# GCSE
# MATHEMATICS
# 8300/3H

Higher Tier Paper 3 Calculator

**Mark scheme**

November 2018

Version: 1.0 Final

18BG83003H/MS

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.

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**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>eg accept 0.5 as well as $\frac{1}{2}$ |
| **[a, b]** | Accept values between a and b inclusive. |
| **[a, b)** | Accept values $a \leq$ value $< b$ |
| **3.14 …** | Accept answers which begin 3.14 eg 3.14, 3.142, 3.1416 |
| **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 student has used an incorrect method to obtain an answer, as a general principle, the benefit of doubt must be given to the student. In cases where there is no doubt that the answer has come from incorrect working then the student should be penalised.

**Questions which ask students to show working**

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

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

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

**Misread or miscopy**

Students often copy values from a question incorrectly. If the examiner thinks that the student 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.

**Continental notation**

Accept a comma used instead of a decimal point (for example, in measurements or currency), provided that it is clear to the examiner that the student intended it to be a decimal point.

| Question | Answer | Mark | Comments |
|---|---|---|---|
| 1 | up | B1 | |
| | **Additional Guidance** | | |
| | | | |
| 2 | $\frac{5}{2}$ | B1 | |
| | **Additional Guidance** | | |
| | | | |
| 3 | $8n - 5$ | B1 | |
| | **Additional Guidance** | | |
| | | | |
| 4 | 120 | B1 | |
| | **Additional Guidance** | | |
| | | | |
| 5 | 109.5 in the correct position | B1 | oe |
| | 110.5 in the correct position | B1 | oe<br>Allow $110.4\dot{9}$<br>answers reversed score B0B1 |
| | **Additional Guidance** | | |
| | 110.4999… | | B1 |
| | 110.4999 | | B0 |

| Question | Answer | Mark | Comments |
|---|---|---|---|
| 6(a) | Plots at least 3 points correctly | M1 | Plots within the correct 2 mm vertical square |
| | Fully correct with all points joined | A1 | |
| | **Additional Guidance** | | |
| | | | |

| | | | |
|---|---|---|---|
| 6(b) | [4200, 4500] | B2 | B1<br>Any indication the 2018 figure is being increased for 2019<br>eg a point plotted for 2019 that is greater than 3780 |
| | **Additional Guidance** | | |
| | Answer in range with or without working | | B2 |
| | 4300 – 4350 on answer line (both values in range) | | B2 |
| | 4400 – 4600 on answer line (one value in range) | | B1 |
| | Answer outside of range but between 3780 and 4200 | | B1 |
| | Answer outside of range but greater than 4500 | | B1 |

| Question | Answer | Mark | Comments |
|---|---|---|---|
| 7 | Any correct value | M1 | 11, 23, 37, 53, 71, 91, 113, 137, 163 |
| | Selects 91 as the only incorrect value with no errors in values given | A1 | oe<br>eg stops at 91 |
| | 91 and 13 (is a factor)<br>or<br>91 and 7 (is a factor)<br>or<br>91 and 13 × 7 | A1 | oe<br>eg 91 ÷ 7 = 13 |
| | **Additional Guidance** | | |
| | Ignore incorrect evaluations for first mark | | |
| | Ignore all values for $n$ greater than 9 | | |
| | Do not allow 11 within a list of prime numbers eg 2, 3, 5, 7, 11… | | |
| | Error in list eg 12, 23, 37, 53, 71, 91, 113, 137, 163 with 12 and 91 selected as not prime (not valid as incorrect) | | M1A0A0 |
| | Error in list eg 12, 23, 37, 53, 71, 91, 113, 137, 163 with only 91 selected as not prime (not valid as incorrect conclusion from their list) | | M1A0A0 |
| | $9^2 + 9 + 1 = 91$ is incorrect working | | M0A0A0 |

