

# GCSE

# Mathematics

Unit 3 43603H

Mark scheme

---

43603H  
June 2015

---

Version 1: Final Mark Scheme

---

---

Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all associates participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every associate understands and applies it in the same correct way. As preparation for standardisation each associate analyses a number of students' scripts: alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Assessment Writer.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Further copies of this Mark Scheme are available from [aqa.org.uk](http://aqa.org.uk)

## Glossary for Mark Schemes

GCSE examinations are marked in such a way as to award positive achievement wherever possible. Thus, for GCSE Mathematics papers, marks are awarded under various categories.

If a student uses a method which is not explicitly covered by the mark scheme the same principles of marking should be applied. Credit should be given to any valid methods. Examiners should seek advice from their senior examiner if in any doubt.

|                        |  |
|------------------------|--|
| <b>M</b>               | Method marks are awarded for a correct method which could lead to a correct answer.  |
| <b>A</b>               | Accuracy marks are awarded when following on from a correct method. It is not necessary to always see the method. This can be implied. |
| <b>B</b>               | Marks awarded independent of method.   |
| <b>Q</b>               | Marks awarded for Quality of Written Communication   |
| <b>ft</b>              | Follow through marks. Marks awarded for correct working following a mistake in an earlier step.  |
| <b>SC</b>              | Special case. Marks awarded within the scheme for a common misinterpretation which has some mathematical worth.                        |
| <b>M dep</b>           | A method mark dependent on a previous method mark being awarded.   |
| <b>B dep</b>           | A mark that can only be awarded if a previous independent mark has been awarded.   |
| <b>oe</b>              | Or equivalent. Accept answers that are equivalent.<br>eg, accept 0.5 as well as $\frac{1}{2}$  |
| <b>[a, b]</b>          | Accept values between <i>a</i> and <i>b</i> inclusive.   |
| <b>3.14 ...</b>        | Accept answers which begin 3.14 eg 3.14, 3.142, 3.149.   |
| <b>Use of brackets</b> | It is not necessary to see the bracketed work to award the marks.  |

Examiners should consistently apply the following principles

**Diagrams**

Diagrams that have working on them should be treated like normal responses. If a diagram has been written on but the correct response is within the answer space, the work within the answer space should be marked. Working on diagrams that contradicts work within the answer space is not to be considered as choice but as working, and is not, therefore, penalised.

**Responses which appear to come from incorrect methods**

Whenever there is doubt as to whether a candidate has used an incorrect method to obtain an answer, as a general principle, the benefit of doubt must be given to the candidate. In cases where there is no doubt that the answer has come from incorrect working then the candidate should be penalised.

**Questions which ask candidates to show working**

Instructions on marking will be given but usually marks are not awarded to candidates who show no working.

**Questions which do not ask candidates to show working**

As a general principle, a correct response is awarded full marks.

**Misread or miscopy**

Candidates often copy values from a question incorrectly. If the examiner thinks that the candidate has made a genuine misread, then only the accuracy marks (A or B marks), up to a maximum of 2 marks are penalised. The method marks can still be awarded.

**Further work**

Once the correct answer has been seen, further working may be ignored unless it goes on to contradict the correct answer.

**Choice**

When a choice of answers and/or methods is given, mark each attempt. If both methods are valid then M marks can be awarded but any incorrect answer or method would result in marks being lost.

**Work not replaced**

Erased or crossed out work that is still legible should be marked.

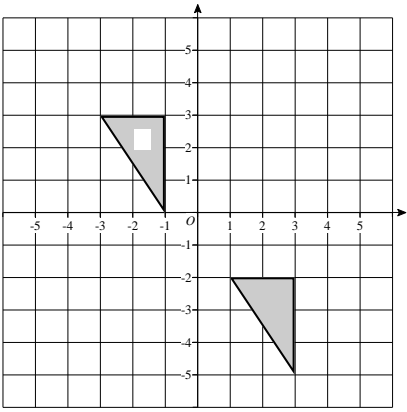
**Work replaced**

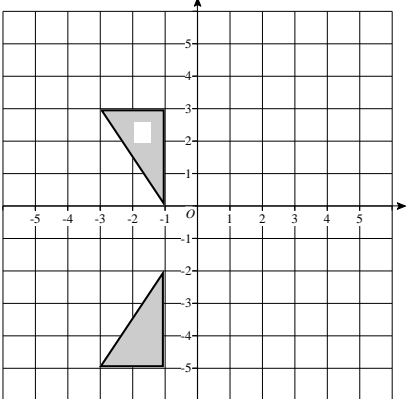
Erased or crossed out work that has been replaced is not awarded marks.

