# GCSE
# MATHEMATICS
# 8300/2F

Foundation Tier Paper 2 Calculator

**Mark scheme**

November 2022

Version: 1.0 Final

22BG8300/2F/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 Examiner.

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 $a \leqslant$ 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.

| Q | Answer | Mark | Comments |
|---|---|---|---|
| 1 | 75 | B1 | |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| 2 | $\frac{3}{100}$ | B1 | |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| 3 | –5°C | B1 | |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| 4 | P | B1 | |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| 5(a) | $d^2$ | B1 | |
| | **Additional Guidance** | | |
| | Allow $D^2$ | | B1 |
| | $dd = d^2$ | | B1 |
| | $dd$ | | B0 |
| | $1d^2$ | | B0 |
| | $d2$ | | B0 |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| 5(b) | 1 or $n^0$ | B1 | |
| | **Additional Guidance** | | |
| | $\frac{n}{n} = 1$ or $\frac{n}{n} = n^0$ | | B1 |
| | $\frac{n}{n}$ | | B0 |
| | $\frac{1}{1}$ or $1 \div 1$ | | B0 |

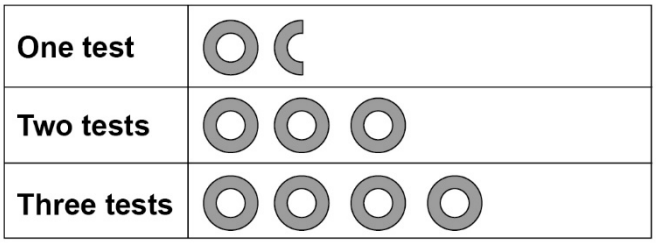
| Q | Answer | Mark | Comments |
|---|---|---|---|
| 5(c) | $2t$ | B1 | |
| | **Additional Guidance** | | |
| | Allow 2T | | B1 |
| | $2 \times t = 2t$ | | B1 |
| | $2 \times t$ | | B0 |
| | $2^t$ | | B0 |
| | $\frac{2t}{1}$ or $\frac{2}{1}t$ | | B0 |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| 6(a) | 1000 or $10^3$ | B1 | |
| | **Additional Guidance** | | |
| | Allow commas but not decimal points<br>eg 1,000 or 10,00<br>eg 1.000 or 10.00 | | <br>B1<br>B0 |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| 6(b) | 4.7 or $\frac{47}{10}$ or $4\frac{7}{10}$ | B1 | |
| | **Additional Guidance** | | |
| | Allow extra zeros eg 4.70 | | B1 |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| 6(c) | $\frac{1}{4}$ | B1 | oe fraction eg $\frac{2}{8}$ |
| | **Additional Guidance** | | |
| | 0.25 | | B0 |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| 6(d) | 19 19<br>or<br>−19 −19 | B1 | accept $\sqrt{361}$ $\sqrt{361}$ |
| | **Additional Guidance** | | |
| | Condone 19 only in one box if other box is blank | | B1 |
| | Condone −19 only in one box if other box is blank | | B1 |
| | Condone $\sqrt{361}$ only in one box if other box is blank | | B1 |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| 7(a) | (One test) One and a half symbols | B1 | allow any orientation for the half circle |
| | (Two tests) Three symbols | B1 | |
| | (Three tests) Four symbols | B1 | SC1 totals seen for either pictogram<br>ie 12, 16, 6 for group A<br>or 6, 12, 16 or 1.5, 3, 4 for group B |
| | **Additional Guidance** | | |
| | Mark intention eg accept any attempt at circle and half circle symbol (unless obviously intended to be quarter or three-quarter circle) and allow different sizes and symbols such as plain circles | | |
| | Two half circle symbols are not acceptable for a whole circle (unless joined to make a circle) | | |
| | Alignment of symbols is not being tested | | |
| | Apart from the Special Case, ignore numbers given | | |
| | SC1 may be implied by 6, 12 and 16 symbols | | |
| |  | | B1B1B1 |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| 7(b) | $\frac{17}{25}$ or 0.68 or 68%<br>or<br>25 – 17 or 8 seen | M1 | oe<br>may be seen in a calculation<br>eg $1 - \frac{17}{25}$ |
| | $\frac{8}{25}$ or 0.32 or 32% | A1 | oe |
| | **Additional Guidance** | | |
| | Ignore simplification or conversion if correct answer seen | | |
| | $\frac{8}{25}$ in working or on answer line with 8 on answer line | | M1A0 |
| | Ignore words if correct answer seen eg $\frac{8}{25}$ unlikely | | M1A1 |
| | Answer 8 : 25 or 8 : 17 or 17 : 8 (even if correct answer also seen) | | M1A0 |
| | 8 out of 25 without correct answer seen | | M1A0 |
| | Answer 17 : 25 only | | M0A0 |
| | eg $\frac{8}{17}$ or $\frac{1}{8}$ or 8% implies 8 | | M1 |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| 8 | $3 \times 13 + 4 \times -2$<br>or<br>$(3r =)$ 39 or $(4t =) -8$ | M1 | oe |
| | 31 | A1 | |
| | **Additional Guidance** | | |
| | $39 + 8$ | | M1A0 |
| | 39 or $-8$ may be implied by a calculation eg $3 \times 13 + 4 \times 2 = 47$ | | M1A0 |
| | 47 only does not imply 39 | | M0A0 |
| | Values are not implied by incorrect expressions eg only $39r$ | | M0 |
| | Incorrect further work | | A0 |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| 9 | **Alternative method 1** Using number of coins left | | |
| | 295 ÷ 8<br>or 36(.875) or 36.88 or 36.9 | M1 | oe implied by (295 ÷ 20) ÷ 8<br>or 14.75 ÷ 8 or 1.84… |
| | their 36 × 8 or 288<br>or<br>their 36.875 – their 36<br>or 0.8(75) or 0.88 | M1dep | oe<br>their 36 must be an integer |
| | 295 – their 288<br>or<br>their 0.875 × 8 or 7 (coins left) | M1dep | oe<br>implied by 0.875 × 20 × 8<br>or 0.875 × 160 or 140 or 1.4 |
| | 1.40 | A1 | |
| | **Alternative method 2** Using total value of coins given | | |
| | 295 ÷ 8<br>or 36(.875) or 36.88 or 36.9 | M1 | oe implied by (295 ÷ 20) ÷ 8<br>or 14.75 ÷ 8 or 1.84… |
| | their 36 × 20 × 8<br>or their 36 × 160 or 5760 | M1dep | oe<br>their 36 must be an integer |
| | 295 × 20 or 5900 | M1 | oe |
| | 1.40 | A1 | |
| | **Alternative method 3** Using value of coins given to each child | | |
| | 295 ÷ 8<br>or 36(.875) or 36.88 or 36.9 | M1 | oe implied by (295 ÷ 20) ÷ 8<br>or 14.75 ÷ 8 or 1.84… |
| | their 36 × 20 or 720 | M1dep | oe<br>their 36 must be an integer |
| | 295 ÷ 8 × 20<br>or 5900 ÷ 8 or 737(.5) or 738 | M1dep | oe<br>dep on 1st M1 only |
| | 1.40 | A1 | |

