OCR
RECOGNISING ACHIEVEMENT

GCSE

# Mathematics A

General Certificate of Secondary Education

Unit **A503/02:** Mathematics C (Higher Tier)

# Mark Scheme for November 2013

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

OCR will not enter into any discussion or correspondence in connection with this mark scheme.

**Annotations used in the detailed Mark Scheme.**

| Annotation | Meaning |
|---|---|
|  | Correct |
|  | Incorrect |
| BOD | Benefit of doubt |
| FT | Follow through |
| ISW | Ignore subsequent working (after correct answer obtained), provided method has been completed |
| M0 | Method mark awarded 0 |
| M1 | Method mark awarded 1 |
| M2 | Method mark awarded 2 |
| A1 | Accuracy mark awarded 1 |
| B1 | Independent mark awarded 1 |
| B2 | Independent mark awarded 2 |
| MR | Misread |
| SC | Special case |
| ^ | Omission sign |

These should be used whenever appropriate during your marking.

The **M**, **A, B**, etc annotations must be used on your standardisation scripts for responses that are not awarded either 0 or full marks.
It is vital that you annotate these scripts to show how the marks have been awarded.
It is not mandatory to use annotations for any other marking, though you may wish to use them in some circumstances.

**Subject-Specific Marking Instructions**

1. **M** marks are for using a correct method and are not lost for purely numerical errors.
   **A** marks are for an accurate answer and depend on preceding **M** (method) marks. Therefore **M0 A1** cannot be awarded.
   **B** marks are independent of **M** (method) marks and are for a correct final answer, a partially correct answer, or a correct intermediate stage.
   **SC** marks are for special cases that are worthy of some credit.

2. Unless the answer and marks columns of the mark scheme specify **M** and **A** marks etc, or the mark scheme is 'banded', then if the correct answer is clearly given and is not from wrong working **full marks** should be awarded.

   Do not award the marks if the answer was obtained from an incorrect method, ie incorrect working is seen and the correct answer clearly follows from it.

3. Where follow through (**FT**) is indicated in the mark scheme, marks can be awarded where the candidate's work follows correctly from a previous answer whether or not it was correct.

   Figures or expressions that are being followed through are sometimes encompassed by single quotation marks after the word *their* for clarity, eg FT 180 × (*their* '37' + 16), or FT 300 – √(*their* '$5^2 + 7^2$'). Answers to part questions which are being followed through are indicated by eg FT 3 × *their* (a).

   For questions with FT available you must ensure that you refer back to the relevant previous answer. You may find it easier to mark these questions candidate by candidate rather than question by question.

4. Where dependent (**dep**) marks are indicated in the mark scheme, you must check that the candidate has met all the criteria specified for the mark to be awarded.

5. The following abbreviations are commonly found in GCSE Mathematics mark schemes.

   - **figs 237**, for example, means any answer with only these digits. You should ignore leading or trailing zeros and any decimal point eg 237000, 2.37, 2.370, 0.00237 would be acceptable but 23070 or 2374 would not.
   - **isw** means **ignore subsequent working** after correct answer obtained and applies as a default.
   - **nfww** means **not from wrong working**.
   - **oe** means **or equivalent**.
   - **rot** means **rounded or truncated**.
   - **seen** means that you should award the mark if that number/expression is seen anywhere in the answer space, including the answer line, even if it is not in the method leading to the final answer.
   - **soi** means **seen or implied**.

6. In questions with no final answer line, make no deductions for wrong work after an acceptable answer (ie **isw**) unless the mark scheme says otherwise, indicated by the instruction 'mark final answer'.

7. In questions with a final answer line following working space,

   (i) if the correct answer is seen in the body of working and the answer given on the answer line is a clear transcription error allow full marks unless the mark scheme says 'mark final answer'. Place the annotation ✓ next to the correct answer.

   (ii) if the correct answer is seen in the body of working but the answer line is blank, allow full marks. Place the annotation ✓ next to the correct answer.

   (iii) if the correct answer is seen in the body of working but a completely different answer is seen on the answer line, then accuracy marks for the answer are lost. Method marks could still be awarded. Use the M0, M1, M2 annotations as appropriate and place the annotation × next to the wrong answer.

8. In questions with a final answer line:

   (i) If one answer is provided on the answer line, mark the method that leads to that answer.