**Premature approximation**

Rounding off too early can lead to inaccuracy in the final answer. This should be penalised by 1 mark unless instructed otherwise.

| Q | Answer                         | Mark | Comments |
|---|--------------------------------|------|----------|
| 1 | $\frac{150}{500} (\times 100)$ | M1   | oe       |
|   | 30                             | A1   |          |

|      |   |    |  |
|------|---|----|--|
| 2(a) | <p>Correct translation</p>  | B2 | <p>B1 for translation 4 right or 5 down<br/>or for 3 correct points without the triangle</p> |
|------|---|----|--|

|      |   |    |   |
|------|---|----|---|
| 2(b) | <p>Correct reflection</p>  | B2 | <p>B1 for reflection in <math>y = c</math> or in <math>x = -1</math><br/>or for 3 correct points without the triangle</p> |
|------|---|----|---|

| Q | Answer  | Mark  | Comments                  |                |
|---|---|-------|---------------------------|----------------|
| 3 | $\frac{30}{100} \times 68$ or 20.4 or 20<br>or $\frac{70}{100} \times 68$ or 47.6 or 48 | M1    | oe                        |                |
|   | $0.75 \times 55$ or 41(.25) or 41.3   | M1    | oe                        |                |
|   | 15 000 $\div$ 47.6 or 315.(...)<br>or 15 000 $\div$ 48<br>or [312, 316]                 | M1dep | oe<br>Dependent on 1st M1 |                |
|   | 12 000 $\div$ 41(.25)<br>or 12 000 $\div$ 41.3<br>or [290, 293]                         | M1dep | oe<br>Dependent on 2nd M1 |                |
|   | [312, 316] and [290, 293] and A   | Q1    |                           |                |
|   | <b>Additional Guidance</b>  |       |                           |                |
|   | 68 – 20.4 = 45.6, 15 000 $\div$ 45.6 = 329 and 291 seen                                 |       |                           | M1M1M1M1<br>Q0 |

|      |  |    |                  |
|------|--|----|------------------|
| 4(a) | $\pi \times 0.7$<br>or $2 \times \pi \times 0.35$<br>or 2.19 | M1 |                  |
|      | [2.198, 2.2]   | A1 | Accept $0.7 \pi$ |

| Q    | Answer   | Mark  | Comments  |            |
|------|--|-------|---|------------|
| 4(b) | Consistent units seen or implied   | B1    | eg 1600 or [0.002 198, 0.002 2] seen              |            |
|      | their $1600 \div$ their [2.198, 2.2]   | M1    | oe<br>Units need not be consistent                |            |
|      | 727.(...)  | A1    |   |            |
|      | 727  | Q1ft  | Strand (i) Rounding down their answer             |            |
|      | <b>Additional Guidance</b>   |       |   |            |
|      | $160 \div 0.7\pi = 72.8$ so 72   |       |   | B0M1A0Q1ft |
| 5(a) | $4x - 5 = 15$  | M1    | $4 \times 5 - 5 = 15$<br>or $4 \times 5 = 20$     |            |
|      | $4x = 15 + 5$<br>or $4x = 20$  | M1dep | oe  |            |
|      | 5  | Q1    | Strand (ii)<br>SC2 Answer 5 without algebra shown |            |
| 5(b) | $5y - 7 = y + 3$   | M1    |   |            |
|      | $5y - y = 3 + 7$<br>or $4y = 10$   | M1    | oe  |            |
|      | $(y =) 2.5$  | A1    |   |            |
|      | their $2.5 + 3$<br>or $5 \times$ their $2.5 - 7$<br>or 5.5<br>or $5.5 \times 15$ | M1    | oe<br>ft their y if clearly shown                 |            |
|      | 82.5   | A1    |   |            |
|      | <b>Additional Guidance</b>   |       |   |            |
|      | $4 \times 2.5 = 10, 2.5 + 3$ embedded value for y                                |       |   | M1M1A1M1A0 |

