

Mark Scheme (Results)

June 2023

Pearson Edexcel International GCSE

Mathematics A (4MA1)

Paper 1HR

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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 – answer which rounds to
  + 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.

If a candidate misreads a number from the question. Eg. Uses 252 instead of 255; method marks may be awarded provided the question has not been simplified. Examiners should send any instance of a suspected misread to review. If there is a choice of methods shown, mark the method that leads to the answer on the answer line; where no answer is given on the answer line, award the lowest mark from the methods shown.

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

| **International GCSE Maths** | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Apart from Questions 1, 12, 15, 16 and 18 (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 |  | e.g.  2 × 5 × 225 or  5 × 5 × 90 or 52 × 90  3 × 5 × 150 or  3 × 3 × 250 or 32 × 250 | |  | 3 | M1 | for 2 correct stages in prime factorisation with 0 incorrect stages  or at least 3 stages in prime factorisation with no more than 1 incorrect stage.  Each stage gives 2 factors – may be in a factor tree or a table or listed eg 2, 2, 225 (see LHS for examples of the amount of work needed for the award of this mark). Example of 3 stages with 1 incorrect stage:  2250 = 225 × 100 = 3 × 5 × 15 × 100  or 225 = 3 × 5 × 15 |
| e.g.   |  |  | | --- | --- | | 2 | 2250 | | 5 | 1125 | |  | 225 | | e.g. |
|  |  | e.g. 2 × 3 × 3 × 5 × 5 × 5 | |  |  | M1 | for 2, 3, 3, 5, 5, 5 or  2 × 3 × 3 × 5 × 5 × 5 or  2 , 32 , 53 oe or  2 + 32 + 53  (ignore 1s)  (may be a fully correct factor tree or ladder) |
| e.g.   |  |  | | --- | --- | | 2 | 2250 | | 5 | 1125 | | 3 | 225 | | 5 | 75 | | 3 | 15 | | 5 | 5 | |  | (1) | | e.g. |
|  |  | *Working required* | |  |  | A1 | dep on M2  can be any order (allow 2 . 32 . 53) |
|  |  |  | |  |  |  | **Total 3 marks** |

| 2 | (a)(i) |  | 5, 7, 11, 13 | 1 | B1 |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | (ii) |  | 5, 6, 8, 10, 12, 14, 15 | 1 | B1 |  |
|  | (b) |  | Correct reason | 1 | B1 | eg 9 is not a member of *C*  **or** 9 is not in *C*  **or** *C* only contains 6, 8, 10, 12, 14  **or** 9 is outside of *C*  there must be no contradictory or incorrect statements |
|  |  |  |  |  |  | **Total 3 marks** |

| 3 | (a) | eg  (= 1.6 oe) **or**  (= 0.625 oe) **or**  oe |  | 2 | M1 | for a correct scale factor accept ratio notation  eg 9.6 : 6  (can be seen near the diagram) |
| --- | --- | --- | --- | --- | --- | --- |
|  |  | *Correct answer scores full marks (unless from obvious incorrect working)* | 2.5 |  | A1 | oe allow 2,5 |
|  | (b) | eg  5.7 × “1.6” **or**  5.7 ÷ “0.625” **or**  **or**  **or** |  | 2 | M1 | ft their scale factor from (a) |
|  |  | *Correct answer scores full marks (unless from obvious incorrect working)* | 9.12 |  | A1 | oe ft their scale factor from (a)  allow 9,12 |
|  |  |  |  |  |  | **Total 4 marks** |

| 4 |  | eg    **or** **or** **or**  **or** |  | 5 | M1 | for a correct start to the method to find *AB* |
| --- | --- | --- | --- | --- | --- | --- |
|  |  | eg  **or**  **or**  **or** |  |  | M1 | for a complete method to find the length of *AB* |
|  |  | eg    **or**  **or**  **or** |  |  | M1 | (indep) for a method to find the circumference of one whole circle **or** the arc length of one semicircle seen (may be embedded) |
|  |  | eg  **or** “9.42” + “9.42” + “13.3”  **or** “18.8” + “13.3” |  |  | M1 | for a complete correct method to find the perimeter of the shape |
|  |  | *Correct answer scores full marks (unless from obvious incorrect working)* | 32.2 |  | A1 | accept answers in the range 32.1 – 32.3 |
|  |  |  |  |  |  | **Total 5 marks** |