   (ii) If more than one answer is provided on the answer line and there is a single method provided, award method marks only.

   (iii) If more than one answer is provided on the answer line and there is more than one method provided, award zero marks for the question unless the candidate has clearly indicated which method is to be marked.

9. In questions with no final answer line:

   (i) If a single response is provided, mark as usual.

   (ii) If more than one response is provided, award zero marks for the question unless the candidate has clearly indicated which response is to be marked.

10. When the data of a question is consistently misread in such a way as not to alter the nature or difficulty of the question, please follow the candidate's work and allow follow through for **A** and **B** marks. Deduct 1 mark from any **A** or **B** marks earned and record this by using the MR annotation. **M** marks are not deducted for misreads.

11. Unless the question asks for an answer to a specific degree of accuracy, always mark at the greatest number of significant figures even if this is rounded or truncated on the answer line. For example, an answer in the mark scheme is 15.75, which is seen in the working. The candidate then rounds or truncates this to 15.8, 15 or 16 on the answer line. Allow full marks for the 15.75.

12. Ranges of answers given in the mark scheme are always inclusive.

13. For methods not provided for in the mark scheme give as far as possible equivalent marks for equivalent work. If in doubt, consult your Team Leader.

14. Anything in the mark scheme which is in square brackets […] is not required for the mark to be earned, but if present it must be correct.

| Question | | | Answer | Marks | Part Marks and Guidance | |
|---|---|---|---|---|---|---|
| 1 | (a) | | - - - 9<br>- 7 9 11<br>7 9 11 13<br>9 11 13 15 | 2 | **B1** for 6 correct entries | |
| | (b) | | Certain<br>Unlikely | 1<br>1 | | |
| | (c) | | $\frac{1}{4}$ | 2 | **B1** for $\frac{4}{n}$ or $\frac{n}{16}$ | |
| | (d) | | $\frac{3}{16}$ or 0.1875 or 18.75% | 1 | | |
| 2 | (a) | | 84 | 2 | **M1** for 7 × 3 × 4 | |
| | (b) | | Correct isometric drawing | 3 | For **3** marks condone hidden edges shown as dotty lines<br><br>Or **B2** for correct isometric drawing but with hidden edges shown solid or incorrect<br><br>Or **B1** for one correct face | Allow freehand if intention clear – ie just misses dot<br>Ignore any non-edge lines |
| 3 | (a) | | $3.32x = 34 – (1.24 × 6)$ oe<br>8 | M2<br>B2 | *Final 2 marks available without algebra*<br>**M1** for $3.32x + (1.24 × 6) = 34$ oe<br>**B1** for $[x =] (34 – 1.24 × 6) ÷ 3.32$ oe soi | |
| | (b) | | £5.09 or £5.10 or £5.11 | 3 | **M2** for (4.56 or 3.32 or 1.24) × 1.12 oe<br><br>Or **M1** for (4.56 or 3.32 or 1.24) × 0.12 oe | Soi by 5.1072 or 3.7184 or 1.3888 rot<br>Soi by 0.5472 or 0.3984 or 0.1488 rot |

| Question | | | Answer | Marks | Part Marks and Guidance | |
|---|---|---|---|---|---|---|
| 4 | (a) | | 11.6 | 2 | **M1** for 3.7 + 2.1 + 3.7 + 2.1 oe | |
| | (b) | | $10x - 6$ or $2(5x - 3)$ final answer | 3 | **M2** for $2(3x + 2 + 2x - 5)$ oe soi<br>OR<br>**B1** for $6x + 4$ seen<br>**B1** for $4x - 10$ seen<br><br>After **0**, allow **SC1** for $5x - 3$ seen or for $10x$ seen in answer | |
| | (c) | (i) | 48.69 to 48.71 | 2 | **M1** for $\pi \times 15.5$ oe | |
| | | (ii) | 1.8 or $\frac{9}{5}$ or $1\frac{4}{5}$<br><br>1.8[0…] or $\frac{9}{5}$ or $1\frac{4}{5}$ | 2<br><br>1FT | **M1** for 27.9 ÷ 15.5 or (87.65 to 87.7) ÷ (48.69 to 48.71)<br><br>FT *their* scale factor | |
| 5 | | | - - 5<br><br>- $\frac{1}{30}$ -<br><br>$\frac{3}{8}$ or $\frac{6}{16}$ - $\frac{15}{8}$ or $\frac{30}{16}$ or $1\frac{7}{8}$ | 1<br><br>1<br><br>1, 1FT | <br><br>For $\frac{1}{30}$ accept 0.033 or better<br><br>For $\frac{3}{8}$ accept 0.375<br><br>For $\frac{15}{8}$ accept 1.875. FT *their* values | Condone $\frac{5}{1}$ |
| 6 | | | 0.16 oe | 3 | **M2** for $(1 - 0.15 - 0.37) \div 3$ oe soi<br><br>Or **M1** for $1 - 0.15 - 0.37$ soi by 0.48 | **M2** implied by an answer figs 16 |