**Additional Guidance is on the next page**

| | | |
|---|---|---|
| **9 cont** | **Additional Guidance** | |
| | Up to M3 may be awarded for correct work with no answer, or incorrect answer, even if this is seen amongst multiple attempts | |
| | Use the scheme that awards most marks | |
| | Methods are shown in pence but equivalent working may be in pounds | |
| | **NB** 7 coins per child or (£)7, possibly from truncating £7.37 or £7.20 or from 56 ÷ 8, does not imply M3 in Alt 1. The 7 must be coins left | |
| | Alt 3 740 or 7.4(0) with no method does not imply 737.5 or 7.375 | |
| | In Alt 2 the 3rd mark is **not** dependent | |
| | Note that the third mark in Alt 3 implies the first mark<br>ie 737(.5) or 738 | M1M0M1 |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| **10** | $62 - 54$ or $8$ or $54 - 62$ or $-8$<br>or<br>$\frac{62-54}{2}$ or $4$ or $\frac{54-62}{2}$ or $-4$<br>or<br>$\frac{62+54}{2}$ or $\frac{116}{2}$ or $58$<br>or<br>$2 + 16 + 13 + 27 = 58$<br>or<br>$1 + 15 + 12 + 30 = 58$ | M1 | oe<br>eg $1 + 15 + 16 + 30 - 2 - 12 - 13 - 27$<br>or<br>$2 + 12 + 13 + 27 - 1 - 15 - 16 - 30$<br>or<br>$-1 + 3 + 3 + 3$ or $1 - 3 - 3 - 3$ |
| | 12 and 16 | A1 | either order |
| | **Additional Guidance** | | |
| | Up to M1 may be awarded for correct work with no answer, or incorrect answer, even if this is seen amongst multiple attempts | | |
| | Answer 12 and 16 even if working unclear (eg many attempts) | | M1A1 |
| | 58 only seen from an incorrect addition | | M0 |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| **11** | $p = m + 5$ | B1 | |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| **12(a)** | 30 or $\frac{1}{2}$ **and** 15 or $\frac{1}{4}$<br>or<br>45 or $\frac{3}{4}$ | M1 | oe<br>allow no units or incorrect units<br>may be on graph |
| | 45 minutes<br>or<br>$\frac{3}{4}$ hour | A1 | oe |
| | **Additional Guidance** | | |
| | Allow abbreviated units<br>eg 45 min(s)<br>eg condone 45 m<br>eg $\frac{3}{4}$ h | | M1A1<br>M1A1<br>M1A1 |
| | 45 minutes in working with answer 45 | | M1A1 |
| | $\frac{3}{4}$ hour in working with answer $\frac{3}{4}$ | | M1A1 |
| | 0.3 + 0.15 is M0 unless recovered to 45 | | |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| 12(b) | 29 or $4 + 25$ | M1 | oe may be embedded<br>29 may be on graph eg on $y$-axis |
| | 58 | A1 | SC1 54 |
| | **Additional Guidance** | | |
| | $29 \times 2$ with no or incorrect evaluation | | M1A0 |
| | Allow the first mark embedded in a calculation<br>eg $29 + 4$ or $29 + 5 + 25$ or $29 + 29 + 25 + 25$ or $29 - 25$ | | M1A0 |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| 13 | Cannot be true<br>Cannot be true<br>Might be true | B3 | B1 for each<br>any clear indication |
| | **Additional Guidance** | | |
| | Only one cross in a row – mark the cross | | |
| | A tick and cross(es) in a row – mark the tick | | |
| | More than one tick in a row scores B0 for that row | | |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| 14(a) | $\frac{165 + 567}{12}$ or $\frac{732}{12}$ | M1 | oe |
| | 61 | A1 | SC1 212.25 |
| | **Additional Guidance** | | |
| | Only $165 + 567 \div 12$ with brackets missing | | M0A0 |
| | 61.00 | | M1A1 |
| | 61.0 | | M1A0 |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| 14(b) | **Alternative method 1** | | |
| | $50 = \frac{165 + x}{15}$<br>or<br>$50 \times 15$ or 750 seen | M1 | oe eg $750 = 165 +$ cost of minibus<br>any letter or symbol or word(s) |
| | $50 \times 15 - 165$ | M1dep | oe |
| | 585 | A1 | SC1 915 |
| | **Alternative method 2** | | |
| | $165 \div 15$ or 11 | M1 | oe |
| | (50 – their 11) × 15<br>or<br>$39 \times 15$ | M1dep | oe |
| | 585 | A1 | SC1 915 |
| | **Additional Guidance** | | |
| | Up to M2 may be awarded for correct work with no answer, or incorrect answer, even if this is seen amongst multiple attempts | | |
| | (165 + any value) ÷ 15 does not imply M1 unless set up as an equation for the first mark of Alt 1 | | |
| | Allow 12 as a misread for 15 | | |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| 15 | $P$ (3, 0)  $Q$ (5, 5) | B2 | B1 $P$ (3, 0) or $Q$ (5, 5)<br>or both $x$-coordinates correct<br>or both $y$-coordinates correct<br>SC1 $P$ (5, 5)  $Q$ (3, 0) |
| | **Additional Guidance** | | |
| | Accept eg $P\ (\overset{x}{3},\ \overset{y}{0})$ | | |
| | Do not accept eg $P$ ($3x$, $0y$) | | |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| 16(a) | $360 - 162 - 40 - 90$ or 68<br>or<br>$x + x + 162 + 40 + 90 = 360$ | M1 | oe eg $360 - 292$<br>or<br>$2x + 292 = 360$ |
| | 34 | A1 | |
| | **Additional Guidance** | | |
| | $68 \div 2$ | M1 | |
| | 68 may be embedded for M1<br>eg $68 + 162 + 40 + 90 = 360$<br>eg $162 + 40 + 90 + 30 + 38 = 360$ (because 30 and 38 total 68)<br>eg $162 + 40 + 90 + 34 + 34 = 360$ (34 needs to be selected to score A1) | <br>M1<br>M1<br>M1 |
| | 34 seen followed by answer 68 | M1A0 | |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| 16(b) | $\frac{135}{90}$ or 1.5<br>or $\frac{90}{135}$ or 0.66(…) or 0.67<br>or<br>any correct method that would lead to answer 243<br>eg<br>$\frac{162}{90} \times 135$ or $135 \div \frac{90}{162}$<br>or $\frac{162}{360} \times 135 \times 4$ or $0.45 \times 540$<br>or $135 \times 4 \div \frac{360}{162}$<br>or $162 + 162 \div 2$<br>or $135 + 108$ | M2 | oe<br>M1<br>linking a correct angle with number of people<br>eg $90 \rightarrow 135$ or $\frac{1}{4} \rightarrow 135$<br>or $180 \rightarrow 270$ or $72 \rightarrow 108$<br>or<br>$135 \times 360 \div 90$ or $135 \times 4$ or 540<br>or<br>$\frac{162}{90}$ or 1.8<br>or $\frac{90}{162}$ or 0.55(…) or 0.56<br>or<br>$\frac{162}{360}$ or 0.45 or 45%<br>or $\frac{360}{162}$ or 2.22(…) |
| | 243 | A1 | |

