# FUNCTIONAL SKILLS CERTIFICATE
# Functional Mathematics

Level 2

Mark Scheme

4368

November 2017

Version: 1.0 Final

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

**Glossary for Mark Schemes**

Examinations are marked to award positive achievement.

Marks are awarded for demonstrating the following interrelated **process skills**.

**Representing**     Selecting the mathematics and information to model a situation.

| | | |
|---|---|---|
| **R.1** | Candidates recognise that a situation has aspects that can be represented using mathematics. |
| **R.2** | Candidates make an initial model of a situation using suitable forms of representation. |
| **R.3** | Candidates decide on the methods, operations and tools, including ICT, to use in a situation. |
| **R.4** | Candidates select the mathematical information to use. |

**Analysing**     Processing and using mathematics.

| | |
|---|---|
| **A.1** | Candidates use appropriate mathematical procedures. |
| **A.2** | Candidates examine patterns and relationships. |
| **A.3** | Candidates change values and assumptions or adjust relationships to see the effects on answers in models. |
| **A.4** | Candidates find results and solutions. |

**Interpreting**     Interpreting and communicating the results of the analysis.

| | |
|---|---|
| **I.1** | Candidates interpret results and solutions. |
| **I.2** | Candidates draw conclusions in light of situations. |
| **I.3** | Candidates consider the appropriateness and accuracy of results and conclusions. |
| **I.4** | Candidates choose appropriate language and forms of presentation to communicate results and solutions. |

In particular, individual marks are mapped onto the following **skills standards**.

**Representing**   Making sense of the situations and representing them.
A learner can:

| | | |
|---|---|---|
| **Ra** | | Understand routine and non-routine problems in familiar and unfamiliar contexts and situations. |

**Rb**   Identify the situation or problems and identify the mathematical methods needed to solve them.

**Rc**   Choose from a range of mathematics to find solutions.

**Analysing**   Processing and using the mathematics.
A learner can:

**Aa**   Apply a range of mathematics to find solutions.

**Ab**   Use appropriate checking procedures and evaluate their effectiveness at each stage.

**Interpreting**   Interpreting and communicating the results of the analysis.
A learner can:

**Ia**   Interpret and communicate solutions to multistage practical problems in familiar and unfamiliar contexts and situations.

**Ib**   Draw conclusions and provide mathematical justifications.

To facilitate marking, the following categories are used:

**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 following a mistake in an earlier step.

**SC**   Special case. Marks awarded within the scheme for a common misinterpretation which has some mathematical worth.

**oe**   Or equivalent. Accept answers that are equivalent.

eg, accept 0.5 as well as $\frac{1}{2}$

| Q | Answer | Mark | Comments |
|---|--------|------|----------|
| **1(a)** | 2.21 (pm)<br>or<br>14 21 | B2<br>*Aa*<br>*Aa* | B1   2.01(pm) or 14 01 seen<br>      or<br>B1ft  correct time for their 2.01(pm)<br>SC1 2.41 (pm) or 1421<br>      or<br>      3.01 (pm) or 1501 |
| | **Additional Guidance** | | |
| | Allow any representation of correct times. E.g. 2:21 or 14.21 or 21 minutes past 2 | | |

| Q | Answer | | Mark | Comments | | |
|---|--------|---|------|----------|---|---|
| **1(b)** | **Alternative method 1** | | | | | |
| | 56 + 43 + 39 + (56 – 39) + (43 – 18) + 18<br><br>or<br><br>56 + 43 + 39 + 17 + 25 + 18<br><br>or<br><br>(43 + 56) × 2<br><br>or<br><br>198 | | M1<br>*Aa* | allow up to two errors or omissions or one additional length | | |
| | their 198 × 4 or 792 | | M1<br>*Ra* | or their 198 ÷ 150 or 1.32<br>their 198 must be a length | | |
| | their 792 ÷ 150 | 5 × 150 or 750 | M1<br>*Rc* | their 1.32 × 4 | their 792 ÷ 5 | their 750 ÷ 4 |
| | 5.2(8 …) or 5.3 or 6 and No<br><br>or<br><br>792 and 750 and No<br><br>or<br><br>158.4 and No<br><br>or<br><br>187.5 and No | | A2<br>*Ib*<br>*Ib* | A1  5.2(8 …) or 5.3<br>     or<br>     792 and 750<br>     or<br>     158(.4)<br>     or<br>     187.5<br>or<br>A1ft  correct decision for their value(s)<br>     for A1ft must score M1M1M1 or<br>     M1M0M1 or M0M1M1 - their 198<br>     must be a length | | |