| Question | Answer | Mark | Comments |
|---|---|---|---|
| 8 | **Alternative method 1** | | |
| | (600 ×) 0.8 or 480 | M1 | oe |
| | $600 \times 0.8^2$ or 384<br>or $600 \times 0.8^3$ or 307.2(0)<br>or $600 \times 0.8^4$ or 245.76<br>or $600 \times 0.8^5$ or [196, 197] | M1dep | |
| | [196, 197] and incorrect | A1 | oe eg 196.61 and no<br>196.61 still owed |
| | **Alternative method 2** | | |
| | 600 × 0.2 or 120 | M1 | oe |
| | 120 × 0.8 or 96<br>or 96 × 0.8 or 76.8(0)<br>or 76.8(0) × 0.8 or 61.44<br>or 61.44 × 0.8 or [49.15, 49.16] | M1dep | oe eg (600 – 120) × 0.2<br>or 480 × 0.2 |
| | [403, 404] and incorrect | A1 | oe eg paid off 403.39(2) |
| | **Alternative method 3** | | |
| | 0.8 | M1 | |
| | $0.8^5$ or 0.327 68 or 0.3277<br>or 0.328 or 0.33 | M1dep | |
| | 0.327 68 (or 0.3277 or 0.328<br>or 0.33) and incorrect | A1 | oe |
| | **Additional Guidance** | | |
| | Ignore units | | |
| | Full marks can be awarded for a correct explanation eg 120 and 96 calculated with a comment 'as soon as the payment is below 120 a month it cannot be paid off in five months' | | |

| Question | Answer | Mark | Comments |
|---|---|---|---|
| 9 | $0.9 \times \pi \div 2$ or $0.9\pi \div 2$ or $0.45\pi$<br>or $0.9 \times [3.14, 3.142] \div 2$<br>or $[2.82, 2.83] \div 2$ or $2.8 \div 2$<br>or 1.4… | M1 | Large semicircle |
| | $0.9 \div 3 \times \pi \div 2$ or $0.3\pi \div 2$<br>or $0.15\pi$<br>or $0.9 \div 3 \times [3.14, 3.142] \div 2$<br>or 0.94… ÷ 2<br>or 0.47… | M1 | Small semicircle<br>May be implied from using 1.4… for three small semicircles in next mark |
| | their 1.4…<br>+ 3 × their 0.47…<br>+ 2 × 0.75<br><br>or $0.9\pi + 2 \times 0.75$<br><br>or 2 × their 1.4… + 2 × 0.75<br><br>or 4.3… | M1dep | oe<br>dep on both marks |
| | 305 ÷ their 4.3…<br>or<br>[70.4, 70.94] | M1dep | dep on previous mark |
| | 71 with working | A1 | |
| | **Additional Guidance** | | |
| | $0.9\pi$ or 2.8… with no evidence of incorrect method | | M1M1 |
| | $0.45\pi \div 2$ | | M0 |

| Question | Answer | Mark | Comments |
|---|---|---|---|
| 10 | **Alternative method 1** | | |
| | $\frac{1}{2}x > 3 - 8$<br>or $\frac{1}{2}x > -5$<br>or $8 - 3 > -\frac{1}{2}x$<br>or $5 > -\frac{1}{2}x$<br>or $8 + \frac{1}{2}x > 3$ | M1 | oe |
| | $x > -10$ | A1 | oe $-10 < x$ |
| | **Alternative method 2** | | |
| | $16 > 6 - x$<br>or $16 - 6 > -x$<br>or $10 > -x$<br>or $x > 6 - 16$<br>or $16 + x > 6$ | M1 | oe |
| | $x > -10$ | A1 | oe $-10 < x$ |
| | **Additional Guidance** | | |
| | Answer using incorrect sign eg $x < -10$ or $x = -10$ | | M1A0 |

| Question | Answer | Mark | Comments |
|---|---|---|---|
| 11 | $\cos x = \frac{9}{10}$ | M1 | oe<br>eg<br>$\sin x = \frac{\sqrt{10^2 - 9^2}}{10}$<br>$\tan x = \frac{\sqrt{10^2 - 9^2}}{9}$ |
| | 25.8… or 26 | A1 | |
| | **Additional Guidance** | | |
| | $\cos = \frac{9}{10}$ $x = 25.8$ (recovered) | | M1A1 |
| | $\cos = \frac{9}{10}$ | | M0A0 |
| 12 | Graph should be a curve | B1 | oe eg<br>Should not be straight lines<br>Not a curve<br>Not smooth<br>Too straight<br>Need more points plotted |
| | **Additional Guidance** | | |
| | | | |
| 13 | 200 | B1 | |
| | **Additional Guidance** | | |
| | | | |

