 method mark awarded (allow $\frac{23}{5}$ as final answer) |
| (b) | $x^2 + 2x + 8x + 16$ | | | M1 for 3 correct terms out of a maximum of 4 terms<br>or for 4 correct terms ignoring signs<br>or for $x^2 + 10x + k$ for any non-zero value of $k$<br>or for … + 10$x$ + 16 |
| | | $x^2 + 10x + 16$ | 2 | A1 cao |
| | | | | **Total 5 marks** |

| Question | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 10 | (6×5) + (10×15) + (19×25) + (15×35) **or** 30 + 150 + 475 + 525 **or** 1180 | | | M2 freq × all correct midpoint values stated (**or** evaluated) with intention to add (condone any one error)<br><br>If not M2 then award M1 for all products $t \times f$ (and $t$ is consistently within the interval, including end values) and intention to add (condone any one error) |
| | "1180" ÷ 50 **or** $\frac{"30"+"150"+"475"+"525"}{6+10+19+15}$ | | | M1 (dep on at least M1) |
| | | 23.6 | 4 | A1 Accept 24 with working (24 without working gains M0A0) |
| | | | | **Total 4 marks** |

| Question | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 11 (a) | | **5**, 0, −3, −4, **−3**, **0**, 5 | 2 | B2 B1 for 2 correct |
| (b) | | correct graph | 2 | B2 For the correct smooth curve<br>B1 for at least 6 points from table plotted correctly provided at least B1 scored in (a) |
| | | | | **Total 4 marks** |

| Question | Working | Answer | Mark | Notes | |
|---|---|---|---|---|---|
| 12 | $\frac{20}{16}$ (=1.25) **or** $\frac{20}{16}\times 14$ oe (=17.5) **or** $\frac{AC}{20}=\frac{14}{16}$ oe | | | M1 or for a correct scale factor eg. $\frac{20}{16}$ or $\frac{16}{20}$ or 1.25 or 0.8 or $\frac{14}{16}$ oe or $\frac{16}{14}$ oe | M1 for $16\div(20-16) = 4$ |
| | eg. $14 \times \frac{20}{16} - 14$ | | | M1 for complete method | M1 for complete method |
| | | 3.5 | 3 | A1 | |
| | | | | | **Total 3 marks** |

| Question | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 13 (a) | eg $\frac{1--2}{6-0}$ oe ($=\frac{1}{2}$ oe) | | | M1 for any correct method to find gradient |
| | $y = "\frac{1}{2}"x - 2$ **or** $y = mx - 2$ **or** $y = "\frac{1}{2}"x + c$ | | | M1 for "$\frac{1}{2}$" substituted for $m$ or $-2$ substituted for $c$ in $y = mx + c$ **or** $y - 1 = "\frac{1}{2}"(x - 6)$ oe **or** $y - -2 = "\frac{1}{2}"(x - 0)$ oe |
| | | $y = \frac{1}{2}x - 2$ oe | 3 | A1 NB Award M2A0 for a final answer of $0.5x - 2$ **or** L = $0.5x - 2$ |
| Alternative | $-2 = 0 + c$ ; $1 = 6m + c$ | | | M1 form two simultaneous equations |
| | $1 = 6m + -2$ | | | M1 substitute for $c$ |
| | | $y = \frac{1}{2}x - 2$ oe | 3 | A1 NB Award M2A0 for a final answer of $0.5x - 2$ **or** L = $0.5x - 2$ |
| (b) | | | | M1 for correct substitution of (4, −2) into $y = "\frac{1}{2}"x + c$ oe using their gradient found in (a) |
| | | $y = \frac{1}{2}x - 4$ oe | 2 | A1 for $y = \frac{1}{2}x - 4$ oe follow through with their gradient found in (a) NB Award M1A0 for a final answer of $0.5x - 4$ |
| | | | | **Total 5 marks** |

| Question | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 14 (a) | | 0.000012 | 1 | B1 |
| (b) | 790000 + 60000 **or** $79 \times 10^4 + 6 \times 10^4$ **or** $7.9 \times 10^5 + 0.6 \times 10^5$ | | | M1 or sight of digits 85 |
| | | $8.5 \times 10^5$ | 2 | A1 |
| | | | | **Total 3 marks** |

