# AQA

# GCSE
# Mathematics (Linear)

Higher Tier      Paper 2

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

# AQA

## 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.

| | |
|---|---|
| **M** | Method marks are awarded for a correct method which could lead to a correct answer. |
| **A** | 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** | Marks awarded independent of method. |
| **ft** | Follow through marks. Marks awarded for correct working following a mistake in an earlier step. |
| **SC** | Special case. Marks awarded for a common misinterpretation which has some mathematical worth. |
| **M dep** | A method mark dependent on a previous method mark being awarded. |
| **B dep** | A mark that can only be awarded if a previous independent mark has been awarded. |
| **oe** | Or equivalent. Accept answers that are equivalent.<br>e.g. accept 0.5 as well as $\frac{1}{2}$ |
| **[*a*, *b*]** | Accept values between *a* and *b* inclusive. |
| **[a, b)** | Accept values a ≤ value < b |
| **3.14…** | Accept answers which begin 3.14  e.g.  3.14,  3.142,  3.1416 |
| **Q** | Marks awarded for quality of written communication |
| **Use of brackets** | 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.

## Paper 2 Higher Tier

| Q | Answer | Mark | Comments |
|---|--------|------|----------|
| **1(a)** | 51 | B1 | |

| Q | Answer | Mark | Comments |
|---|--------|------|----------|
| **1(b)** | 123 – 2 or 121 <br> or $11^2$ seen | M1 | |
| | 11 | A1 | |
| | **Additional Guidance** | | |
| | 11 × 11 + 2 ( = 123) or $11^2$ + 2 ( = 123) embedded answer with or without an incorrect answer | M1A0 | |
| | $\sqrt{123}$ = 11.09, 11 or $\sqrt{123}$ = 11 | M0A0 | |
| | T & I follow scheme | | |

| Q | Answer | Mark | Comments |
|---|--------|------|----------|
| **2(a)** | Fully correct enlargement | B3 | B2 for enlargement SF2, wrong position <br> or for any enlargement centre *P* <br> or for 3 correct vertices plotted but no triangle drawn <br><br> B1 for any other enlargement not SF1 <br> or for 2 correct vertices plotted |
| | **Additional Guidance** | | |
| | Mark intention | | |

| Q | Answer | Mark | Comments | |
|---|---|---|---|---|
| **2(b)** | **Alternative method 1** | | | |
| | Rotation | B1 | | |
| | Origin or (0, 0) or *O* | B1 | oe | |
| | 180 (clockwise) <br> or 180 (anticlockwise) <br> or −180 | B1 | oe | |
| | **Alternative method 2** | | | |
| | Enlargement and SF −1 | B2 | | |
| | Origin or (0, 0) or *O* | B1 | oe | |
| | **Additional Guidance** | | | |
| | Rotation, (0, 0), 90 then 90 | | | B1B1B0 |
| | Accept 180C for 180 (clockwise) | | | B1 |
| | Accept ½ turn for 180 | | | B1 |
| | Accept $\begin{pmatrix} 0 \\ 0 \end{pmatrix}$ for origin | | | B1 |
| | Enlargement (0, 0) | | | B0B1 |
| | Allow rotate, rotating, rotational (symmetry) | | | B1 |
| | Mixed transformations, eg <br> translation of 180 <br> reflection (0, 0) | | | B0B0B1 <br> B0B1B0 |
| | Do not accept turn for rotation | | | B0 |
| | Double transformations eg Rotate, translate | | | B0B0B0 |