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| Q | Answer | Mark | Comments |
|---|---|---|---|
| | **Alternative method 2** | | |
| | 56 + 43 + 39 + (56 – 39) + (43 – 18) + 18<br><br>or<br><br>56 + 43 + 39 + 17 + 25 + 18<br><br>or<br><br>(43 + 56) × 2<br><br>or<br><br>198 | M1<br><br>*Aa* | allow up to two errors or omissions or one additional length |
| | 150 × 5 or 750 | M1<br><br>*Ra* | |
| | their 750 ÷ their 198 | M1<br><br>*Rc* | their 198 must be a length |
| **1(b)** | 3.78 and No | A2<br><br>*Ib*<br><br>*Ib* | A1   3.78<br><br>or<br><br>A1ft   correct decision for their value(s) must score M1M1M1 or M0M1M1 or M1M0M1 |

| **Additional Guidance** |||
|---|---|---|
| Award first M1 for any evidence of trying to find the total perimeter.<br>'(He will need) 6 rolls' implies 'No' |||
| 750 – 792 and need another 42 m | | M3A2 |
| 150 – 39 – 25 – 17 – 18 – 56 – 43 or -48 | | M1 |
| 4 × their -48 or -192 | | M1 |
| 150 – 192 or -42 | | M1 |
| 42 m short with 5 rolls so needs 6 rolls | | A2 |
| If their 198 < 198 can score M3 A1ft (allow 4 × 150 instead of 5 × 150). E.g. |||
| 39 + 18 + 56 + 43 = 156 | | M1 |
| 4 × 156 = 624 | | M1 |
| 4 × 150 = 600 | | M1 |
| Yes | | A1ft |

| **1(c)** | **Alternative method 1** | | |
|---|---|---|---|

| Q | Answer | Mark | Comments |
|---|---|---|---|
| | any appropriate area calculated, eg | M1 | |
| | 56 × 43 or 2408<br>or<br>(56 – 39) × (43 – 18) or 17 × 25 or 425<br><br>39 × 43 or 1677<br>or<br>18 × (56 – 39) or 18 × 17 or 306<br><br>18 × 56 or 1008<br>or<br>(43 – 18) × 39 or 25 × 39 or 975 | Ra | |
| | their 2408 – their 425<br><br>or<br><br>their 1677 + their 306<br><br>or<br><br>their 1008 + their 975<br><br>or<br><br>1983 | M1<br>Aa | |
| | their 1983 × 1.196 or [2371, 2371.7] | M1<br>Rb | 2371.668<br>their 1983 must be an area |
| | 4840 ÷ 2 or 2420    their [2371, 2372] × 2 | M1<br>Rc | or    their [2371, 2372] ÷ 4840 |
| | [2371, 2372] and 2420 and No<br>or<br>[4742, 4744] and No | A2<br>Ib<br>Ib | A1    [2371, 2372] and 2420<br>       or<br>       [4742, 4744]<br>       or<br>       0.48(9 …) or 0.49<br>   or<br>A1ft    correct decision for their value(s)<br>         must score M3 and use 1.196 |

| 1(c) | **Alternative method 2** | | |
|---|---|---|---|
| | any appropriate area calculated, eg | M1 | |

| Q | Answer | | Mark | Comments |
|---|--------|--|------|----------|
| | 56 × 43 or 2408 or<br>(56 – 39) × (43 – 18) or 17 × 25 or 425<br><br>39 × 43 or 1677<br>or<br>18 × (56 – 39) or 18 × 17 or 306<br><br>18 × 56 or 1008<br>or<br>(43 – 18) × 39 or 25 × 39 or 975 | | | |
| | their 2408 – their 425<br>or<br>their 1677 + their 306<br>or<br>their 1008 + their 975<br>or<br>1983 | | M1<br>*Aa* | |
| | 4840 ÷ 2 or 2420 | 4840 ÷ 1.196 or 4046.8 … | M1<br>*Rb* | |
| | their 2420 ÷ 1.196 | their 1983 × 2<br>or<br>their 4046.8 ÷ 2 | M1<br>*Rc* | 2023.411 …<br>or    their 1983 ÷ their 4046.8 … |
| | 2023.4 … and 1983 and No<br>or<br>4046.8 … and 3966 and No | | A2<br>*lb*<br>*lb* | A1  2023.4 … and 1983<br>    or<br>    4046.8 … and 3966<br>    or<br>    0.48(9 …) or 0.49<br>or<br>A1ft    correct decision for their value(s)<br>        must score M3 and use 1.196 |