| Question | Answer | Mark | Comments |
|---|---|---|---|
| **14** | 19 × 82 or 1558 | M1 | |
| | $\frac{\text{their } 1558 + 93}{20}$ or $\frac{1651}{20}$ | M1dep | oe |
| | 82.55 or 82.6 | A1 | |
| | **Additional Guidance** | | |
| | | | |
| **15** | $2 \times \pi \times 8 \times 22$ or $352\pi$ or [1105, 1106] | M1 | Area of lampshade A<br>oe<br>$2 \times \pi \times 0.08 \times 0.22$ or $0.0352\pi$ or [0.1105, 0.1106] |
| | $4 \times \frac{1}{2} \times 15 \times 24$ or 720 | M1 | Area of lampshade B<br>oe<br>$4 \times \frac{1}{2} \times 0.15 \times 0.24$ or 0.072 |
| | their $352\pi \div 100^2 \times 400$ or $14.08\pi$ or [44.2, 44.24] | their 720 ÷ $100^2 \times 400$ or 28.8(0) | M1dep | their $0.0352\pi \times 400$ or $14.08\pi$ or [44.2, 44.24] | their 0.072 × 400 or 28.8(0) |
| | | | | dep on 1st M1 | dep on 2nd M1 |
| | their $14.08\pi + 3.50$ or [47.7, 47.74] and their 28.8(0) + 7.5(0) or 36.3(0) | | M1dep | dep on M3 and method for fabric cost for both lampshades correct | |
| | 1.3(1…) : 1 or 1.32 : 1 | | A1 | | |
| | **Additional Guidance** | | | | |
| | 1 : 1.3(1…) or 1 : 1.32 | | | | M4A0 |

| Question | Answer | Mark | Comments |
|---|---|---|---|
| 16 | **Alternative method 1** | | |
| | 0.38 × 50 or 19 | M1 | oe |
| | 0.6 × 80 or 48 | M1 | oe |
| | $\frac{\text{their } 19 + \text{their } 48}{50 + 80}$ or $\frac{67}{130}$ | M1dep | oe |
| | 0.51(5…) or 0.52 or $\frac{67}{130}$ and (67 × 2 =) 134 or $\frac{67}{130}$ and (130 ÷ 2 =) 65 | A1 | oe |
| | **Alternative method 2** | | |
| | 0.38 × 50 or 19 | M1 | oe |
| | 0.6 × 80 or 48 | M1 | oe |
| | 0.5 × (50 + 80) or 65 | M1dep | oe |
| | 65 and 67 | A1 | |
| | **Alternative method 3** | | |
| | 0.38 × 50 or 19 | M1 | oe |
| | 0.5 × (50 + 80) or 65 | M1 | oe |
| | $\frac{\text{their } 65 - \text{their } 19}{80}$ or $\frac{46}{80}$ | M1dep | oe |
| | 0.575 | A1 | |

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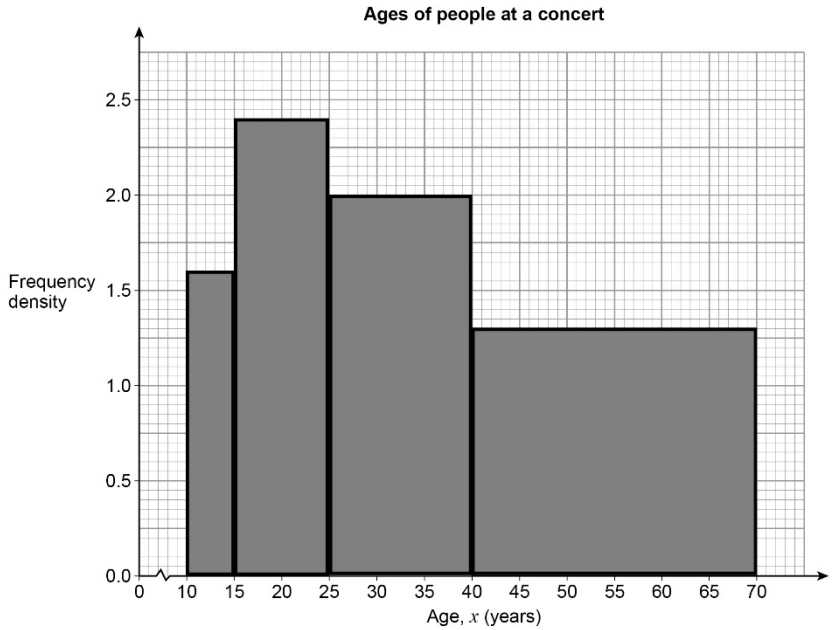
| Question | Answer | Mark | Comments |
|---|---|---|---|
| 16 cont | **Alternative method 4** | | |
| | 0.6 × 80 or 48 | M1 | oe |
| | 0.5 × (50 + 80) or 65 | M1 | oe |
| | $\frac{\text{their } 65 - \text{their } 48}{50}$ or $\frac{17}{50}$ | M1dep | oe |
| | 0.34 | A1 | |
| | **Alternative method 5** | | |
| | $\frac{50}{130}$ × 0.38 or 0.14… or 0.15 | M1 | oe |
| | $\frac{80}{130}$ × 0.6 or 0.36… or 0.37 | M1 | oe |
| | their 0.14… + their 0.36… | M1dep | oe |
| | 0.51(5…) or 0.52 | A1 | |
| | **Additional Guidance** | | |
| | | | |
| 17 | $\frac{9}{25x}$ | B1 | |
| | **Additional Guidance** | | |
| | | | |