| Question | | | Answer | Marks | Part Marks and Guidance | |
|---|---|---|---|---|---|---|
| 7 | (a) | | $5(x + 2)$ final answer | 1 | | |
| | (b) | (i) | $x^3 - 5x$ final answer | 2 | **B1** for $x^3$ or $-5x$ seen | |
| | | (ii) | $11x + 2$ final answer | 3 | **B1** for $3x + 6$<br>**B1** for $8x - 4$<br><br>After **0**, allow **SC1** for $11x$ seen in answer | |
| 8 | (a) | | 0.25[0] | 4 | nfww<br>**M2** for $(0.5 \times 0.3 \div 2) + (0.5 \times 0.7 \div 2)$ oe<br>Or **M1** for $0.5 \times 0.3 \div 2$ or $0.5 \times 0.7 \div 2$<br>AND<br>**A1** for 0.075 or 0.175 | For **M2** and **M1** allow correct work in cm |
| | (b) | | FT *their* (a) × 10 000 | 1FT | Integer or standard form | |
| 9 | (a) | (i) | 2.5 | 1 | | |
| | | (ii) | 1997 | 2 | **M1** for 2013 – 16 oe | |
| | (b) | | 4453.51 or 4453.52 | 1 | | |
| 10 | (a) | | $8.5 \times 10^{-6}$, $6.8 \times 10^{-5}$, $8.6 \times 10^{5}$, $5.6 \times 10^{8}$ | 2 | **B1** for one value misplaced | ie if any one value is covered, are the other three in order? |
| | (b) | | 107 to 108 or $1.07 \times 10^2$ to $1.08 \times 10^2$ | 2 | **M1** for $(1.4 \times 10^{11}) \div (1.3 \times 10^9)$ oe | |

| Question | | | Answer | Marks | Part Marks and Guidance | |
|---|---|---|---|---|---|---|
| 11 | | | $x = 1.4$ $y = -0.3$ | 3 | **B2** for one value correct or for answers reversed<br>OR<br>**M1** for equalising $x$ or $y$ coefficients<br>**M1** for correctly adding or subtracting *their* equations soi<br>OR<br>**M1** for correct rearrangement into $x =$ or $y =$<br>**M1** for correct substitution | <br><br><br>Allow one error or omission<br>Allow one error or omission<br><br><br>Allow one error or omission<br>Allow one error or omission |
| 12 | (a) | | 0.2 and 0.8 correctly placed throughout | 2 | **B1** for 0.2 correctly placed once | |
| | (b) | | 0.36 oe | 3 | **M2** for 1 – (0.8 × 0.8) oe<br>or for (0.8 × 0.2) + (0.2 × 0.8) + (0.2 × 0.2) oe soi<br>Or **M1** for 0.8 × 0.2 or 0.2 × 0.8 or 0.2 × 0.2 oe soi | FT *their* tree for **M2** or **M1**<br>May be on diagram |
| 13 | (a) | | …, 2, 0, …, …, 6 | 2 | **B1** for 2 values correct | |
| | (b) | | *Their* 6 points correctly plotted<br>Curve through *their* 6 points | 2FT<br>1FT | **B1** for 4 of *their* points correctly plotted<br>Curve must go below $x$-axis. Not too 'hairy' | ± ½ small square<br>± ½ small square |
| | (c) | | 1.2 to 1.4 and $-2.2$ to $-2.4$ | 2 | **B1** for one value correct | |
| | (d) | | Ruled graph of $y = x + 2$<br>$x = 1.3$ to $1.5$ $y = 3.3$ to $3.5$<br>$x = -1.3$ to $-1.5$ $y = 0.5$ to $0.7$ | M1<br>B1<br>B1 | After **B0**, allow **SC1** for any two of the four values correct and in correct place or for both pairs correct but answers reversed | |