| Additional Guidance | |
|---|---|
| Up to M2 may be awarded for correct work with no answer, or incorrect answer, even if this is seen amongst multiple attempts | |
| M1 may be seen as eg 90 = 135 | |
| If shown on pie chart, just writing 135 in Computer sector is insufficient for M1 unless 90 or $\frac{1}{4}$ also shown | |
| Allow embedded fraction, even in an incorrect calculation for at least M1<br>eg $\frac{90}{162} \times 135$<br>eg $\frac{90}{135} \times 162$ | M1<br>M2 |
| Build-up must be correct or full method must be shown | |
| 243 from an incorrect method eg $135 + 40 + 68$ | M0A0 |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| 17 | 100 | B1 | oe eg $10^2$ or hundred |
| | **Additional Guidance** | | |
| | Do not allow 100 000 000 even if word million is crossed out | | |
| | 1 hundred or one hundred or a hundred | | B1 |
| | 100 000 000 100 million | | B1 |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| 18(a) | 38.5(0) × 40 000 | M1 | oe<br>implied by digits 154 |
| | 1 540 000 | A1 | oe<br>eg $1.54 \times 10^6$ or 1.54 million or 1.54 m<br>SC1 3 080 000 or 770 000 |
| | **Additional Guidance** | | |
| | Allow any commas or spaces eg 154,00,00 | | M1A1 |
| | Using decimal points is A0, even if 1 540 000 seen in working<br>eg 15 400.00 | | M1A0 |
| | 1 540 000 seen in working but loses or gains one zero on answer line is acceptable as a transcription error<br>eg 1 540 000 seen and answer 1 5040 000 or answer 1 540 00 | | M1A1 |
| | Do not allow the A1 for further work (but may gain M1 eg for digits 154 seen or SC1) | | |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| 18(b) | It is not possible to tell | B1 | |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| 18(c) | **Alternative method 1** Working out the increase using 35% | | |
| | $55\,000 - 40\,000$ or $15\,000$ | M1 | oe |
| | $0.35 \times 40\,000$ or $14\,000$ | M1 | oe |
| | $15\,000$ and $14\,000$ and Yes | A1 | oe |
| | **Alternative method 2** Working out the tickets for the second or first match using 35% | | |
| | $0.35 \times 40\,000$ or $14\,000$ | M1 | oe |
| | $40\,000 + 0.35 \times 40\,000$ or $54\,000$<br>or<br>$55\,000 - 0.35 \times 40\,000$ or $41\,000$ | M1dep | oe<br>$1.35 \times 40\,000$ scores M2 |
| | $54\,000$ and Yes<br>or<br>$41\,000$ and Yes | A1 | oe |
| | **Alternative method 3** Working out the percentage increase | | |
| | $55\,000 - 40\,000$ or $15\,000$<br>or<br>$\frac{55\,000}{40\,000}$ or 1.375 | M1 | oe |
| | $\frac{55\,000 - 40\,000}{40\,000}$<br>or $\frac{15\,000}{40\,000}$<br>or $\frac{55\,000}{40\,000} - 1$ or $1.375 - 1$<br>or 0.375 or 37.5<br>or 1.375 **and** 1.35 | M1dep | oe eg $\frac{55 - 40}{40}$ |
| | 37.5 and Yes<br>or<br>0.375 and 0.35 and Yes<br>or<br>1.375 and 1.35 and Yes | A1 | oe |