| 5 |  | eg0.74 × 300 (= 222) **or** 1 − 0.74 (= 0.26) seen **or** |  | 2 | M1 | for a method to work out an estimate for the number of games Evie will win  **or**  the probability that Evie will lose  **or**  an answer of |
| --- | --- | --- | --- | --- | --- | --- |
|  |  | *Correct answer scores full marks (unless from obvious incorrect working)* | 78 |  | A1 | cao |
|  |  |  |  |  |  | **Total 2 marks** |

| 6 | (a) |  | *m*7 | 1 | B1 |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | (b) |  | 8 | 1 | B1 | Allow *k*8 |
|  | (c) |  | 9*x*12*y*16 | 2 | B2 | B1 for a product in the form *axpyq* where 2 from *a* , *p* or *q* are correct  eg 3*x*12*y*16  (Allow 9*x*12 or 9*y*16 or *x*12*y*16 so as long as not added to any other terms) |
|  |  |  |  |  |  | **Total 4 marks** |

| 7 | (a) |  | 4*x*2 – 20*x* | 1 | B1 | or – 20*x* + 4*x*2 |
| --- | --- | --- | --- | --- | --- | --- |
|  | (b) | (*y* ± 5)(*y* ± 4) or (5 ± *y*) (4 ± *y*) or or |  | 2 | M1 | for (*y* ± 5)(*y* ± 4)  **or**  (5 ± *y*) (4 ± *y*)  **or**  for (*y* + *a*)(*y* + *b*)  where *ab* = 20 or *a* + *b* = −9 |
|  |  | *Correct answer scores full marks (unless from obvious incorrect working)* | (*y* − 5)(*y* – 4) |  | A1 | oe Allow any letter for *y*  Accept (5 − *y*) (4 − *y*) |
|  |  |  |  |  |  | **Total 3 marks** |

| 8 | (a) |  | 0.0056 | 1 | B1 |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | (b) | 20 000 000 oe eg 20 × 106 or 0.2 × 108  **or** 2 × 10*n* *n* ≠ 7 **or**  **or** **or**  **or** **or** |  | 2 | M1 |  |
|  |  | *Correct answer scores full marks (unless from obvious incorrect working)* | 2 × 107 |  | A1 |  |
|  |  |  |  |  |  | **Total 3 marks** |

| 9 |  | 0.12 × 700 000 oe (= 84 000) **or**0.88 × 700 000 oe (= 616 000) **or**  700 000 × 0.882 oe (= 542 080) |  | 3 | M1 | for finding 12% **or** 88% of 700 000 | M2 for  700 000 × 0.883  **or**  700 000 × 0.884  (= 419 786.75) |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | 0.88 × “616 000” oe (= 542 080)**and** 0.88 × “542 080” oe (= 477 030.4) |  |  | M1 | for completing method to find the value of the car |
|  |  | *Correct answer scores full marks (unless from obvious incorrect working)* | 477 030 |  | A1 | accept 477 030 – 477 031 | |
|  |  |  |  |  |  | **SC:** if no other marks gained award M1 for  0.36 × 700 000 oe **or** 252 000  **or** 0.64 × 700 000 oe **or** 448 000  accept (1 − 0.12) as equivalent to 0.88 throughout | |
|  |  |  |  |  |  | **Total 3 marks** | |

| 10 |  |  | Triangle with vertices(3, 6) (3, 9) (5, 6) | 2 | B2  (B1 | for a fully correct shape with correct orientation and in the correct position.  for a shape of correct size and orientation  **or** 2 or 3 points plotted correctly) |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  | **Total 2 marks** |

| 11 |  | **or** or |  | 3 | M1 | for correct method to find volume using mass ÷ density **or** a correct equation with correct expression for volume  (may be embedded in another calculation) |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | eg**or** **or** 20*w* = “250” **or** 4 × 5 × *w* = “250”  **OR**  eg    **or** 1950 ÷ (20 ×7.8)  **or** 1950 ÷ 156  **or** “250” ÷ 20 |  |  | M1 | for a fully correct equation in *w*  **or**  a fully correct calculation to find the value of *w* (may be labelled eg *x* or *L*) |
|  |  | *Correct answer scores full marks (unless from obvious incorrect working)* | 12.5 |  | A1 |  | |
|  |  |  |  |  |  | **Total 3 marks** | |