| Question | | | Answer | Marks | Part Marks and Guidance | |
|---|---|---|---|---|---|---|
| 14 | | | $^-0.21$ and $^-4.8$ | 3 | **B3** only after using quadratic formula<br>Or **B2** for one value correct<br>or for $^-0.20871..$ and $^-4.7912..$ rot<br>Or **M1** for $\frac{-5 \pm \sqrt{(5^2 - 4 \times 1 \times 1)}}{2 \times 1}$<br>or for $(x + 2.5)^2 - 6.25 + 1$ oe | **B2** or **M1** available after using complete the square |
| 15 | (a) | | $(x - 3)(x + 3)$ final answer | 1 | | |
| | (b) | | $(x - 3)(x - 1)$ final answer | 2 | **M1** for $(x \pm 3)(x \pm 1)$ | |
| | (c) | | $\frac{x-1}{x+3}$ final answer | 1 | | |
| 16 | | | $4, ^-4\sqrt{3}, [+][1]\sqrt{3}, ^-\sqrt{3}\sqrt{3}$ all seen<br>$1 - 3\sqrt{3}$ | M2<br>B1 | **M1** for two of $4, ^-4\sqrt{3}, [+][1]\sqrt{3}, ^-\sqrt{3}\sqrt{3}$ seen | Allow $^-3$ or $^-\sqrt{9}$ or $^-\sqrt{3^2}$ for $^-\sqrt{3}\sqrt{3}$ |
| 17 | | | 51 | 4 | **B3** for 51.5151… rot<br>OR<br>**B1** for use of 25.5 (kg) or 25500 (g)<br>**B1** for use of 0.495 (kg) or 495 (g)<br>**M1** for $\frac{\textit{their}\ 25500}{\textit{their}\ 495}$ | Leading to their answer<br>Leading to their answer<br>For **M** mark allow any $\frac{\text{sack weight}}{\text{bag weight}}$<br>eg $\frac{2500}{500}$ |

| Question | | | Answer | Marks | Part Marks and Guidance | |
|---|---|---|---|---|---|---|
| **18** | | | $\pi \times 1.2^2 \times 3$ | M1 | Soi by **A** marks | |
| | | | $\frac{1}{3} \times \pi \times 1.2^2 \times 3$ | M1 | Soi by **A** marks | |
| | | | 18 to 18.15 or $\frac{144}{25}\pi$ oe | A2 | **A1** for 13.5 to 13.6 or $\frac{108}{25}\pi$ or for 4.5 to 4.52 or $\frac{36}{25}\pi$ | **A2** may be implied by *their* final answer |
| | | | *Their*(total volume) × 0.79 | M2 | **M1** for (part volume) × 0.79 soi by 10.66 to 10.75 or 3.5 to 3.6 | |
| | | | 14 to 14.4 | A1 | | |
| **19*** | | | Answer of 161.99 to 162.24 with correct and clear method shown. Appropriate language throughout. | 6 | $x^2 + x^2 + x^2 = 9^2$<br>$3x^2 = 81$<br>$x^2 = 27$<br>$(x = \sqrt{27})$<br>$SA = 6x^2 = 162$ *(Allow 161.99 to 162.24)* | For Pythagoras:<br>- *a*, *b* and *c* must be a number or a letter (one of which may be *a*, *b* or *c*)<br>- allow cosine rule with angle 90 |
| | | | Correct answer and method shown but with less structure to solution and slips in notation | 5-4 | Attempt to use 3D Pythagoras (could be using 2D twice) **and** attempt to find total surface area | |
| | | | Any attempt at Pythagoras in 3D **Or** correct use of Pythagoras in 2D **and** considers total surface area | 3-2 | Any attempt at Pythagoras in 3D **Or** any attempt at Pythagoras in 2D **and** considers total surface area | For **3** or more marks Pythag. must contain *x* |
| | | | Any attempt at Pythagoras in 2D **or** attempt to find total surface area | 1-0 | No relevant comment | For **2** or **1** marks Pythag. may be using values or letters and a value |

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