| Q    | Answer   | Mark  | Comments                          |
|------|--|-------|-----------------------------------|
| 6(a) | Never true   | B1    |                                   |
| 6(b) | Always true  | B1    |                                   |
| 7    | $9^2 + 16^2$<br>or $81 + 256$<br>or 337                      | M1    |                                   |
|      | $\sqrt{9^2 + 16^2}$<br>or $\sqrt{81+256}$<br>or $\sqrt{337}$ | M1dep |                                   |
|      | 18.35... or 18.36  | A1    |                                   |
|      | 18.4   | B1ft  | ft their answer to 2 dp or better |
|      | <b>Additional Guidance</b>                                   |       |                                   |
|      | 18.4 on its own  |       | M1M1A1B1                          |
|      | 18.40  |       | M1M1A1B0                          |
|      | 18.3   |       | M1M1A0B0                          |



| Q   | Answer   | Mark | Comments  |
|---|--|------|-----------|
| <b>8</b>                                  | <b>Alternative method 1</b>  |      |           |
|   | $\tan 25 (= \frac{x}{30})$   | M1   |           |
|   | 30 tan 25 or [13.9, 14]  | M1   |           |
|   | 30 tan 25 ÷ 3 × 5<br>or [4.6, 4.7] × 5<br>or their height ÷ 3 × 5                            | M1   |           |
|   | [23.3, 23.4]   | A1   | Accept 23 |
|   | <b>Alternative method 2</b>  |      |           |
|   | $\frac{30}{\sin 65} = \frac{b}{\sin 25}$   | M1   |           |
|   | $\frac{30 \sin 25}{\sin 65}$ or [13.9, 14]   | M1   |           |
|   | $\frac{30 \sin 25}{\sin 65} \div 3 \times 5$<br>or [4.6, 4.7] × 5<br>or their height ÷ 3 × 5 | M1   |           |
|   | [23.3, 23.4]   | A1   | Accept 23 |
|   | <b>Alternative method 3</b>  |      |           |
|   | 30 ÷ 3 × 5 or 50   | M1   |           |
|   | $\tan 25 (= \frac{x}{50})$   | M1   |           |
|   | 50 tan 25  | M1   |           |
|   | [23.3, 23.4]   | A1   | Accept 23 |
|   | <b>Additional Guidance</b>   |      |           |
| 50 tan 25 or $\frac{50 \sin 25}{\sin 65}$ | M1M1M1A0   |      |           |

| Q    | Answer  | Mark | Comments                              |        |
|------|---|------|---------------------------------------|--------|
| 9(a) | $(180 - 38) \div 2$   | M1   |                                       |        |
|      | 71  | A1   | May be on diagram if no contradiction |        |
| 9(b) | <i>ODE</i> = 90 seen or implied<br>or <i>CDO</i> = 25<br>or <i>COD</i> = 130                      | B1   | May be on diagram                     |        |
|      | <i>DOE</i> = 50<br>or <i>CDE</i> = 115<br>or 140 seen   | M1   | May be on diagram                     |        |
|      | 40  | A1   |                                       |        |
|      | <b>Additional Guidance</b>  |      |                                       |        |
|      | 40 with no working seen   |      |                                       | B1M1A1 |
|      | 115 is B1M1 unless from clearly incorrect working<br>eg 115 leading to an answer of 65 is M1 only |      |                                       |        |