| 12 | (a) | | eg  *x* + 0.15 + 0.5 + *y* + 0.13 + 0.03 = 1 oe **or**  *x* + *y* = 1 − 0.15 − 0.5 − 0.13 − 0.03 oe **or**  *x* + *y* + 0.81 = 1 oe **or**  *x* + *y* = 1 – 0.81 oe **or**  1 − 0.15 − 0.5 − 0.13 − 0.03 = 0.19 oe **or**  1 − 0.81 = 0.19 oe | | | |  | | 2 | | M1 | | for setting up an equation in *x* and *y* using the sum of probabilities equals 1  **or**  for showing that probabilities add up to 1 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | | *Working required* | | | | Shown | |  | | A1 | | correctly rearranges to  *x* + *y* = 0.19 (must be shown from a correct method)  **or**  a clear statement that *x* + *y* = 0.19 |
|  | (b) | | *x* + *y* = 0.19  3*x* – *y* = 0.09  Adding  (*x* + 3*x* = 0.19 + 0.09 or  4*x* = 0.28)  **or**  3*x* – (0.19 – *x*) = 0.09  or  *x* + 3*x* – 0.09 = 0.19 | | 3*x* + 3*y* = 0.57  3*x* − *y* = 0.09  Subtracting  (3*y* – – *y* = 0.57 – 0.09 or  4*y* = 0.48)  **or**  3(0.19 – *y*) – *y* = 0.09  or | |  | | 3 | | M1 | | for a correct method to eliminate *x* or *y*:  coefficients of *x* or *y* the same **and** correct operator to eliminate selected variable (condone any one arithmetic error in multiplication)  **or**  writing *x* or *y* in terms of the other variable and correctly substituting (condone missing brackets) |
|  |  | | “0.07” + *y* = 0.19  or  3 × “0.07”– *y* = 0.09  **or**  *y* = 0.19 – “0.07”  or  *y* = 3 × “0.07” – 0.09 | | 3*x* + 3 × “0.12” = 0.57  or  3*x* – “0.12” = 0.09  **or**  *x* = 0.19 – “0.12”  or | |  | |  | | M1 | | dep on first M1for a correct method to find other variable by substitution of found variable into one equation  **or**  for repeating the above method to find the second variable. |
|  |  | | *Working required* | | | | *x* = 0.07 and*y* = 0.12 | |  | | A1 | | oe dep on M1 |
|  |  | |  | | | |  | |  | |  | | **Total 5 marks** |
| 13 | | (a) | |  | | 0.1 and 0.6 | | 1 | | B1 | | oe | |
|  | | (b) | | 0.7 × 0.9 or  1 – (0.7 × “0.1” + 0.3 × 0.4 + 0.3 × “0.6”) | |  | | 2 | | M1 | | must be considering one correct product only or 1 – (all 3 correct products only)  allow ft if using  1 – P(WL or LW or LL) | |
|  | |  | | *Correct answer scores full marks (unless from obvious incorrect working)* | | 0.63 | |  | | A1 | | oe eg 63% or  allow ft if using  1 – P(WL or LW or LL) | |
|  | |  | |  | |  | |  | |  | | **Total 3 marks** | |

| 14 | (a) |  | 15, 31, 52, 66, 74, 80 | 1 | B1 |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | (b) |  |  | 2 | M1 | ft from table for at least 5 points plotted correctly at end of interval **or** ft from sensible table for all 6 points plotted consistently within each interval in the **freq table** at the correct height |
|  |  |  | Correct cf curve |  | A1 | accept curve or line segments  accept curve that is not joined at (50,0) |
|  | (c) | *Correct answer scores full marks (unless from obvious incorrect working)* | 73 – 75 | 1 | B1ft | ft their cumulative frequency graph |
|  | (d) | NB: readings are 62.5 – 64 and 85 – 86.5 (but for this M1 these do not have to be correct if correct working is shown – eg lines or marks indicating use of CF 20 (or 20.25)and CF 60 (or 60.75) with an indication on the Time Taken axis at the correct points (or they can just show the correct readings)) |  | 2 | M1ft | For correct use of LQ and UQ, ft from a cum freq graph provided method is shown – eg a line horizontally to the graph from readings of CF 20 and CF 60 to meet the graph and then a vertical line to the Time Taken axis (even if wrongly read scale) **or** clear marks on the graph and Time Taken axis that correspond to the correct readings **or** correct values from the Time Taken axis |
|  |  | If answer is in the given range, then award the marks – unless from obvious incorrect working | 21 to 24 |  | A1ft | Accept a single value in range 21 to 24 or ft from their cumulative frequency graph provided method is shown |
|  |  | *Correct answer scores full marks (unless from obvious incorrect working)* |  |  |  | **Total 6 marks** |