| | **Additional Guidance** |
|---|---|
| **1(c)** | Use of perimeter instead of area can score M1 max for 4840 ÷ 2 or 2420<br><br>Error in calculation of area can score M1M0M1M1A1ft max |

| Q | Answer | Mark | Comments |
|---|--------|------|----------|
| | Misread of 1.196 (e.g. 1.96) can score M4A1ft max | | |
| | Not using 1.196 or misread of 1.196 can score M1M1M0M1A0 max | | |
| | Examples | | |

| Area = 1983 | M2 |
|-------------|-----|
| 1983 ÷ 1.196 = 1658 | M0 |
| 2420 | M1 |
| Compares 1658 and 2420 and states or implies No | A1ft |
| Scores A1ft as M3 scored and 1.196 used | |

| Area = 2408 | M1 |
|-------------|-----|
| 2408 ÷ 1.196 = 2013.4 | M0 |
| 2420 | M1 |
| Compares 2013.4 and 2420 and states or implies No | A0ft |
| Does **not** score A1ft as only M2 scored even though 1.196 used | |

| Area = 2408 | M1 |
|-------------|-----|
| 2408 × 1.96 = 4719.68 | M1 (mr) |
| 2420 | M1 |
| Compares 4719.68 and 2420 and states or implies Yes | A1ft |
| Would have scored M4A1ft with correct area | |

| Area = 1983 | M2 |
|-------------|-----|
| 4840 × 1.196 = 5788.64 | M0 |
| 5788.64 ÷ 2 = 2894.32 (5788.64 is their 4046.8 …) | M1 |
| Compares 1983 with 2894.32 and states or implies No | A1ft |
| Scores A1ft as M3 scored and 1.196 used (even though used incorrectly) | |

| 2(a) | rota completed with criteria for workers required correct | B1 la | |
|------|-----------------------------------------------------------|--------|--|
| | rota completed with criteria for when workers are available correct | B1 la | maximum of 2 shifts per worker per day |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| | rota clearly communicated for all shifts for all days and all names | B1 *1a* | SC1 Workers 'correctly' allocated with shifts not specified |

**Additional Guidance**

**B1B1B1 responses**

**Example 1** (tabulated list)

| Monday | Evening | Amy | |
| Tuesday | Evening | Amy | |
| Wednesday | Evening | Amy | |
| Thursday | Morning | Cathy | Ben |
| Thursday | Afternoon | Cathy | Ben |
| Thursday | Evening | Amy | Eva |
| Friday | Morning | Ben | Eva |
| Friday | Afternoon | Ben | David |
| Friday | Evening | David | Amy |
| Saturday | Morning | David | Cathy |
| Saturday | Afternoon | Ben | David |
| Saturday | Evening | Ben | Amy |
| Sunday | Afternoon | Cathy | |

**Example 2** (non-tabulated list)

Amy – Mon, Tue, Wed, Thu, Fri and Sat Evenings
Ben – Thu Morning and Afternoon, Fri Morning and Afternoon, Sat Afternoon and Evening
Cathy – Thu Morning and Afternoon, Sat Morning, Sun Afternoon
David – Fri Afternoon and Evening, Sat Morning and Afternoon
Eva – Thu Evening and Fri Morning

**2(a)**

**Example 3** (2-way table)

| | Mon | Tue | Wed | Thu | Fri | Sat | Sun |
|---|---|---|---|---|---|---|---|
| **Amy** | Evening | Evening | Evening | Evening | Evening | Evening | |
| **Ben** | | | | Morning Afternoon | Morning Afternoon | Afternoon Evening | |

| Q | | Answer | | Marking | | Comments | |
|---|---|---|---|---|---|---|---|
| | **Cathy** | | | Morning Afternoon | | Morning | Afternoon |
| | **David** | | | | Afternoon Evening | Morning Afternoon | |
| | **Eva** | | | Evening | Morning | | |