| Question | Answer | Mark | Comments |
|---|---|---|---|
| 18 | Any one of<br>$8 \div 5$ or 1.6<br>or<br>$24 \div 10$ or 2.4<br>or<br>$30 \div 15$ or 2<br>or<br>$39 \div 30$ or 1.3 | M1 | Implied by a correct bar |
| | At least three of<br>1.6 and 2.4 and 2 and 1.3 | M1dep | Implied by three correct bars |
| | Fully correct histogram | A1 | Tolerance $\pm\frac{1}{2}$ square<br>ignore frequency polygon if drawn |
| | **Additional Guidance** | | |
| |  | | 3 marks |

| Question | Answer | Mark | Comments |
|---|---|---|---|
| **19** | 30.25<br>or 29.75<br>or 5.85<br>or 5.75 | B1 | |
| | their 30.25 – their 5.75 | M1 | Must be their max roll – their min cut<br>their max must be (30, 30.5]<br>their min must be [5.5, 5.8) |
| | 24.5 | A1 | |
| | **Additional Guidance** | | |
| | 30.5 – 5.75 = 24.75 | | B1M1A0 |
| **20** | **Alternative method 1** | | |
| | $2(-x-1)^2-5$ | M1 | oe<br>Replacing $x$ with $-x$ |
| | $2(x^2+x+x+1)-5$<br>or $2x^2+4x+2-5$<br>or $2x^2+4x-3$ | M1dep | oe expansion |
| | $y=2x^2+4x-3$ | A1 | |
| | **Alternative method 2** | | |
| | $2(x^2-x-x+1)-5$<br>or $2x^2-4x+2-5$<br>or $2x^2-4x-3$ | M1 | oe expansion<br>Multiplying out original expression |
| | $2(-x)^2-4(-x)-3$<br>or $2x^2+4x-3$ | M1dep | oe<br>Replacing $x$ with $-x$ |
| | $y=2x^2+4x-3$ | A1 | |
| | **Additional Guidance** | | |
| | Using symmetry in $y$ axis, $y=2(x+1)^2-5 \rightarrow y=2x^2+4x-3$ | | M1M1A1 |

| Question | Answer | Mark | Comments |
|---|---|---|---|
| **21** | 1(h) 20 (min) and 50 (min)<br>or<br>$1\frac{20}{60}$ (h) or $1\frac{1}{3}$ (h) or 1.33…(h)<br>or $\frac{50}{60}$ (h) or $\frac{5}{6}$ (h) or 0.83…(h) | B1 | oe<br>Journey time(s) at 10.20 am |
| | 6 × their $1\frac{1}{3}$ or 8 | M1 | oe Priya's distance at 10.20 am |
| | their 8 ÷ their $\frac{50}{60}$ or 9.6<br>or 16.8 ÷ 8 or 2.1 | M1dep | oe Joe's speed in km/h<br>Multiplier for distance comparison |
| | 16.8 ÷ their 9.6 or 1.75(h)<br>or 1(h) 45 (min) or 105 (min)<br>or 16.8 ÷ 8 × 50 (÷ 60)<br>or<br>$\frac{16.8 - \text{their } 8}{\text{their } 9.6}$ or $\frac{8.8}{\text{their } 9.6}$<br>or 0.91(6…)(h) or 0.917(h)<br>or 0.92(h) or 55(min) | M1dep | oe<br>Joe's total journey time<br>Joe's journey time after overtaking Priya |
| | 11.15 (am) | A1 | oe eg quarter past 11 (in the morning) |
| | **Additional Guidance** | | |
| | If 11.15 comes from correct method but with premature rounding<br>eg 8 ÷ 0.83 = 9.64<br>16.8 ÷ 9.64 = 1.743 h<br>1.743 × 60 = 104.58 minutes<br>ie 11 : 14 : 58 so 11 : 15 | | B1M3A0 |
| | 8 km implies | | B1M1 |
| | 16.8 ÷ 6 or 2.8 with no further valid working | | B0M0 |