| Question | Working | | Answer | Mark | Notes |
|---|---|---|---|---|---|
| 15 | eg.<br>$12x + 8y = 28$<br>$-\ 12x - 9y = 45$ | eg.<br>$9x + 6y = 21$<br>$+\ 8x - 6y = 30$ | | | M1 for coefficient of $x$ or $y$ the same **and** correct operation to eliminate selected (condone any one arithmetic error in multiplication) **or**<br><br>for correct rearrangement of one equation followed by correct substitution in the other |
| | $y = -1$ | $x = 3$ | | | A1 cao dep on M1 |
| | Substitution of their found value above into one of the equations | | | | M1 (dep on 1st M1) for substituting to find the other variable **or**<br>correct method of elimination to find second variable (as first M1) |
| | | | $x = 3$; $y = -1$ | 4 | A1 cao<br>Award 4 marks for correct values if at least first M1 scored |
| | | | | | **Total 4 marks** |

| Question | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 16 (a) | Angle *POR* = 180 − 2×36 (=108) | | | M1 May be seen on diagram |
| | | 54 | 2 | A1 |
| (b) | Angle *HJK* = 180 − 124 (=56) **or** angle *JHK* = 90 | | | M1 May be seen on diagram |
| | Angle *HKJ* = 180 − 90 – 56 | | | M1 |
| | | 34 | 3 | A1 |
| | | | | **Total 5 marks** |

| Question | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 17 (a) | $F = \frac{"k"}{x^2}$ | | | M1 *k* must be a letter not a number |
| | $0.8 = \frac{k}{5^2}$ **or** $k = 20$ | | | M1 for substitution (implies first M1) |
| | | $F = \frac{20}{x^2}$ | 3 | A1 Award 3 marks for $F = \frac{"k"}{x^2}$ and $k = 20$ stated anywhere (even in (b)) unless contradicted by later work |
| (b) | $x^2 = \frac{"20"}{320}$ **or** $x = \sqrt{\frac{"20"}{320}}$ | | | M1 ft if $k \neq 1$ for correct rearrangement<br>NB. The only ft is for the value of *k* in $F = \frac{k}{x^2}$ |
| | | 0.25 oe | 2 | A1 cao (ignore ±) |
| | | | | **Total 5 marks** |

| Question | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 18 (a) | $\frac{--6\pm\sqrt{(-6)^2-4\times5\times-2}}{2\times5}$ | | | M1 for correct substitution; condone one sign error ; condone missing brackets around $(-6)^2$; accept 6 and $6^2$ in place of $--6$ and $(-6)^2$ **There may be partial evaluation – if so, this must be correct** |
| | $\sqrt{76}$ or $\sqrt{36+40}$ or $2\sqrt{19}$ or 8.71..... | | | M1 (independent) for correct simplification of discriminant (if evaluated, at least 3sf rounded or truncated) |
| | | 1.47, −0.272 | 3 | A1 for −0.27 to −0.272 **and** 1.47 to 1.472 **Award 3 marks if first M1 scored and answer correct** |
| | **Alternative** $x^2-\frac{6}{5}x-\frac{2}{5}=0$ $(x-\frac{3}{5})^2-\frac{9}{25}-\frac{2}{5}=0$ | | | M1 for $(x-\frac{3}{5})^2$ oe |
| | $(x-\frac{3}{5})=\pm\sqrt{\frac{19}{25}}$ | | | M1 for $(x-\frac{3}{5})=\pm\sqrt{\frac{19}{25}}$ oe |
| | | 1.47, −0.272 | 3 | A1 for −0.27 to −0.272 **and** 1.47 to 1.472 **Award 3 marks if first M1 scored and answer correct** |
| (b) | $m^2 > 81$ **or** $m^2 - 81 > 0$ | | | M1 Allow $m^2 = 81$ **or** $m^2 - 81 = 0$ |
| | $\pm\sqrt{"81"}$ **or** ±9 **or** $(m + 9)(m - 9)$ | | | B1 |
| | | $m > 9$ ; $m < -9$ | 4 | A2 A1 for $m > 9$; A1 for $m < -9$ **dep on at least M1 scored** |
| | | | | **Total 7 marks** |