**Additional Guidance is on the next page**

| | Additional Guidance | |
|---|---|---|
| **18(c) cont** | Up to M2 may be awarded for correct work with no answer, or incorrect answer, even if this is seen amongst multiple attempts | |
| | May use sales of tickets but must use 1 540 000<br>**Alt 1**<br>$55\,000 \times 38.5 - 40\,000 \times 38.5$ or $2\,117\,500 - 1\,540\,000$ or $577\,500$<br>$0.35 \times 1\,540\,000$ or $539\,000$<br>$577\,500$ and $539\,000$ and Yes<br>**Alt 2**<br>$0.35 \times 1\,540\,000$ or $539\,000$<br>$1\,540\,000 + 539\,000$ or $2\,079\,000$ or $2\,117\,500 - 539\,000$ or $1\,578\,500$<br>$2\,079\,000$ and $2\,117\,500$ and Yes or $1\,578\,500$ and $1\,540\,000$ and Yes<br>**Alt 3**<br>$55\,000 \times 38.5 - 40\,000 \times 38.5$ or $2\,117\,500 - 1\,540\,000$ or $577\,500$<br>or $\frac{2\,117\,500}{1\,540\,000}$<br>$\frac{2\,117\,500 - 1\,540\,000}{1\,540\,000}$<br>37.5 and Yes | <br><br>M1<br>M1<br>A1<br><br>M1<br>M1dep<br>A1<br><br>M1<br>M1dep<br>A1 |
| | Only $40\,000 - 55\,000$ (may be recovered) | M0 |
| | In Alt 1 the 2nd mark is **not** dependent | |
| | Build-up to 35% must be correct or full method must be shown | |
| | Accept $35\% \times 40\,000$ for 2nd mark of Alt 1 or 1st mark of Alt 2 | M1 |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| 19 | **Alternative method 1** | | |
| | Pair of integers in the ratio 5 : 4 between 20 : 16 and 75 : 60<br>or<br>list of multiples of 9 with at least 3 correct including 63<br>or<br>$63 \div 9 = 7$ or $63 \div 7 = 9$<br>or $9 \times 7 = 63$ | M1 | 20 and 16 or 25 and 20<br>or 30 and 24 or 35 and 28<br>or 40 and 32 or 45 and 36<br>or 50 and 40 or 55 and 44<br>or 60 and 48 or 65 and 52<br>or 70 and 56 or 75 and 60 |
| | 63 | A1 | |
| | **Alternative method 2** | | |
| | An integer [60, 70] divided in the ratio 5 : 4<br>eg $65 \div 9 \times 5$ and $65 \div 9 \times 4$ | M1 | if no method seen, values must be rounded or truncated to at least 1 dp<br>eg 65 and 36.1 and 28.8 or 28.9 |
| | 63 | A1 | |
| | **Additional Guidance** | | |
| | Up to M1 may be awarded for correct work with no answer, or incorrect answer, even if this is seen amongst multiple attempts | | |
| | M1 pairs of responses may be seen in a ratio | | |
| | Answer 35 : 28 | | M1A0 |
| | 63 seen in list of multiples eg 27, 36, 45, 54, 63, … but not selected as the answer | | M1A0 |
| | 63 from incorrect method with no M1 response seen | | M0A0 |
| | Alt 2 eg $65 \div 9 = 7.2$ with 36 and 28.8 implies multiplication by 5 and 4 (because it follows through from their answer to the correct division) | | M1A0 |
| | Alt 2 eg $65 \div 9 = 7.2$ with 36.1 and 28.8 or 28.9 implies multiplication by 5 and 4 (may have kept full value on calculator) | | M1A0 |
| | Alt 2 eg 65 and no working with 36 and 28.8 does not imply the method (because these are not rounded or truncated to at least 1 dp) | | M0A0 |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| 20(a) | $\frac{90-42}{100} \times 24\,000$<br>or<br>$\frac{48}{100} \times 24\,000$ or 11 520<br>or<br>$\frac{42}{100} \times 24\,000$ or 10 080<br>or<br>$\frac{48-42}{100} \times 24\,000$<br>or<br>6 and 48 and 42 seen | M1 | oe |
| | 1440 | A1 | SC1 1920 or answer with digits 144 |
| | **Additional Guidance** | | |
| | Up to M1 may be awarded for correct work with no answer, or incorrect answer, even if this is seen amongst multiple attempts | | |
| | Build-up to 48% or 42% must be correct or full method must be shown | | |
| | eg only 48% × 24 000 with no or incorrect evaluation | | M0 |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| 20(b) | Ticks Cannot tell<br>and<br>valid reason | B1 | eg ticks Cannot tell and We don't know the number sold (in 2019) |
| | **Additional Guidance** | | |
| | Ignore calculations using percentages from the bar chart | | |
| | Allow any unambiguous indication of Cannot tell with a valid reason | | |
| | Ticks Cannot tell and They might have sold fewer drinks (in 2019) | B1 | |
| | Ticks Cannot tell and It (only) gives percentages | B1 | |
| | Ticks Cannot tell and It doesn't tell you how many coffees were sold | B1 | |
| | Ticks Cannot tell and Don't have enough information | B1 | |
| | Ticks Cannot tell and Both bars the same height | B0 | |
| | Ticks Yes or ticks No | B0 | |