| Question | Answer | Mark | Comments |
|---|---|---|---|
| 22(a) | –0.3 or $-\frac{3}{10}$ | B1 | |
| | –0.2027 or $-\frac{2027}{10\,000}$ | B1ft | ft their –0.3 |
| | **Additional Guidance** | | |
| | ft answer must be to at least 4 decimal places | | |
| | Note: if their –0.3 is –0.2027, then ft answer is –0.200 832 8… | | |
| 22(b) | –0.20081 | B1 | |
| | **Additional Guidance** | | |
| | Answer must be to exactly 5 decimal places | | |
| | –0.20083 | | B0 |
| 23 | **Alternative method 1** | | |
| | 48 ÷ 2 × 3 or 72 | M1 | oe |
| | their 72 ÷ 2 or 36 | M1dep | $\cos^{-1}\left(\frac{36}{141}\right)$ or 75.2 |
| | $141^2$ – their $36^2$ or 18 585 | M1dep | ft their base ÷ 2<br>sin (their 75.2) = $\frac{h}{141}$<br>or tan (their 75.2) = $\frac{h}{\text{their } 36}$ |
| | $\sqrt{141^2 - \text{their } 36^2}$ or $\sqrt{18\,585}$ | M1dep | 141 × sin (their 75.2)<br>or their 36 × tan (their 75.2) |
| | [136.2, 136.4] or 136 | A1 | |

**Continues on next page**

| Question | Answer | Mark | Comments |
|---|---|---|---|
| 23 cont | **Alternative method 2** | | |
| | 141 ÷ 3 or 47 | M1 | oe |
| | 24 and their 47 × 2<br>or 24 and 94<br>or 12 and their 47 | M1dep | $\cos^{-1}\left(\frac{24}{94}\right)$ or 75.2 |
| | their $94^2 - 24^2$ or 8260<br>or $\sqrt{8260}$<br>or 90.88…<br>or their $47^2 - 12^2$ or 2065<br>or $\sqrt{2065}$<br>or 45.44… | M1dep | sin (their 75.2) = $\frac{h}{\text{their } 94}$<br>or tan (their 75.2) = $\frac{h}{24}$ |
| | $\sqrt{\text{their } 94^2 - 24^2}$ × 3 ÷ 2<br>or $\sqrt{8260}$ × 3 ÷ 2<br>or 90.88… × 3 ÷ 2<br>or $\sqrt{\text{their } 47^2 - 12^2}$ × 3<br>or $\sqrt{2065}$ × 3<br>or 45.44… × 3 | M1dep | their 94 × sin (their 75.2) × 3 ÷ 2<br>or 24 × tan (their 75.2) × 3 ÷ 2 |
| | [136.2, 136.35] or 136 | A1 | |
| | **Additional Guidance** | | |
| | Values may be seen on diagram in correct positions | | |

| Question | Answer | Mark | Comments |
|---|---|---|---|
| **24** | $\frac{4}{3}\pi(2x)^3$<br>or $\frac{1}{3}\pi(3x)^2h$ | M1 | oe |
| | $\frac{4}{3}\pi(2x)^3 = \frac{1}{3}\pi(3x)^2h$<br>or<br>$\frac{4}{3}\pi 8x^3 = \frac{1}{3}\pi 9x^2h$ | M1dep | oe<br>Sets up equation |
| | $32x = 9h$ or $x = \frac{9}{32}h$<br>or $h = \frac{32}{9}x$<br>or<br>$\frac{32}{3}r = 9h$ or $r = \frac{27}{32}h$<br>or $h = \frac{32}{27}r$ or $27h = 32r$<br>or<br>$\frac{27}{32}h : h$ or $3x : \frac{32}{9}x$<br>or $\frac{27}{32} : 1$ or $3 : \frac{32}{9}$<br>or 0.84… : 1 or 3 : 3.55… | M1dep | oe linear equation or ratio |
| | 27 : 32 | A1 | |
| | **Additional Guidance** | | |
| | 32 : 27 | | M1M1M1A0 |
| | Note $\frac{4}{3}\pi(2)^3$ = [33.49, 33.52]<br>$\frac{1}{3}\pi(3)^2h$ = [9.42$h$, 9.43$h$] | | |