| Q | Answer | Mark | Comments |
|---|--------|------|----------|
| **3**<br>**Alt 1**<br>**Alt 2** | **Alternative method 1** | | |
| | 300 × 0.19 or 57 | M1 | oe<br>300 × 19 or 5700 |
| | $\frac{5}{100}$× their 57 or 2.85<br><br>or 1.05 seen | M1dep | oe<br>$\frac{5}{100}$× their 5700 or 285<br><br>or 1.05 seen |
| | their 57 + their 2.85<br>or their 57 × 1.05 | M1dep | their 5700 + their 285<br>or their 5700 × 1.05 or 5985 |
| | 59.85 | A1 | |
| | **Alternative method 2** | | |
| | $\frac{5}{100}$× 0.19<br><br>or 0.0095<br>or 1.05 seen | M1 | oe<br>$\frac{5}{100}$× 19<br><br>or 0.95<br>or 1.05 seen |
| | their 0.0095 + 0.19<br>or 1.05 × 0.19<br>or 0.1995 | M1dep | oe<br>their 0.95 + 19<br>or 1.05 × 19<br>or 19.95 |
| | their 0.1995 × 300 | M1dep | their 19.95 × 300 or 5985<br>or 1.05 × 19 × 3 |
| | 59.85 | A1 | |

| Q | Answer | Mark | Comments |
|---|--------|------|----------|
| | | | |

| **3**<br>**Alt 3** | **Alternative method 3** | | |
|---|---|---|---|
| | $\dfrac{5}{100} \times 300$<br>or 15<br>or 1.05 seen | M1 | oe |
| | their 15 + 300<br>or 1.05 × 300<br>or 315 | M1dep | oe |
| | their 0.19 × their 315 | M1dep | 19 × their 315 or 5985 |
| | 59.85 | A1 | |
| | **Additional Guidance** | | |
| | Pick out any correct step, eg<br>300 ÷ 19 × 1.05<br>300 × 0.5 × 0.19 | M1M1M0A0<br>M1M0M0A0 | |
| | Beware, 10% of 19 = 1.90, 5% of 19 = 0.95, 1.90 + 0.95 = 2.85 (Alt 2) | M1M0M0A0 | |
| | If a choice of methods is seen, mark the best | | |

| Q | Answer | Mark | Comments |
|---|--------|------|----------|
| | **Alternative method 1** | | |
| | $x + 2x + 3x + 60 = 360$ | M1 | 360 – 60 or 300 |
| | $6x + 60 = 360$<br>or $6x = 300$ | M1dep | $\dfrac{360 - 60}{6}$ |
| | 50 | A1 | |
| **4** | States that 120 + 50 ≠ 180<br>or<br>120 + 50 = 170 | Q1 | Strand (ii)<br>oe<br>eg 180 – 120 = 60 and 60 ≠ 50<br>$x = 60$ and 50 seen<br>50 and 130 ≠ 120 seen |
| | **Alternative method 2** | | |
| | $x = 180 - 120$<br>or $x = 60$ | M1 | May be on diagram in the correct position |
| | 60 + 2 × 60 + 3 × 60 + 60<br>or 60 + 120 + 180 + 60 | M1dep | |
| | 420 | A1 | $3x = 180$ means a straight line |
| | States that 420 ≠ 360<br>or<br>States 420 so cannot be a quadrilateral | Q1 | Strand (ii)<br>oe<br>Left hand shape is a triangle<br>or<br>Left hand shape is not a quadrilateral |

| Q | Answer | Mark | Comments |
|---|--------|------|----------|
| 5 | 140 – 110<br><br>90 ÷ 3<br><br>or 30<br><br>or 1800 is 90°<br><br>or 1800 × 4<br><br>or 7200 seen<br><br>or 1800 ÷ 90<br><br>or 7200 ÷ 360<br><br>or 20 | M1 | oe<br>90 ÷ 1800 or 0.05°<br>1800 may be in sector D but must see 90 |
| | 1800 ÷ 90 × 140 or 2800<br><br>or 1800 ÷ 90 × 110 or 2200<br><br>or 1800 ÷ 90 × 20 or 400<br><br>or 1800 ÷ 90 × 30<br><br>or 1800 ÷ 3 | M1dep | oe<br>140 ÷ 0.05 or 2800<br>or 110 ÷ 0.05 or 2200<br>or 20 ÷ 0.05 or 400<br>or 30 ÷ 0.05 |
| | 600 | A1 | SC1 for 150 |