<table>
<tr><th>Q</th><th>Answer</th><th>Mark</th><th>Comments</th></tr>
<tr><td rowspan="11">21(a)</td><td>Correct evaluation of the cube root of an integer [40, 50]<br>or<br>correct evaluation of the cube of a decimal or fraction (3, 3.5]</td><td>M1</td><td>eg $\sqrt[3]{40} = 3.4$ or $40 \rightarrow 3.4$<br><br>eg $3.5^3 = 42.8$ or $3.5 \rightarrow 42.8$</td></tr>
<tr><td>42</td><td>A1</td><td>SC1 answer given as $\sqrt[3]{42}$</td></tr>
<tr><td colspan="3">Additional Guidance</td></tr>
<tr><td colspan="2">Up to M1 may be awarded for correct work with no answer, or incorrect answer, even if this is seen amongst multiple attempts</td><td></td></tr>
<tr><td colspan="2">Condone eg $40 = 3.4$ or $\sqrt{40} = 3.4$ to mean $\sqrt[3]{40} = 3.4$</td><td></td></tr>
<tr><td colspan="2">Answer only 42</td><td>M1A1</td></tr>
<tr><td colspan="2">Must select 42 as final answer for M1A1 ie 42 as the last in a list with a blank answer line is not enough for A1 unless 42 selected</td><td></td></tr>
<tr><td colspan="2">If $\sqrt[3]{42}$ or $3.5^3$ is evaluated then it must be correct to award the A1 for 42</td><td></td></tr>
<tr><td colspan="2">NB 42 only from incorrect method eg listing multiples of 3 or $42 \div 3$ seen or 42 is divisible by 3 as the working</td><td>M0A0</td></tr>
<tr><td colspan="3">Acceptable values for cube roots of integers in range
<table>
<tr><td>40</td><td>3.4(19…) or 3.42(0)</td></tr>
<tr><td>41</td><td>3.4(48…) or 3.45</td></tr>
<tr><td>42</td><td>3.4(76…) or 3.48 or 3.5</td></tr>
<tr><td>43</td><td>3.5(03…)</td></tr>
<tr><td>44</td><td>3.5(30…)</td></tr>
<tr><td>45</td><td>3.5(56…) or 3.557 or 3.56 or 3.6</td></tr>
</table>
<table>
<tr><td>46</td><td>3.5(83…) or 3.6</td></tr>
<tr><td>47</td><td>3.6(08…) or 3.609 or 3.61</td></tr>
<tr><td>48</td><td>3.6(34…)</td></tr>
<tr><td>49</td><td>3.6(59…) or 3.66 or 3.7</td></tr>
<tr><td>50</td><td>3.6(84…) or 3.7</td></tr>
</table></td></tr>
<tr><td colspan="3">Examples of cubes of numbers in range with their acceptable values
<table>
<tr><td>3.1</td><td>29(.791) or 29.8 or 30</td></tr>
<tr><td>3.2</td><td>32(.768) or 32.77 or 32.8 or 33</td></tr>
<tr><td>3.3</td><td>35(.937) or 35.94 or 36</td></tr>
</table>
<table>
<tr><td>3.4</td><td>39(.304)</td></tr>
<tr><td>3.5 or $3.4\dot{9}$</td><td>42(.875) or 42.88 or 42.9 or 43</td></tr>
</table></td></tr>
</table>