| Question | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 19 (a) | | $\frac{5}{7}$ for does not win | | B1 on lower first branch **or** on any branch labelled 'does not win' |
| | | correct binary structure | | B1 4 branches needed on RHS |
| | | all labels and values correct | 3 | B1 NB. Allow decimals rounded or truncated to 3 or more sig figs $\left(\frac{2}{7} = 0.285714... ;\ \frac{5}{7} = 0.714285\right)$ |
| (b) | $"\frac{2}{7}"\times"\frac{2}{7}"$ (=0.0813…) **or** $"\frac{2}{7}"\times"\frac{5}{7}"$ (=0.204…) **or** $"\frac{5}{7}"\times"\frac{2}{7}"$ | | | M1 ft for any "correct" product; allow decimals only ft probabilities < 1 **or** M2 for $1 - \left("\frac{5}{7}"\right)^2$ |
| | $"\frac{2}{7}"\times"\frac{2}{7}" + "\frac{2}{7}"\times"\frac{5}{7}" + "\frac{5}{7}"\times"\frac{2}{7}"$ **or** $"\frac{2}{7}"+"\frac{5}{7}"\times"\frac{2}{7}"$ | | | M1 ft for full method |
| | | $\frac{24}{49}$ | 3 | A1 ft ; allow for decimal answer, accept 0.4897959… truncated or rounded to 3 or more sig figs; only accept 0.49 if preceded by more accurate answer or M2 awarded |
| | | | | **Total 6 marks** |

| Question | Working | Answer | Mark | Notes | | |
|---|---|---|---|---|---|---|
| 20 | $x = 0.3888888...$<br>$10x = 3.88888...$<br>$9x = 3.5$<br>$x = \frac{3.5}{9}$ | | | M1 for method as far as attempting to subtract | eg $100x = 38.88888...$<br>$10x = 3.88888...$<br>$90x = 35$<br>$x = \frac{35}{90}$ | eg $1000x = 388.8888...$<br>$10x = 3.88888...$<br>$990x = 385$<br>$x = \frac{385}{990}$ |
| | | $x = \frac{3.5}{9}$ | 2 | A1 must reach $\frac{3.5}{9}$ or equivalent fraction **or** $18x = 7$ before reaching $\frac{7}{18}$ | | |
| | | | | | | **Total 2 marks** |

| Question | Working | Answer | Mark | Notes | |
|---|---|---|---|---|---|
| 21 | $4\pi r^2 = 81\pi$ **or** $4r^2 = 81$ | | | M1 | M2 for $r = 4.5$ **or** |
| | $r = \sqrt{\frac{81\pi}{4\pi}}$ (=4.5) | | | M1 | $r = \sqrt{\frac{81\pi}{4\pi}}$ oe (may be seen in two stages) |
| | $\frac{4}{3} \times \pi \times "4.5"^3$ | | | M1 ft for "$r$" dep on first M1 | |
| | | 382 | 4 | A1 for 381 - 382 | |
| | | | | | **Total 4 marks** |

| Question | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 22 | Bars of height<br>1.2 , 2, 2, 3.6, 1.4 | | | M1 for use of frequency ÷ class width may be implied by 3 correct bars **or** 3 of 6÷5(=1.2) , 10 ÷ 5(=2) , 20 ÷ 10(=2) , 36 ÷ 10(=3.6) , 28 ÷ 20(=1.4) |
| | | | | M1 for at least 4 bars correct **or**<br>all of 1.2, 2, 2, 3.6 and 1.4 (can be implied by correct heights) |
| | | correct histogram | 3 | A1 fully correct histogram<br><br>**SC**: B2 for all bars in correct proportion but at wrong heights (unless rescaled in which case full marks are available)<br>(eg heights of 0.6, 1, 1, 1.8, 0.7) |
| | | | | **Total 3 marks** |