**Example 4** (2-way table)

| | Mon | Tue | Wed | Thu | Fri | Sat | Sun |
|---|---|---|---|---|---|---|---|
| **Morning** | | | | B and C | B and E | C and D | |
| **Afternoon** | | | | B and C | B and D | B and D | C |
| **Evening** | A | A | A | A and E | A and D | A and B | |

For B1B1B1 there must be a total of 22 "worker allocations"

Same worker allocated to the same shift more than once could score B0B0B1 max

Same worker with more than 2 shifts a day could score B1B0B1 max

Specifying shifts for Thu, Fri and Sat only could score B1B1B0

No shifts specified - final mark for communication must be B0

The final communication mark can be scored for

   a fully labelled 2-way table completed incorrectly

   an incorrect list including all names, all shifts and all days

| | **Alternative method 1** | | | |
|---|---|---|---|---|
| **2(b)** | 1800 – 6 × 20 <br> or <br> 1800 – 120 <br> or <br> 1680 | (1800 – 20) ÷ 5 <br> or <br> 356 | M1 <br> *Rb* | or dimensions correctly converted to cm |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| | their 1680 ÷ 5    their 356 – 20 | M1 | their 1680 cannot be 1800 |
| | | *Aa* | |
| | 336 and Yes | A2 *Ib* *Ib* | A1    336 <br> or <br> A1ft  correct decision from their value must score M2 or M1M0 or M0M1 with 5 shelves instead of 6 or 6 spaces instead of 5 |
| | **Alternative method 2** | | |
| | 320 × 5 or 1600 <br> or <br> 6 × 20 or 120 | M1 *Rb* | or dimensions correctly converted to cm |
| | their 1600 + their 120 | M1 *Aa* | |
| | 1720 and Yes | A2 *Ib* *Ib* | A1    1720 <br> or <br> A1ft correct decision from their value must score M2 or M1M0 or M0M1 with 5 shelves instead of 6 or 6 spaces instead of 5 |

| | | | |
|---|---|---|---|
| | **Alternative method 3** | | |
| **2(b)** | 1800 – 6 × 20 <br> or <br> 1800 – 120 or 1680 | M1 *Rb* | or dimensions correctly converted to cm |
| | 320 × 5 | M1 *Aa* | 1680 ÷ 320 |

| Q | Answer | Mark | Comments |
|---|--------|------|----------|
| | 1680 and 1600 and Yes | A2 | A1  1680 and 1600 |
| | or | *lb* | or |
| | 5.25 and Yes | *lb* | 5.25 |
| | | | or |
| | | | A1ft correct decision from their value must score M2 or M1M0 or M0M1 with 5 shelves instead of 6 or 6 spaces instead of 5 |
| | **Additional Guidance** | | |
| | Starting with 1800 ÷ 6 scores zero | | |
| | Mixing up 5 and 6 can occur once only for A1ft | | |
| | Examples that score M1M0A1ft or M0M1A1ft | | |
| | **Alt 1**<br>1680<br>1680 ÷ 6 = 280<br>No | | M1<br>M0<br>A1ft |
| | **Alt 2**<br>320 × 6 = 1920 and 5 × 20 = 100<br>1920 + 100 = 2020<br>Yes<br>Uses 5 shelves and 6 spaces so mixes up 5 and 6 twice | | M0<br>M1<br>A0 |
| | **Alt 3**<br>1800 − 5 × 20 = 1700<br>320 × 5 = 1600<br>Yes | | M0<br>M1<br>A1ft |

| Q | Answer | Mark | Comments |
|---|--------|------|----------|
| **2(c)** | 550 ÷ 260 or 2.1(1…) or 2.12 or 2<br>or<br>470 ÷ 155 or 3.0(3…) or 3<br>or<br>390 ÷ 65 or 6 | M1<br>*Ra* | Allow<br>  155 × 3 = 465 etc<br>or<br>  470 − 155 − 155 − 155 (= 5) etc |
| | their 2 and their 3 and their 6 | M1<br>*lb* | their values rounded down<br>award M2 if first M1 scored and 11 seen |

| Q | | Answer | Mark | Comments |
|---|---|---|---|---|
| | | their 2 × their 3 × their 6 | M1 Rc | multiplying their values allow if incorrectly rounded or not rounded |
| | | 36 | A1 Aa | |
| | | **Additional Guidance** | | |
| | | These attempts are common and score zero<br><br>• (470 × 390 × 550) ÷ (155 × 65 × 260) or 38<br>• (470 + 390 + 550) ÷ (155 + 65 + 260) or 3 | | |