| Q | Answer | Mark | Comments |
|---|---|---|---|
| 21(b) | Valid response that indicates there is one (negative) answer missing | B1 | eg $-10$ (is also an answer)<br>or there is a negative value as well<br>or square roots have two answers<br>or answer is 10 and $-10$ |
| | **Additional Guidance** | | |
| | $-10 \times -10$ (= 100) | | B1 |
| | Another number can square to make 100 (implies exactly two) | | B1 |
| | She has forgotten the other value (implies exactly two) | | B1 |
| | There is another value it could be (implies exactly two) | | B1 |
| | It could be a different number (implies exactly two) | | B1 |
| | It could be negative (bod means 10 could be $-10$) | | B1 |
| | $-10^2$ (= 100) (condone missing brackets around $-10$) | | B1 |
| | $\pm \sqrt{100}$ | | B1 |
| | Indication that there might be **more** than two possible values for $x$<br>eg There are other possible numbers<br>eg There could be other values<br>eg Other numbers square to make 100<br>eg She hasn't included negatives | | <br>B0<br>B0<br>B0<br>B0 |
| | Repeating the question<br>eg There is more than 1 possible value<br>eg 10 is not the only possible value<br>eg More than 1 number works | | <br>B0<br>B0<br>B0 |
| | A partially correct statement<br>eg $x$ could be negative or decimal<br>eg $-10 \times -10 = -100$<br>eg $x^2 = -10$ | | <br>B0<br>B0<br>B0 |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| 22(a) | 11 5 4<br>or<br>10 7 3<br>or<br>10 6 4<br>or<br>9 8 3<br>or<br>9 7 4<br>or<br>9 6 5<br>or<br>8 7 5 | B2 | any order<br>B1 answer of three positive numbers in any order with sum 20<br>eg 17 2 1<br>or $9\frac{1}{2}$ $8\frac{1}{2}$ 2<br>or 10 5 5<br>or $6\frac{2}{3}$ $6\frac{2}{3}$ $6\frac{2}{3}$<br>or<br>correct equation in $w$, $x$ and $y$<br>eg $4w + 4x + 4y = 80$ or $w + x + y = 20$ |
| | **Additional Guidance** | | |
| | Ignore attempts to work out the volume or surface area<br>eg 10 5 5 volume calculated as 500 | | B1 |
| | Negative numbers and/or zero used | | B0 |
| | $wxy > 200$ or $wxy = 200$ | | B0 |
| | Allow $6.\dot{6}$ for $6\frac{2}{3}$ | | |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| 22(b) | $54a^2$ | B1 | |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| 23 | (0, –6) | B1 | |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| 24(a) | 74.0656<br>or 74.1<br>or 74.07<br>or 74.066 | B2 | B1 61.4656 or 61.5 or 61.47<br>or 61.466 or $\frac{38\,416}{625}$<br>or 12.6 or $\frac{63}{5}$<br>or $\frac{46\,291}{625}$ |
| | **Additional Guidance** | | |
| | Truncated answer only eg 74 or 74.0 or 74.06 or 74.065 | | B0 |
| | An incorrect answer cannot imply B1 – a value for B1 must be seen | | |
| | Ignore subsequently incorrect rounding or any truncation once a correct B2 response seen<br>eg 74.0656 seen, answer 74<br>eg 74.07 seen, answer 74.0 | | <br>B2<br>B2 |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| 24(b) | $1.45 \times 10^5$ | B2 | B1 correct value not in standard form<br>eg 145 000 or $14.5 \times 10^4$ |
| | **Additional Guidance** | | |
| | Ignore incorrect conversion if correct B1 value seen<br>eg 145 000, answer $1.45 \times 10^3$<br>eg 145 000, answer $145^3$ | | <br>B1<br>B1 |
| | Ignore a decimal point in a correct B1 value if it is part of their conversion attempt | | |
| | Condone $10^5 \times 1.45$ | | B2 |
| | Only 1.45 05 or 1.45 $10^5$ | | B0 |