| 15 |  | eg (6 – 2) × 180 (= 720) |  | 4 | M1 | for a method to find the sum of the interior angles for a hexagon |
| --- | --- | --- | --- | --- | --- | --- |
|  |  | eg |  |  | M1 | for a method to find the missing angle in the hexagon |
|  |  | eg **or**  **or**  oe  **or** |  |  | M1 | for a complete method |
|  |  | *Working required* | 8 |  | A1 | cao dep on M2  NB: the answer of 8 can be gained from assuming that *AB* splits reflex *GBC* into 2 equal angles – without gaining the first 2 method marks [M0M0 is awarded]  Award SCB1 for the student who gains an answer of 8 from this assumption or trial and improvement or no method shown |
|  |  |  |  |  |  | **Total 4 marks** |

| **16** |  | eg 10 000*x* = 1767.67…\_  100*x* = 17.67…  **or** 1000*x* = 176.76…\_  10*x* = 1.76…  **or** 100*x* = 17.676…\_  *x* = 0.176…  oe |  | 2 | M1 | for 2 recurring decimals that when subtracted give a whole number or terminating decimal (17.5 or 175 or 1750 etc)  eg 10 000*x* = 1767.67... and 100*x* = 17.676....  **or** 1000*x* = 176.76… and 10*x* = 1.7676…  **or** 100*x* = 17.676… and *x* = 0.17676…  with intention to subtract.  (if recurring dots not shown in both numbers then showing at least **one** of the numbers to at least 5sf)  **or and** eg with intention to subtract. | |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | eg 10 000*x* – 100*x* = 1767.67... – 17.67...= 1750 **and**  **or**  1000*x* – 10*x* = 176.76... – 1.76...= 175  **and**  **or**  100*x* – *x* = 17.676... – 0.176...= 17.5  **and**  **or**  eg 10*x* – *x* = 7.6767... – 0.07676...= 7.6  **and** oe | shown | A1 | for completion to dep on M1 | |
|  |  | *Working required* |  |  |  | | **Total 2 marks** |

| 17 | (a) | or |  | 3 | M1 | (NB. Not for )  Constant of proportionality must be a symbol such as *k* | M2 for oe |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | oe **or**  **or** *k* = 576 |  |  | M1 | for substitution of *F* and *r* into a correct formula |
|  |  | *Correct answer scores full marks (unless from obvious incorrect working)* |  |  | A1 | oe e.g  Award 3 marks if answer is  on the answer line and clearly given in the body of working of the script | |
|  | (b) |  | 0.25 | 1 | A1ft | oe dep on M1 in part (a) and  for their value of *k* if | |
|  |  |  |  |  |  | **Total 4 marks** | |

| 18 |  | 47.5 **or** 52.5 **or** 1.25 **or** 1.35 |  | 4 | B1 | for a correct bound, accept 4750 **or** 5250 **or** 125 **or** 135 if working in cm |
| --- | --- | --- | --- | --- | --- | --- |
|  |  | eg**or** |  |  | M1 | for correct substitution of  47.5 *LBF*< 50  **and** 1.3 < *UBFP* 1.35  **or**  50 < *UBF* 52.5  **and** 1.25 *LBFP*< 1.3 |
|  |  | eg**or** “42” × 8.65 – “36” × 8.65 **or**  363.3 – 311.4 |  |  | M1 | (dep on M1) for using **their** lower and upper bounds for the number of fence panels needed to find the cost – lower bound and/or upper bound must be an integer rounded up |
|  |  | *Working required* | 51.9(0) |  | A1 | cao dep on M2 |
|  |  |  |  |  |  | **Total 4 marks** |