| Additional Guidance | |
|---|---|
| 1800 is ¼, 7200 is the whole circle | M1 |
| 1800 is ¼ | M0 |

| Q | Answer | Mark | Comments |
|---|--------|------|----------|
| | **Alternative method 1** | | |
| | $4x - 10$ | B1 | |
| | $6x -$ their $4x =$ their $-10 - 4$<br>or $2x = -14$ | M1 | oe<br><br>$\dfrac{\text{their} -10 - 4}{6 - \text{their } 4}$<br><br>or $\dfrac{-14}{2}$ |
| | $-7$ | A1ft | ft their $(4x - 10)$ |
| | **Alternative method 2** | | |
| | $3x + 2 = 2x - 5$ | B1 | |
| **6(a)** | their $3x - 2x = -5 -$ their $2$ | M1 | oe |
| | $-7$ | A1ft | ft their $(3x + 2)$ |
| | **Additional Guidance** | | |
| | their $(4x - 10)$ must be two terms with one correct to award the method mark | | |
| | their $(3x + 2)$ must be two terms with one correct to award the method mark | | |
| | $6x + 4 = 4x - 5$, $2x = -9$, $x = -\dfrac{9}{2}$ | | B0M1A1ft |
| | $3x + 4 = 2x - 5$, $x = -9$ | | B0M1A1ft |
| | $6x + 4 = 22x - 25$ (2 incorrect terms), $29 = 16x$, $x = \dfrac{29}{16}$ | | B0M0A0 |

| Q | Answer | Mark | Comments |
|---|--------|------|----------|
| **6(b)** | $2y - y^4$ | B2 | B1 each term <br> Do not ignore fw for B2 |

| | Additional Guidance | |
|---|---|---|
| | Do not accept $y2$ | |
| | $2y + - y^4$ | B1 |
| | $2y - y^4 = y^3$ | B1 |
| | $2 \times y - y^4$ | B1 |
| | $y \times 2 - y \times y^3$ | B0 |
| | $y2 + - y^4$ | B0 |

| Q | Answer | Mark | Comments |
|---|--------|------|----------|
| **7(a)** | 25(%) : 75(%) <br> or $\dfrac{1}{4} : \dfrac{3}{4}$ | M1 | oe |
| | 1 : 3 | A1 | SC1 3 : 1 |

| Q | Answer | Mark | Comments |
|---|--------|------|----------|
| **7(b)** | 19.5 ÷ 3 <br> or 26 ÷ 4 <br> or 6.5 | M1 | oe <br> 19.5 ÷ 75 × 25 |
| | 6.50 | A1 | Correct money notation |

| | Additional Guidance | |
|---|---|---|
| | Condone 6.50p on answer line provided £ sign is not crossed out | M1A1 |

| Q | Answer | Mark | Comments |
|---|--------|------|----------|
| **8** | **Alternative method 1** | | |
| | $6.25^2 + 15^2$ <br> or $39(.0625) + 225$ <br> or $264(.0625)$ | M1 | 5, 12, 13 seen |
| | $\sqrt{6.25^2 + 15^2}$ <br> or $\sqrt{39(.0625) + 225}$ <br> or $\sqrt{264(.0625)}$ | M1dep | oe <br> $\dfrac{13}{5} \times 6.25$ <br> or $\dfrac{13}{12} \times 15$ |
| | [16.2, 16.3] | A1 | Allow 16 with working shown |
| | **Alternative method 2** | | |
| | $\tan^{-1} \dfrac{6.25}{15}$ or 22.6… <br><br> or $\tan^{-1} \dfrac{15}{6.25}$ or 67.38… | M1 | |
| | $\dfrac{15}{\cos \text{ their } 22.6}$ <br> or $\dfrac{15}{\sin \text{ their } 67.38}$ <br> or $\dfrac{6.25}{\sin \text{ their } 22.6}$ <br> or $\dfrac{6.25}{\cos \text{ their } 67.38}$ | M1dep | |
| | [16.2, 16.3] | A1 | Allow 16 with working shown |