| | Only $1.45 + 10^5$ | | B0 |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| 25(a) | $1.2 \times 20 = 24$ and $40 - 24 = 16$ | B1 | oe eg $1.2 \times 20 = 24$ and $24 + 16 = 40$<br>or $40 - 16 = 24$ and $24 \div 20 = 1.2$<br>or $24 + 16 = 40$ and $24 \div 1.2 = 20$<br>may be seen as one calculation<br>eg $40 - 1.2 \times 20 = 16$<br>or $16 + 1.2 \times 20 = 40$<br>or $40 - 16 = 1.2 \times 20$ |
| | **Additional Guidance** | | |
| | $40 - 24 = 16$ and $40 - 16 = 24$ and $24 + 16 = 40$ are equivalent | | |
| | $1.2 \times 20 = 24$ and $24 \div 1.2 = 20$ and $24 \div 20 = 1.2$ are equivalent | | |
| | $40 - 24 = 16$ or $16 + 24 = 40$ or $40 - 16 = 24$ | | B0 |
| | (20 minutes =) 24 litres leak out $40 - 24 = 16$ | | B0 |
| | $1.2 \times 20 = 24$ 16 litres left | | B0 |
| | Allow unambiguous working in ml and/or seconds | | |
| | For eg $40 - 24 = 16$ condone $24 - 40 = 16$ or $24 - 40 = -16$ | | |
| | Condone incorrect use of equals sign<br>eg $1.2 \times 20 = 24 + 16 = 40$ or $1.2 \times 20 = 24 - 40 = 16$ | | B1 |
| | Correct response with irrelevant work | | B1 |
| | 16 from two different ways with one way incorrect is choice<br>eg $1.2 \times 20 = 24$ and $40 - 24 = 16$ and $20 \div 1.2 = 16$ | | B0 |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| 25(b) | 3 | B1 | |
| | Correct method for gradient<br>eg $\frac{40-16}{15-\text{their } 3}$ or $\frac{24}{12}$ | M1 | oe eg $\frac{30-25}{10-7.5}$ or $\frac{10}{5}$ or $40-38$ |
| | 2 | A1ft | correct or ft their 3 |
| | **Additional Guidance** | | |
| | Note that their 3 can be used to work out the rate but does not have to be | | |
| | Values seen on graph must be used correctly<br>eg 24 and 12 seen on the graph is M0 unless subsequently used correctly in attempt to work out the gradient | | |
| | A1ft answers must be to 1 dp or better<br>eg 3.5<br>$\frac{40-16}{15-3.5}$<br>2.1 (accept 2.08…) | | B0<br>M1<br>A1ft |
| | After B0 the method may be implied (use $\frac{40-16}{15-\text{their } 3}$ to check)<br>eg 6<br>2.7 (accept 2.66…) | | B0<br>M1A1ft |
| | If the report is blank, 3 and 2 must be unambiguously identified in working to be acceptable | | |
| | Allow 2 to be written as $\frac{2}{1}$ | | |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| 26 | $14^2$ or 196 **and** $9^2$ or 81<br>or<br>115 | M1 | implied by 277<br>or $\sqrt{277}$ or 16.6(4…) |
| | $\sqrt{14^2-9^2}$ or $\sqrt{196-81}$<br>or $\sqrt{115}$ | M1dep | |
| | 10.7(2…) | A1 | accept 11 with M2 seen |
| | **Additional Guidance** | | |
| | Ignore incorrect rounding or truncation once correct answer seen | | M1M1A1 |
| | Answer 10.7(2…) with no working | | M1M1A1 |
| | Answer 10.7(2…) from trigonometry or accurate drawing | | M0M0A0 |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| 27 | **Alternative method 1** | | |
| | $6x + x + 5x + 6x + x + 6x + x$<br>or $26x$<br>or<br>$6 + 1 + 5 + 6 + 1 + 6 + 1$ or 26 | M1 | oe eg $7x + 6x - x + 6x + x + 6x + x$<br>$26x$ or 26 is implied by 3.8 oe if addition not seen |
| | their $26x = 98.8$<br>or<br>98.8 ÷ their 26<br>or<br>3.8 or $\frac{19}{5}$ | M1 | oe<br>equation must have terms collected<br>if 1st M1 **not** awarded their $26x$ must be $24x$ or $25x$ or $27x$<br>if 1st M1 **not** awarded their 26 must be 24 or 25 or 27 |
| | their 3.8 × 14 | M1dep | dep on 2nd M1<br>oe eg 45.6 + 7.6 |
| | 53.2 | A1ft | oe<br>ft their 3.8 if M0M2 awarded |