| Q | Answer | | Mark | Comments |
|---|--------|--|------|----------|
| **2(d)** | **Alternative method 1** | | | |
| | 11.41 ÷ 1000<br>or (£) 0.01141 or 1.141 p | | M1<br><br>*Ra* | allow subsequent use of 0.01 or 1 if method seen |
| | their 0.01141 ×<br>384 or 4.38144<br><br>or<br><br>0.05 × 384 or<br>19.2 | their 1.141 × 384<br>or 438.144<br><br>or<br><br>5 × 384 or 1920 | M1<br><br>*Rc* | |
| | their 19.2<br>– their 4.38144<br>or 14.81856 | their 1920<br>– their 438.144<br>or 1481.856 | M1<br><br>*Aa* | units must be consistent |
| | their 14.81856<br>× 0.8 | their 1481.856<br>× 0.8 | M1<br><br>*Aa* | |
| | £11.85 or £11.86<br><br>or<br><br>1185 p or 1186 p | | A1<br><br>*Ia* | must see £ or p |
| | **Alternative method 2** | | | |
| | 11.41 ÷ 1000<br>or (£) 0.01141 or 1.141 p | | M1<br><br>*Ra* | allow subsequent use of 0.01 or 1 if method seen |
| | 0.05 – 0.01141<br>or 0.03859 | 5 – 1.141<br>or 3.859 | M1<br><br>*Rc* | profit on one bag in £ or p<br><br>units must be consistent |
| | 384 × their<br>0.03859<br>or<br>[14.81, 14.82] | 384 × their 3.859<br>or<br>[1481, 1482] | M1<br><br>*Aa* | profit on 384 bags in £ or p |
| | their [14.81,<br>14.82] × 0.8 | their [1481, 1482]<br>× 0.8 | M1<br><br>*Aa* | |
| | £11.85 or £11.86<br><br>or<br><br>1185 p or 1186 p | | A1<br><br>*Ia* | must see £ or p |

| Q | | Answer | | Mark | Comments |
|---|---|---|---|---|---|
| | | **Alternative method 3** | | | |
| | | 11.41 ÷ 1000 <br> or (£) 0.01141 or 1.141 p | | M1 <br><br> *Ra* | allow subsequent use of 0.01 or 1 if method seen |
| | | their 0.01141 × 384 or 4.38144 <br><br> or <br><br> 0.05 × 384 or 19.2 | their 1.141 × 384 or 438.144 <br><br> or <br><br> 5 × 384 or 1920 | M1 <br><br> *Rc* | |
| | | their 19.2 × 0.8 or 15.36 <br><br> or <br><br> their 4.38144 × 0.8 or 3.505 … | their 1920 × 0.8 or 1536 <br><br> or <br><br> their 438.144 × 0.8 or 350.5 | M1 <br><br> *Aa* | units must be consistent |
| | | their 15.36 – their 3.505 | their 1536 – their 350.5 | M1 <br><br> *Aa* | |
| **2(d)** | | £11.85 or £11.86 <br> or <br> 1185 p or 1186 p | | A1 <br><br> *Ia* | must see £ or p |
| | | **Alternative method 4** | | | |
| | | 0.05 × 1000 <br> or (£)50 | 5 × 1000 <br> or 5 000 p | M1 <br><br> *Ra* | |
| | | their 50 – 11.41 <br> or (£)38.59 | their 5 000 – 1141 or 3 859 p | M1 <br><br> *Rc* | profit on 1000 bags in £ or p <br><br> units must be consistent |
| | | 384 ÷ 1000 × their 38.59 or [14.81, 14.82] | 384 ÷ 1000 × their 3859 or [1481, 1482] | M1 <br><br> *Aa* | |
| | | their 0.8 × their [14.81, 14.82] | their 0.8 × their [14.81, 14.82] | M1 <br><br> *Aa* | |
| | | £11.85 or £11.86 <br> or <br> 1185 p or 1186 p | | A1 <br><br> *Ia* | must see £ or p |