| Q | Answer | Mark | Comments |
|---|--------|------|----------|
| **9 Alt 1** | **Alternative method 1** | | |
| | Mid values seen (continuous data) | M1 | 5, 15, 25, 35 and 45<br>Allow one error |
| | All products seen for their mid values<br>4 × 5 or 20<br>8 × 15 or 120<br>9 × 25 or 225<br>3 × 35 or 105<br>1 × 45 or 45<br><br>or 515 | M1dep | Allow one calculation error |
| | their (20 + 120 + 225 + 105 + 45) ÷ 25<br>their 515 ÷ 25<br>or 20.6 or 21<br>or 22 × 25 or 550 | M1dep | |
| | 20.6 or 21 and no<br><br>or 515 and 550 and no | A1 | SC2 15.6 or 16 and no<br>or 16.6 or 17 and no<br>or 25.6 or 26 and yes<br><br>or 390 or 400 or 415 or 425 and 550 and no<br>or 640 or 650 and 550 and yes |

| Q | Answer | Mark | Comments |
|---|--------|------|----------|
| | **Alternative method 2** | | |
| | Mid values seen (discrete data) | M1 | 5.5, 15.5, 25.5, 35.5 and 45.5<br>Allow one error |
| **9**<br>**Alt 2** | All products seen for their consistent mid points<br>4 × 5.5 or 22<br>8 × 15.5 or 124<br>9 × 25.5 or 229.5<br>3 × 35.5 or 106.5<br>1 × 45.5 or 45.5<br><br>or 527.5 | M1dep | Allow one calculation error |
| | their (22 + 124 + 229.5 + 106.5 + 45.5) ÷ 25<br>their 527.5 ÷ 25<br>or 21.1 or 21<br>or 22 × 25 or 550 | M1dep | |
| | 21.1 or 21 and no<br><br>or 527.5 and 550 and no | A1 | SC2 15.6 or 16 and no<br>or 16.6 or 17 and no<br>or 25.6 or 26 and yes<br><br>or 390 or 400 or 415 or 425 and 550 and no<br>or 640 or 650 and 550 and yes |
| | **Additional Guidance** | | |
| | Beware, sight of 5 is not necessarily the first mid value as there are 5 groups | | |
| | Beware, the middle of the middle class is 25 | | |

| Q | Answer | Mark | Comments |
|---|--------|------|----------|
| **10(a)** | Substitutes and evaluates correctly to show that the answer is even | B1 | eg<br>$5^2 + 3^2 = 34$   or  $3^2 + 5^2 = 34$<br>$25 + 9 = 34$   or   $9 + 25 = 34$<br>$7^2 + 3^2 = 58$   or   $3^2 + 7^2 = 58$<br>$49 + 9 = 58$   or   $9 + 49 = 58$<br>$7^2 + 5^2 = 74$   or   $5^2 + 7^2 = 74$<br>$49 + 25 = 74$  or   $25 + 49 = 74$<br>Ignore fw |

| | **Additional Guidance** | | |
|---|---|---|---|
| | One correct example required with or without incorrect examples<br>eg $2^2 + 3^2 = 13$, $5^2 + 3^2 = 34$ | | B1 |

| Q | Answer | Mark | Comments |
|---|--------|------|----------|
| **10(b)** | Substitutes and evaluates correctly to show that the answer is odd | B1 | eg<br>$3^2 + 2^2 = 13$   or   $2^2 + 3^2 = 13$<br>$9 + 4 = 13$    or   $4 + 9 = 13$<br>$5^2 + 2^2 = 29$   or   $2^2 + 5^2 = 29$<br>$25 + 4 = 29$   or   $4 + 25 = 29$<br>$7^2 + 2^2 = 53$   or   $2^2 + 7^2 = 53$<br>$49 + 4 = 53$   or   $4 + 49 = 53$<br>Ignore fw |