| Question | Answer | Mark | Comments |
|---|---|---|---|
| 25 | *B* and *C* | B1 | |
| | **Additional Guidance** | | |
| | | | |
| 26 | $y(x - 4) = 2x + 3$ | M1 | $x(y - 4) = 2y + 3$ |
| | $yx - 4y = 2x + 3$ | M1dep | $xy - 4x = 2y + 3$ |
| | $yx - 2x = 4y + 3$<br>or $x(y - 2) = 4y + 3$<br>or $x = \frac{4y + 3}{y - 2}$ | M1dep | $xy - 2y = 4x + 3$<br>or $y(x - 2) = 4x + 3$ |
| | $\frac{4x+3}{x-2}$ | A1 | oe<br>Must be in terms of $x$ |
| | **Additional Guidance** | | |
| | Ignore any attempt to give the domain of $f^{-1}$ | | |
| 27(a) | $x^2 + (3x + p)^2 = 53$ | M1 | oe |
| | $9x^2 + 3xp + 3xp + p^2$<br>or $9x^2 + 6xp + p^2$ | M1 | Expands $(3x + p)^2$ correctly |
| | $x^2 + (3x + p)^2 = 53$<br>and $x^2 + 9x^2 + 3xp + 3xp + p^2 = 53$<br>and $10x^2 + 6px + p^2 - 53 = 0$<br>or<br>$x^2 + (3x + p)^2 = 53$<br>and $x^2 + 9x^2 + 6xp + p^2 = 53$<br>and $10x^2 + 6px + p^2 - 53 = 0$ | A1 | |
| | **Additional Guidance** | | |
| | | | |

| Question | Answer | Mark | Comments |
|---|---|---|---|
| **27(b)** | $7 = 3 \times 2 + p$ or $7 = 6 + p$<br>or $p = 1$ | M1 | oe<br>Substitutes $x = 2$ into given equation<br>$10(2)^2 + 6p(2) + p^2 - 53 = 0$<br>or $p^2 + 12p - 13 = 0$<br>or $(p - 1)(p + 13)$<br>or $p = 1$ (and $p = -13$) |
| | $10x^2 + 6x + 1 - 53 (= 0)$<br>or $10x^2 + 6x - 52 (= 0)$<br>or $5x^2 + 3x - 26 (= 0)$ | M1dep | oe equation<br>Substitutes their $p$ into given equation |
| | $(5x + 13)(x - 2)$<br>or $\frac{-3 \pm \sqrt{3^2 - 4 \times 5 \times -26}}{2 \times 5}$<br>or $-\frac{3}{10} \pm \sqrt{\frac{529}{100}}$ | M1 | oe<br>Correct factorisation of their 3-term quadratic<br>or correct substitution in formula for their 3-term quadratic<br>or correct completion of square to expression for $x$ |
| | $(x =) -2.6$ | A1 | oe |
| | $(-2.6, -6.8)$ | A1 | oe |
| | **Additional Guidance** | | |
| | After scoring first M1, they substitute $p = -13$<br>$(p - 1)(p + 13)$<br>or $p = 1$ (and $p = -13$) | M1 | |
| | $10x^2 - 78x + 169 - 53 = 0$<br>or $10x^2 - 78x + 116 = 0$<br>or $5x^2 - 39x + 58 = 0$ | M1dep | |
| | $(5x - 29)(x - 2)$<br>or $\frac{--39 \pm \sqrt{(-39)^2 - 4 \times 5 \times 58}}{2 \times 5}$<br>or $\frac{39}{10} \pm \sqrt{\frac{361}{100}}$ | M1dep<br>A0 A0 | |

| Question | Answer | Mark | Comments |
|---|---|---|---|
| 28 | gradient is negative | B1 | |
| | **Additional Guidance** | | |
| | | | |