|           |   |       |                                   |
|-----------|---|-------|-----------------------------------|
| <b>10</b> | <b>Alternative method 1</b>                                   |       |                                   |
|           | $0.8 \times 0.48 \times 20$ or 7.68                           | M1    | Units need not be consistent here |
|           | $0.5 \times 0.35 \times 20$ or 3.5                            | M1    | Units need not be consistent here |
|           | $7.68 - 3.5$ or 4.18  | M1    |                                   |
|           | $(4.18 \times 7.9 =)$<br>[33.0, 33.2]                         | A1    |                                   |
|           | <b>Alternative method 2</b>                                   |       |                                   |
|           | $80 \times 48 \times 2000$ or 7 680 000                       | M1    | Units need not be consistent here |
|           | $50 \times 35 \times 2000$ or 3 500 000                       | M1    | Units need not be consistent here |
|           | $(7\,680\,000 - 3\,500\,000) \div 1\,000\,000$<br>or 4.18     | M1    |                                   |
|           | $(4.18 \times 7.9 =)$<br>[33.0, 33.2]                         | A1    |                                   |
|           | <b>Alternative method 3</b>                                   |       |                                   |
|           | $0.8 \times 0.48$ or 0.384<br>and $0.50 \times 0.35$ or 0.175 | M1    | oe                                |
|           | $0.8 \times 0.48 - 0.50 \times 0.35$ or 0.209                 | M1dep | oe                                |
|           | their $0.209 \times 20$ or 4.18                               | M1    | Units must be consistent here     |
|           | $(4.18 \times 7.9 =)$<br>[33.0, 33.2]                         | A1    |                                   |
|           | <b>Alternative method 4</b>                                   |       |                                   |
|           | $80 \times 48$ or 3840<br>and $50 \times 35$ or 1750          | M1    | oe                                |
|           | $80 \times 48 - 50 \times 35$ or 2090                         | M1dep | oe                                |
|           | their $2090 \div 1000 \times 20$ or 4.18                      | M1    | Units must be consistent here     |
|           | $(4.18 \times 7.9 =)$<br>[33.0, 33.2]                         | A1    |                                   |

| Q     | Answer   | Mark | Comments                  |
|-------|--|------|---------------------------|
| 11(a) | 1 0 4 in correct positions   | B2   | B1 for 2 correct          |
| 11(b) | 6 or 7 of their points plotted correctly                           | M1   | $\pm \frac{1}{2}$ square  |
|       | Fully correct smooth curve   | A1   | $\pm \frac{1}{2}$ square  |
|       | <b>Additional Guidance</b>   |      |                           |
|       | Curve should not curve back in from outside $x = 0$ or $x = 6$     |      |                           |
|       | Curve should not have vertical end of more than 2 small squares    |      |                           |
| 11(c) | 3  | B1ft | ft their graph or correct |
| 12(a) | SAS<br>or Side, Angle, Side<br>or two sides and the included angle | B1   | oe                        |
|       | <b>Additional Guidance</b>   |      |                           |
|       | 2 sides and included angle   |      | B1                        |
|       | 2 sides and angle  |      | B0                        |
| 12(b) | RHS<br>or Right angle, Hypotenuse, Side                            | B1   | oe eg RSH                 |

| Q  | Answer  | Mark | Comments   |
|--|---|------|--|
| 13(a)  | C   | B1   |  |
| 13(b)  | $y \propto \sqrt{x}$ or $y = k\sqrt{x}$   | B1   | oe<br>or $cy = \sqrt{x}$   |
|  | $36 = k\sqrt{100}$<br>or $k = 3.6$<br>or $y = 3.6\sqrt{x}$  | M1   | oe<br>$36c = \sqrt{100}$<br>or $c = \frac{5}{18}$ or 0.277...<br>or $\frac{5}{18}y = \sqrt{x}$ |
|  | $3.6 \times \sqrt{250}$<br>or 56.9(...)   | M1   | oe<br>$\sqrt{250} \div \frac{5}{18}$   |
|  | 57  | A1   |  |
| 14   | $\frac{1}{2} \times 5x \times 3x \times \sin 30$<br>or Height = $3x \times \sin 30$<br>or Height = $1.5x$ | M1   | oe<br>Height may be on the diagram   |
|  | $\frac{1}{2} \times 5x \times 3x \times \sin 30 = 45$<br>or $3.75x^2 = 45$                                | M1   | oe   |
|  | $x^2 = 45 \div 3.75$<br>or $x^2 = 12$   | M1   | oe   |
|  | 3.46(4...) or 3.5 or $\sqrt{12}$ or $2\sqrt{3}$   | A1   |  |
|  | <b>Additional Guidance</b>  |      |  |
| Ignore further working if $\sqrt{12}$ is followed by an attempt to simplify the surd |   |      |  |