| | **Additional Guidance** | | |
|---|---|---|---|
| | One correct example required with or without incorrect examples<br>eg $2^2 + 3^2 = 13$, $5^2 + 3^2 = 34$ | | B1 |

| Q | Answer | Mark | Comments |
|---|--------|------|----------|
| **11** | 12 | B1 | |
| | their 12 x 1000 or 12 000<br>or 1.25 x 60 (x 60) or 75 or 4500<br>or their 12 ÷ 1.25 or 9.6<br>or 1000 ÷ 1.25 or 800<br>or 1.25 ÷ 1000 or 0.001 25 | M1 | oe |
| | their 12 000 ÷ their 75<br>or their 12 000 ÷ 1.25<br>or their 12 ÷ their 0.001 25<br>or their 9.6 x 1000<br>or their 12 x their 800 or 9600<br>or their 800 ÷ 60 (÷ 60)<br>or 13.3(…) or 0.2(…)<br><br>or their 12 x 1000 and 1.25 x 60 (x 60)<br>or their 12 x 1000 and their 75 (x 60)<br>or their 12 000 and their 4500 | M1dep | oe |
| | 160<br>or 2.66(…) or 2.67 | A1 | oe |
| | 2 hours 40 minutes | A1 | |

| Additional Guidance | |
|---------------------|--|
| 160 or 2.66(…) or 2.67 implies 4 marks | B1M1M1A1A0 |
| 2 hours 66 minutes implies 2.66 | B1M1M1A1A0 |
| their 12 is their volume | |

| Q | Answer | Mark | Comments |
|---|---|---|---|

| | | | |
|---|---|---|---|
| **12(a)** | − 3 | B1 | |
| | 32 | B1 | |
| | **Additional Guidance** | | |
| | $x = -2$, $y = -3$ | | B1 |
| | $x = 3$, $y = 32$ | | B1 |

| | | | |
|---|---|---|---|
| **12(b)** | 6 or 7 of their points plotted correctly | M1 | tolerance ± $\frac{1}{2}$ square <br><br> ft their points |
| | Fully correct smooth increasing curve passing through all 7 correct points | A1 | tolerance ± $\frac{1}{2}$ square |

| | | | |
|---|---|---|---|
| **13(a)** | $\frac{2}{5}$ | B1 | |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| | **Alternative method 1** | | |
| **13(b)** | $7 \div \dfrac{2}{5}$ <br><br> or $7 \times \dfrac{5}{2}$ or 17.5 <br><br> or $\dfrac{6}{5}$ <br><br> or $\dfrac{5}{6}$ | M1 | oe <br><br> $\dfrac{?}{6w} = \dfrac{7}{5w}$ |
| | their $17.5 \times \dfrac{6}{5}$ <br><br> or 21 | M1 | oe <br><br> $7 \times \dfrac{6w}{5w}$ |
| | $21 \times \dfrac{2}{5}$ <br><br> or $7 \times \dfrac{6}{5}$ <br><br> or 8.4 <br> or 10 + 17.5 + 21 or 48.5 | M1dep | oe |
| | 19.4 | A1 | |
| | **Alternative method 2** | | |
| | $5w \times \dfrac{2}{5} = 7$ or $\dfrac{5w}{10} = \dfrac{7}{4}$ or $\dfrac{5w}{7} = \dfrac{10}{4}$ | M1 | oe |
| | $(w =) \dfrac{7}{5} \times \dfrac{5}{2}$ or 3.5 | M1 | oe |
| | (Perimeter of $A$ =) 10 + 17.5 + 21 <br> or 48.5 <br><br> or (Third side of $B$ =) <br><br> $6 \times 3.5 \times \dfrac{2}{5}$ <br><br> or 8.4 | M1 | oe |
| | 19.4 | A1 | |