**Mark scheme and Additional Guidance continue on the next page**

| | | | |
|---|---|---|---|
| **27 cont** | **Alternative method 2** | | |
| | $6x + x + 6x$ or $13x$<br>or<br>$6 + 1 + 6$ or 13 | M1 | oe eg $6x + x + 5x + x$<br>$13x$ or 13 is implied by 3.8 oe if addition not seen |
| | their $13x = 98.8 \div 2$<br>or<br>$49.4 \div$ their 13<br>or<br>3.8 or $\frac{19}{5}$ | M1 | oe<br>equation must have terms collected<br>if 1st M1 **not** awarded their $13x$ must be $12x$<br>if 1st M1 **not** awarded their 13 must be 12 |
| | their $3.8 \times 14$ | M1dep | dep on 2nd M1<br>oe eg $49.4 + 3.8$ |
| | 53.2 | A1ft | oe<br>ft their 3.8 if M0M2 awarded |
| | **Additional Guidance** | | |
| | Up to M3 may be awarded for correct work with no answer, or incorrect answer, even if this is seen amongst multiple attempts | | |
| | Follow through must be to at least 1 dp and their 26 or their 13 must be seen<br>For information: 24 → 57.6… 25 → 55.3… 27 → 51.2… 12 → 57.6… | | M0M1M1A1ft |
| | Both 2nd and 3rd method marks may be implied by their answer. If not using 24, 25, 26, 27, 12 or 13 you must have seen the first M1. | | |
| | $27x = 98.8$ (1st M0, no addition seen, but $27x$ allowed)<br>$\frac{98.8}{27} \times 14$, answer 51.2 | | M0M1<br>M1A1ft |
| | $7x + 5x + 6x + x + 6x + x = 20x$ (correct terms added with incorrect total)<br>$98.8 \div 20 = 4.94$<br>69.16 (multiplication by 14 implied) | | M1<br>M1<br>M1A0 |
| | $98.8 \div 20 = 4.94$ (1st M0, no addition seen, and 20 not allowed)<br>$4.94 \times 14$, answer 69.16 | | M0M0<br>M0A0 |
| | $6x + x + 5x + 6x + x + 6x + x = 26x^7$ | | M1M0M0A0 |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| 28 | At least two of $2^3$, $3^2$, 7 selected<br>eg $2^3 \times 3^2 \times 7$<br>or 2 2 2 3 3 7 7<br>or $2^2 + 3^2 + 7$<br>or $2^3 \times 3^2$ or $2^3 + 7$ or $3^2 . 7$ | M1 | allow $2^3$ to be $2 \times 2 \times 2$ or 8<br>allow $3^2$ to be $3 \times 3$ or 9<br>allow 7 to be $7^1$<br>selection is implied by inclusion in intersection of overlapping circles<br>M0 inclusion of 5 in selection |
| | 504 | A1 | |
| | **Additional Guidance** | | |
| | $8 \times 9 \times 7$ | | M1 |
| | 8, 9, 49 | | M1 |
| | $4 + 9 + 7$ | | M1 |
| | Intersecting circles with eg only 9 and 7 in the intersection | | M1 |
| | Allow inclusion of 1 for up to M1<br>eg $1 \times 2^3 \times 3^2 \times 7$ | | M1 |
| | $2^3 \times 3^2 \times 5 \times 7$ | | M0 |
| | Answer 504 | | M1A1 |
| | M1 seen with answer the LCM | | M1A0 |