| 19 |  | eg  **or** **or**  **or** |  | 5 | M1 | for a method for finding or  or  for sight of or |
| --- | --- | --- | --- | --- | --- | --- |
|  |  | eg |  |  | M1 | (dep on previous M1) for a method to find the magnitude of or |
|  |  | eg  **or** |  |  | M1 | (indep) for a method to find the magnitude of either **or** |
|  |  | **or**  **or**  “7.28” + “5.83” (= 13.1(110)) |  |  | M1 | (dep on previous M1) for a complete method to find Pru’s distance travelled |
|  |  | *Correct answer scores full marks (unless from obvious incorrect working)* | 8.1 |  | A1 | accept 8.1 – 8.2, to award full marks must be correct |
|  |  |  |  |  |  | **Total 5 marks** |

| 20 | (a)(i) |  | | (3, 10) | 1 | B1 |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | (ii) |  | | (3, −2) | 1 | B1 |  |
|  | (iii) |  | | (−3, 5) | 1 | B1 |  |
|  | (b) |  | or |  | 4 | M1 | for sight or use of (*x* ± 2) or  (*x* + 1.5) or (*x* + 5.5) |
|  |  |  | or |  |  | M1 | for correct substitution or correct use of (*x* ‒ 2) for *x* into **L** |
|  |  |  | or |  |  | M1 | dep on M2  for expanding brackets **correctly** |
|  |  | *Correct answer scores full marks (unless from obvious incorrect working)* | |  |  | A1 |  |
|  |  |  | |  |  |  | **Total 7 marks** |

| 21 | (a) | 3*x*² or −2×2*x* or −4*x* or−9 oe |  | 2 | M1 | for differentiating one term correctly |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  | A1 | for a correct expression  Allow |
|  | (b) | **or** |  | 4 | M1 | for finding the critical values for a 3-term quadratic using any correct method - if using formula or completing the square allow one sign error and some simplification – allow as far as eg oe  **or** eg oe) |
|  |  |  | −1.19 and 2.52 |  | A1 | for critical values  of −1.19 **and** 2.52 or better  (for this A1 mark allow  –1.2 or –1.18 **and** 2.5  **or** oe) |
|  |  |  |  |  | A1 | awrt −1.19 |
|  |  |  |  |  | A1 | awrt 2.52 |
|  |  |  |  |  |  | **Total 6 marks** |

| 22 |  | e.g. 20 × 9 (= 180) or  20 × 0.9 (= 18) or  20 × 1.8 (= 36) or  (4 × 25) + (4 × 20) (= 180) oe or  4 × 0.9 (= 3.6) or  4 × 1.8 (7.2) |  | 4 | M1 | for a method to find the area of the 55 - 75 bar |
| --- | --- | --- | --- | --- | --- | --- |
|  |  | e.g.  5 × 16 + 5 × 50 + 10 × 33 + 10 × 19 + 25 × 9 (= 1075) or  5 × 1.6 + 5 × 5 + 10 × 3.3 + 10 × 1.9 + 25 × 0.9 (= 107.5) or  5 × 3.2 + 5 × 10 + 10 × 6.6 + 10 × 3.8 + 25 × 1.8 (= 215) or  (3×25 + 5) + (10×25) + (12×25 + 2×15) + (6×25 + 2×20) +  (5×25 + 5×20) (= 1075) or  1 × 1.6 + 1 × 5 + 2 × 3.3 + 2 × 1.9 + 5 × 0.9 (= 21.5) or  1 × 3.2 + 1 × 10 + 2 × 6.6 + 2 × 3.8 + 5 × 1.8 (= 43) |  |  | M1 | for a method to find the total area    **Using 5 bars** (products or areas)  eg 80 + 250 + 330 + 190 + 225 or  16 + 50 + 66 + 38 + 45  allow one error or omission  **Using 6 bars** (products or areas)  eg 80 + 250 + 330 + 190 + 45 + “180” or  16 + 50 + 66 + 38 + 9 + “36”  allow one error or omission |
|  |  | e.g.  or or or or or 0.167(441…) (× 100) |  |  | M1 | for a method to find a fraction aged 55+ or percentage aged 55+ using all **correct** values only |
|  |  | *Correct answer scores full marks (unless from obvious incorrect working)* | 16.7 |  | A1 | awrt 16.7 |
|  |  |  |  |  |  | **Total 4 marks** |