| Question | Working | Answer | Mark | Notes | | |
|---|---|---|---|---|---|---|
| **23** | Angle *AMB* identified | | | M1 | Angle *AMB* identified | |
| | $(BM^2) = 15^2 + 6^2$ | | | M1 | $(AM^2 =) 9^2 + 15^2 + 6^2$ | M2 for $BM = 16.1 - 16.2$ **or** $AM = 18.4 - 18.5$ |
| | $(BM =) \sqrt{15^2 + 6^2}$ **or** $\sqrt{261}$ **or** $3\sqrt{29}$ (=16.1...) | | | M1 (dep on previous M1) | $(AM =)\sqrt{9^2 + 15^2 + 6^2}$ **or** $\sqrt{342}$ **or** $3\sqrt{38}$ (=18.49…) | |
| | $\tan AMB = \frac{9}{"\sqrt{261}"}$ | | | M1 | $\sin AMB = \frac{9}{"18.49"} (\times \sin 90)$ $(= 0.4867)$ etc **or** $\cos AMB = \frac{"16.16"}{"18.49"} (= 0.8735)$ etc **or** correct method to find *AM* and *BM* with correct substitution into Cosine rule and correct rearrangement to make cos*AMB* the subject | |
| | | 29.1 | 5 | A1 | for 29.1 − 29.25<br>NB. If angle *BAM* (60.9) found then maximum of M0M1M1M0A0 unless this is used to go onto find angle AMB | |
| | | | | | | **Total 5 marks** |

| Question | Working | Answer | Mark | Notes | |
|---|---|---|---|---|---|
| 24 | $2^{\frac{1}{2}n} = \frac{2^x}{(2^3)^y}$ | | | M1 | for writing 8 as $2^3$ or $2^{\frac{1}{2}n}$ on lhs |
| | $2^{\frac{1}{2}n} = 2^{x-3y}$ | | | M1 | for $2^{x-3y}$ **or** $\frac{1}{2}n = x - 3y$ |
| | | $n = 2x - 6y$ | 3 | A1 | or for $n = 2(x - 3y)$ **or** $n = (x - 3y) \div 0.5$ |
| | | | | | **Total 3 marks** |

| Question | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| **25** | $\frac{5}{2(x-3)}-\frac{x+2}{(x-3)(x-1)}$ **or** $\frac{5}{2x-6}-\frac{x+2}{(x-3)(x-1)}$ | | | M1 $x^2 - 4x + 3$ factorised correctly |
| | $\frac{5(x-1)}{2(x-3)(x-1)}-\frac{2(x+2)}{2(x-3)(x-1)}$ | | | M1 a correct common denominator – may be a single fraction or two fractions with correct numerators; denominator may be expanded correctly |
| | $\frac{5x-5-2x-4}{2(x-3)(x-1)}$ | | | M1 correct single fraction with numerator expanded correctly; denominator may be expanded correctly |
| | $\frac{3(x-3)}{2(x-3)(x-1)}$ | | | M1 correct factorisation of numerator ; denominator may be expanded correctly |
| | | $\frac{3}{2(x-1)}$ | 5 | A1 Accept $\frac{3}{2x-2}$ |
| | **Alternative** $\frac{5(x^2-4x+3)}{(2x-6)(x^2-4x+3)}-\frac{(2x-6)(x+2)}{(2x-6)(x^2-4x+3)}$ | | | M1 a correct common denominator – may be a single fraction or two fractions with correct numerators; denominator may be expanded correctly |
| | $\frac{5x^2-20x+15-2x^2-4x+6x+12}{(2x-6)(x^2-4x+3)}$ | | | M1 correct single fraction with numerator expanded correctly; denominator may be expanded correctly; |
| | $\frac{3x^2-18x+27}{(2x-6)(x-3)(x-1)}$ | | | M1 $x^2 - 4x + 3$ factorised correctly – could occur earlier |
| | $\frac{3(x-3)^2}{2(x-3)(x-3)(x-1)}$ | | | M1 correct fully factorised numerator and denominator |

| | | | | |
|---|---|---|---|---|
| | | $\frac{3}{2(x-1)}$ | 5 | A1 Accept $\frac{3}{2x-2}$ |
| | | | | **Total 3 marks** |

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

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