| Q | Answer | Mark | Comments |
|---|--------|------|----------|
| **14(a)** | £50 × 0.92 | B1 | |

| Q | Answer | Mark | Comments |
|---|--------|------|----------|
| **14(b)** | **Alternative method 1** | | |
| | 9 ÷ 0.45 or 20<br>or 9 ÷ 45 or 0.2 | M1 | oe<br>5% = 1 (kg) or 1% = 0.2 (kg) or 10% = 2 (kg) |
| | their 20 – 9<br>or their 0.2 × 55 | M1dep | oe<br>55 ÷ 5 or 9 + 2 |
| | 11 | A1 | |
| | **Alternative method 2** | | |
| | $\dfrac{y}{9} = \dfrac{55}{45}$ | M1 | oe<br>eg $y : 9 = 55 : 45$ |
| | $9 \times \dfrac{55}{45}$ | M1dep | oe |
| | 11 | A1 | |

| 15 | **Alternative method 1** | | |
|---|---|---|---|
| | 2 × π × 40<br><br>or [251.2, 251.5]<br><br>or 251<br><br>or 250 | M1 | |
| | (2 × π × 40 + 200)<br><br>or [251.2, 251.5] + 200<br><br>or 251 + 200<br><br>or 250 + 200 | M1dep | |
| | Distance ÷ 18  or  Distance ÷ 30 | M1 | |
| | 25.(…) and yes<br><br>or 15.(…) and yes | Q1ft | Strand (iii) decision to match their answers<br><br>ft provided M1M0M1 |
| | **Alternative method 2** | | |
| | 2 × π × 40<br><br>or [251.2, 251.5]<br><br>or 251<br><br>or 250 | M1 | |
| | (2 × π × 40 + 200)<br><br>or [251.2, 251.5] + 200<br><br>or 251 + 200<br><br>or 250 + 200 | M1dep | |
| | 18 × 30 or 540 | M1 | |
| | [450, 451.5] and 540 and yes | Q1ft | Strand (iii) decision to match their answers<br><br>ft provided M1M0M1 |

| **Additional Guidance** | |
|---|---|
| 100 + 100 + 40 + 40 = 280,  280 ÷ 18 = 15.(…) | M0M0M1Q0 |
| π × 80 = 251.3,   251.3 ÷ 2 = 125.65 | M0 |
| Distance means any number using addition of lengths given in the question<br>eg  (100 + 40), 250, 200, 100 | |

| Q | Answer | Mark | Comments |
|---|--------|------|----------|
| **16(a)** | $\dfrac{1}{6}$ <br><br> $\dfrac{5}{6}$ | B1 | On every pair of branches <br> oe <br> Allow 0.16… or 0.17 <br> Allow 0.83… |