| 23 |  | oe or  oe |  | 4 | M1 | for complete factorisation of **or**  Each factor must be in the form (*ax* ± *b*) where *a* and *b* are integers |
| --- | --- | --- | --- | --- | --- | --- |
|  |  | or  or |  |  | M1 | for complete factorisation of **and** and inverting and intention to multiply |
|  |  | or or  or |  |  | M1 | for a correct single fraction following correct cancellation  or  for two correct fractions with common denominator following correct cancellation |
|  |  | *Correct answer scores full marks (unless from obvious incorrect working)* |  |  | A1 | oe but must be in form where *a*, *b* and *c* are integers. |
|  |  |  |  |  |  | **Total 4 marks** |

| 23 **ALT** |  | oe |  | 4 | M1 | for a correct single fraction |
| --- | --- | --- | --- | --- | --- | --- |
|  |  | oe |  |  | M1 | for complete factorisation of **or**  Each factor must be in the form (*ax* ± *b*) |
|  |  | oe |  |  | M1 | for complete factorisation of **and**  Each factor must be in the form (*ax* ± *b*) |
|  |  | *Correct answer scores full marks (unless from obvious incorrect working)* |  |  | A1 | oe but must be in form where *a*, *b* and *c* are integers. |
|  |  |  |  |  |  | **Total 4 marks** |

| 24 |  | 23 **and**  24*x* or (24)*x* |  | 5 | M1 | for writing 16*x* **and** 8 as a power of 2 (or all as powers of 4,8 or 16) |
| --- | --- | --- | --- | --- | --- | --- |
|  |  | *n* = *x*2 + 4*x* + 3 oe or  *x*2 + 4*x* + 3 − *n* = 0 |  |  | A1 | for writing *n* in terms of *x*  correct expression implies first M1 |
|  |  | oe or  oe |  |  | M1 | for a correct first step in completing the square or using the quadratic formula correctly  ft their 3 term quadratic |
|  |  | oe or  oe |  |  | A1 | for correctly rearranging to make *x* the subject (must be positive square root) |
|  |  | *Correct answer scores full marks (unless from obvious incorrect working)* | **and** *n* > 3 |  | A1 | must be positive square root  Accept oe and  3 < *n*  Accept oe  **and** *n* > 3 or 3 < *n* |
|  |  |  |  |  |  | **Total 5 marks** |

| 24 **ALT** |  | , ,  **and** | ,  **and** | ,  **and** |  | 5 | M1 | for all as powers of 4 or 8 or 16 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | *n* = *x*2 + 4*x* + 3 oe or  *x*2 + 4*x* + 3 − *n* = 0 | | |  |  | A1 | for writing *n* in terms of *x*  correct expression implies first M1 |
|  |  | oe or  oe | | |  |  | M1 | for a correct first step in completing the square or using the quadratic formula correctly  ft their 3 term quadratic |
|  |  | oe or  oe | | |  |  | A1 | for correctly rearranging to make *x* the subject (must be positive square root) |
|  |  | *Correct answer scores full marks (unless from obvious incorrect working)* | | | **and** *n* > 3 |  | A1 | must be positive square root  Accept oe and  3 < *n*  Accept oe  **and** *n* > 3 or 3 < *n* |
|  |  |  | | |  |  |  | **Total 5 marks** |

| 25 | eg oe |  | 6 | M1 | for equating area of triangle with the given area |
| --- | --- | --- | --- | --- | --- |
|  |  | 3.5 |  | A1 | for the value of *x* |
|  | oe  or (*BC* =) (= 4.10(628…)) |  |  | M1 | ft dep on M1 for a correct method to find *BC*2 or *BC*  (*AB* = 6 and *AC* = 8) |
|  | oe or oe or  oe or  oe |  |  | M1 | ft dep on previous M1 for a correct method to find angle *ABC* or angle *BCA* |
|  | oe or *ABC* = 76.9… oroe or *BCA* = 46.9… or  oe or *BCA* = 46.9… or  oe or *ABC* = 103.0… |  |  | M1 | ft dep on previous M1 for a correct rearrangement for sin *ABC* or sin *BCA* or cos *BCA* or cos *ABC* |
|  | *Correct answer scores full marks (unless from obvious incorrect working)* | 103 |  | A1 | accept awrt 103 |
|  |  |  |  |  | **Total 6 marks** |

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