| Q  | Answer  | Mark | Comments                   |
|----|---|------|----------------------------|
| 15 | 180 – 112 – 46 or 22  | M1   | May be seen on the diagram |
|    | $\frac{15}{\sin 112} = \frac{x}{\sin \text{their } 22}$                                       | M1   | oe                         |
|    | $\frac{15 \sin \text{their } 22}{\sin 112}$   | M1   |                            |
|    | 6.06... or 6.1 or 6   | A1   |                            |
| 16 | $\frac{-8 \pm \sqrt{8^2 - 4 \times 5 \times 2}}{2 \times 5}$ or $\frac{-8 \pm \sqrt{24}}{10}$ | M1   | Allow one error            |
|    | $\frac{-8 \pm \sqrt{8^2 - 4 \times 5 \times 2}}{2 \times 5}$ or $\frac{-8 \pm \sqrt{24}}{10}$ | A1   | oe                         |
|    | -0.3 and -1.3   | A1   | SC2 for -0.3 or -1.3       |

| Q     | Answer   | Mark  | Comments  |
|-------|--|-------|---|
| 17(a) | $\mathbf{a} + \frac{1}{2} \mathbf{b}$  | B1    | oe  |
| 17(b) | $\overline{QS} = -\mathbf{a} + \mathbf{b}$<br>or $\overline{SQ} = \mathbf{a} - \mathbf{b}$   | M1    | oe  |
|       | $\overline{QN} = -\frac{1}{3}\mathbf{a} + \frac{1}{3}\mathbf{b}$<br>or $\overline{SN} = \frac{2}{3}\mathbf{a} - \frac{2}{3}\mathbf{b}$ | M1dep | oe  |
|       | $\overline{PN} = \frac{2}{3}\mathbf{a} + \frac{1}{3}\mathbf{b}$<br>or $\overline{NM} = \frac{1}{3}\mathbf{a} + \frac{1}{6}\mathbf{b}$  | A1    | oe  |
|       | Valid reason   | Q1    | Strand (ii)<br>eg $PN$ is a multiple of $PM$<br>$PN$ is a multiple of $NM$<br><br>$\overline{PN} = \frac{1}{3}(2\mathbf{a} + \mathbf{b})$ and $\overline{PM} = \frac{1}{2}(2\mathbf{a} + \mathbf{b})$<br><br>$\overline{PN} = \frac{2}{3}(\mathbf{a} + \frac{1}{2}\mathbf{b})$ and $\frac{2}{3}\overline{PM}$ |

| Q  | Answer  | Mark | Comments   |                   |
|----|---|------|--|-------------------|
| 18 | $4 \times \pi \times 6^2$ or $144\pi$<br>or 452.(...)   | M1   | oe   |                   |
|    | $2 \times \pi \times 9^2$ or $162\pi$<br>or [508, 509]  | M1   | oe   |                   |
|    | $\pi \times 9^2$ or $81\pi$<br>or 254.(...)<br><br>or $3 \times \pi \times 9^2$ or $243\pi$<br>or 763.(...) | M1   | oe   |                   |
|    | $144\pi : 243\pi$   | M1   | oe<br>eg<br>$452.(...) : 763.(...)$<br>$4 \times 6 \times 6 : 3 \times 9 \times 9$ |                   |
|    | 16 : 27   | A1   |  |                   |
|    | <b>Additional Guidance</b>  |      |  |                   |
|    | 243 $\pi$ alone implies   |      |  | M0 M1 M1<br>M0 A0 |

|    |   |       |    |
|----|---|-------|----|
| 19 | $\frac{1}{3} \times \pi \times 1.5^2 \times 4$<br>or $3\pi$           | M1    |    |
|    | $\frac{1}{3} \times \pi \times 1.5^2 \times 4 \div 0.2$<br>or $15\pi$ | M1dep | oe |
|    | [47, 47.2] or 48  | A1    |    |