| Q | Answer | Mark | Comments |
|---|--------|------|----------|
| **16(b)** | $\dfrac{1}{6}$ × $\dfrac{1}{6}$ <br><br> or $\dfrac{1}{6}$ × their $\dfrac{1}{6}$ | M1 | oe <br> Allow 0.16… or 0.17 <br> ft their $\dfrac{1}{6}$ provided [0, 1] |
|  | $\dfrac{1}{36}$ | A1ft | oe <br> Allow 0.027… <br> Allow 0.03 if working shown <br> Ignore fw if attempting to convert <br> $\dfrac{1}{36}$ to a decimal, otherwise, do not ignore fw, <br> eg $\dfrac{1}{36}$ × 2 |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| **17** | *ABC* = 52 | M1 | May be on diagram |
| | *BAC* = 52<br>or *BAQ* = 104<br>or *ACB* = 76 | M1dep | May be on diagram |
| | *PAB* = 76<br>or *PBA* = 76 | M1dep | May be on diagram |
| | 28 | A1 | Clear evidence that 28 is for angle *x* |
| | **Additional Guidance** | | |
| | Angles may be on diagram | | |
| | *ACB* = 52 and *ABC* = 52 | | M1 only |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| **18(a)** | $\dfrac{\sin 130}{95} = \dfrac{\sin x}{50}$<br><br>or  $0.008(...) = \dfrac{\sin x}{50}$ | M1 | $\dfrac{95}{\sin 130} = \dfrac{50}{\sin x}$<br><br>or  $124.(...) = \dfrac{50}{\sin x}$ |
| | $\dfrac{50 \sin 130}{95}$<br><br>or 0.4(…) | M1dep | $50 \div \dfrac{95}{\sin 130}$ |
| | [23.7, 23.8] or 24 | A1 | |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| **18(b)** | $30^2 + 72^2 - 2 \times 30 \times 72 \cos 40$ | M1 | |
| | 2774.(688…) or 2775 | A1 | |
| | [52.6, 52.7] or 53 | A1 | SC1 for [36.7, 36.8] or 37 |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| **19(a)** | 3 and 1.2 seen | M1 | |
| | 1.8 | A1 | SC1 for 1.9 |
| | **Additional Guidance** | | |
| | Beware, median = 1.8 | | |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| **19(b)** | 110 – 70 or 40 <br> or $\frac{25}{120}$ or 0.208… or 0.21 | M1 | 109 – 70 or 39 |
| | 40 ÷ 120 × 25 | M1dep | oe <br> 39 ÷ 120 × 25 |
| | [8.1, 8.4] | A1 | |
| | 8 or 9 | B1ft | |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| **20(a)** | $5x^2 + 10xy - 2xy - 4y^2$ | M1 | Allow one error in their four terms |
| | $5x^2 + 10xy - 2xy - 4y^2$ | A1 | Fully correct<br>May be in a grid |
| | $5x^2 + 8xy - 4y^2$ | A1ft | ft their four terms<br>Do not ignore fw |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| **20(b)** | **Alternative method 1** | | |
| | $\dfrac{2 \pm \sqrt{(-2)^2 - (4 \times 1 \times -2)}}{2}$ | M1 | oe<br>Allow one error |
| | $\dfrac{2 \pm \sqrt{(-2)^2 - (4 \times 1 \times -2)}}{2}$ <br> or $\dfrac{2 \pm \sqrt{4 - -8}}{2}$ | A1 | oe<br>Fully correct |
| | 2.7 and $-0.7$ | A1 | SC2 for either 2.7 or $-0.7$ |
| | **Alternative method 2** | | |
| | $(x - 1)^2 - 1 - 2 = 0$ | M1 | oe |
| | $1 \pm \sqrt{3}$ | A1 | oe<br>Fully correct<br>or 2.7(…) or $-0.7$(…) |
| | 2.7 and $-0.7$ | A1 | SC2 for either 2.7 or $-0.7$ |

| Additional Guidance | | |
|---|---|---|
| $-0.73$(…) or 2.73(…)<br>$-2^2$ in the discriminant is one error unless recovered | | M1A1A0 |

| Q | Answer | Mark | Comments |
|---|--------|------|----------|
| **20(c)** | $(ax + b)(cx + d)$ <br> or $(x + 2)(x - 2)$ | M1 | where $ac = 3$ and $bd = -10$ <br> or $ad + bc = -1$ |
| | $(3x + 5)(x - 2)$ | A1 | |
| | $\dfrac{3x + 5}{x + 2}$ | A1 | Do not ignore fw |

<table>
<tr><th colspan="2">Additional Guidance</th></tr>
<tr><td>$\dfrac{(3x - 5)(x + 2)}{(x + 2)(x - 2)}$<br><br>$= \dfrac{(3x - 5)}{(x - 2)}$</td><td>M1<br>A0<br>A0</td></tr>
</table>

| Q | Answer | Mark | Comments |
|---|--------|------|----------|
| **21** | $x^2 - 5x - 5x + 25$ <br> or $x^2 - 10x + c$ <br> $x^2 + \text{(term(s) in } x) + 25 + 7$ <br> or $(x + \dfrac{a}{2})^2$ | M1 | |
| | $a = -10$ | A1 | |
| | $b = 32$ | A1 | |

| Q | Answer | Mark | Comments |
|---|--------|------|----------|
| **22** | $\dfrac{70-(17+21)}{8}$ or $\dfrac{32}{8}$ or 4 | M1 | oe |
| | 12 and 20 | A1 | May be implied from histogram |
| | Correct scale on vertical axis to at least 2.0 | B1 | eg<br>(0), 0.1, 0.2 …<br>(0), 0.2, 0.4 …<br>(0), 1, 2 … |
| | 10 – 20 bar drawn at height 1.2<br>20 – 40 bar drawn at height 1<br>40 – 50 bar drawn at height 1.7 | B3 | (6 squares high)<br>(5 squares high)<br>(8.5 squares high)<br><br>B2 for 2 correct bars drawn<br>or 3 or 4 correct calculations<br><br>B1 for 1 correct bar drawn<br>or 1 or 2 correct calculations |
| | **Additional Guidance** | | |
| | Note: Correct bar heights can be awarded even if scale is incorrect or not given | | |

| Q | Answer | Mark | Comments |
|---|--------|------|----------|
| | **Alternative method 1** | | |
| | $2x^2 + 7x - 1 = 4x + 1$ | M1 | Eliminates a variable |
| | $2x^2 + 3x - 2 = 0$ <br> or $2x^2 + 3x = 2$ | M1dep | Correctly reduces to three terms |
| | $(2x - 1)(x + 2)\ (= 0)$ | M1dep | If quadratic formula used here it must be fully correct |
| | $x = \dfrac{1}{2},\ x = -2$ <br><br> or $x = \dfrac{1}{2},\ y = 3$ <br><br> or $x = -2,\ y = -7$ | A1 | SC3 if from T & I and $2^{nd}$ answer not obtained |
| | $x = \dfrac{1}{2},\ y = 3$ <br><br> and $x = -2,\ y = -7$ | A1 | |
| **23** | **Alternative method 2** | | |
| | $y = 2\left(\dfrac{y-1}{4}\right)^2 + 7\left(\dfrac{y-1}{4}\right) - 1$ | M1 | Eliminates a variable |
| | $y^2 + 4y - 21 = 0$ <br> or $y^2 + 4y = 21$ | M1dep | Correctly reduces to three terms |
| | $(y - 3)(y + 7)\ (= 0)$ | M1dep | If quadratic formula used here it must be fully correct |
| | $y = 3,\ y = -7$ <br><br> or $y = 3,\ x = \dfrac{1}{2}$ <br><br> or $y = -7,\ x = -2$ | A1 | SC3 if from T & I and $2^{nd}$ answer not obtained |
| | $y = 3,\ x = \dfrac{1}{2}$ <br><br> and $y = -7,\ x = -2$ | A1 | |

| Q | Answer | Mark | Comments |
|---|--------|------|----------|
| | | | 29 of 29 |
| **24** | 350 or 450 or 449.$\dot{9}$<br><br>or 24.5 or 25.5 or 25.4$\dot{9}$ | B1 | |
| | 450 ÷ 24.5 or 18.3(6) or 18.4<br><br>or their 450 ÷ their 24.5 | M1 | Accept (400, 450] for their 450<br><br>Accept [24.5, 25) for their 24.5 |
| | 450 ÷ 24.5 and 18<br><br>or  449.$\dot{9}$ ÷ 24.5 and 18 | A1 | |
| | **Additional Guidance** | | |
| | 400 ÷ 25 | | M0 |