| Q | Answer | | Mark | Comments |
|---|--------|--------|------|----------|
| | **Alternative method 5** | | | |
| | 11.41 ÷ 1000<br>or (£) 0.01141 or 1.141 p | | M1<br><br>*Ra* | allow subsequent use of 0.01 or 1 if method seen |
| | 0.05 – 0.01141<br>or 0.03859 | 5 – 1.141<br>or 3.859 | M1<br><br>*Rc* | profit on one bag in £ or p<br><br>units must be consistent |
| | their 0.03859<br>× 0.8<br>or 0.030872 | their 3.859 × 0.8<br>or 3.0872 | M1<br><br>*Aa* | 80% of profit on one bag in £ or p |
| | their 0.030872<br>× 384 | their 3.0872<br>× 384 | M1<br><br>*Aa* | |
| | £11.85 or £11.86<br><br>or<br><br>1185 p or 1186 p | | A1<br><br>*Ia* | must see £ or p |
| | **Alternative method 6** | | | |
| **2(d)** | 11.41 ÷ 1000<br>or (£) 0.01141 or 1.141 p | | M1<br><br>*Ra* | allow subsequent use of 0.01 or 1 if method seen |
| | their 0.01141 ×<br>0.8 or 0.009128<br>or<br>0.05 × 0.8 or<br>0.04 | their 1.141 × 0.8<br>or 0.9128<br>or<br>5 × 0.8 or 4 | M1<br><br>*Rc* | |
| | their 0.009128 ×<br>384 or 3.5051 …<br>or<br>their 0.04 × 384<br>or 15.36 | their 0.9128 ×<br>384 or 350 51 …<br>or<br>their 4 × 384 or<br>1536 | M1<br><br>*Aa* | |
| | their 15.36 – their<br>3.5051 … | their 1536 – their<br>3505.1 | M1<br><br>*Aa* | |
| | £11.85 or £11.86<br><br>or<br><br>1185 p or 1186 p | | A1<br><br>*Ia* | must see £ or p |

| Q | Answer | Mark | Comments |
|---|--------|------|----------|
| | | | Additional Guidance |
| 2(d) | Incorrect answer caused by premature or incorrect rounding or truncation can score M4A0 <br><br> Award M1 for the correct method for working out 80% of any sum of money or 80% of 384 | | |
| | There are other less obvious methods. E.g. <br><br> Working out the profit as a fraction of the cost multiplied by 80% of the cost from <br><br>      $[(50 – 11.41) ÷ 50] \times 19.2 \times 0.8$ | | |
| | 2 marks can be scored for <u>only</u> working out the total sales of 384 bags (£15.36) <br><br> 3 marks can be scored for <u>only</u> working out the total sales (£15.36) plus the unit cost per bag (£0.01141) <br><br> 3 marks can be scored for only working out the total cost of 384 bags (£[3.50.3.51]) <br><br> Note that £15.36 can also be obtained from the profit per bag if the unit cost per bag has been rounded to 1p (giving a profit per bag of 4p) <br><br> Examples | | |

| | | |
|---|---|---|
| $11.41 ÷ 1000 = 0.01$ | M1 | 0.01 (rounded down - no method) |
| $0.05 – 0.01 = 0.04$ | M1 | $0.05 – 0.01 = 0.04$ |
| $0.04 \times 384 = 15.36$ | M1 | $0.04 \times 384 = 15.36$ |
| $0.8 \times 15.36 = £12.29$ | M1A0 | $0.8 \times 15.36 = £12.29$ |

| | |
|---|---|
| M0 | |
| M1 | |
| M1 | |
| M1A0 | |

| Q | Answer | | Mark | Comments | |
|---|--------|--|------|----------|--|
| **3(a)** | 225 litres | | B1 *Aa* | | |
| **3(b)** | 3 × 77 or 231 | | M1 *Ra* | water used for 3 baths | |
| | 216 ÷ 6 × 3 or 108 | | M1 *Rc* | water used for 3 showers<br>123 implies M2 | |
| | 1.5 × 30 or 45 | | M1 *Ra* | water saved for 30 flushes<br>or (288 ÷ 32) × 30 − ((288 ÷ 32) − 1.5) × 30<br>or<br>their 9 × 30 – their 7.5 × 30<br>or<br>their 270 – their 225 | |
| | their 231 – their 108 + their 45<br>or<br>their 123 + their 45<br>or<br>(270 + 231) – (225 + 108)<br>or<br>501 – 333<br>or<br>168 | | M1 *Rc* | total water saved | |
| | 1200 ÷ 6 | their 168 × 6 | M1 *Aa* | 1 ÷ 6 = 0.16(6 …)<br>and<br>their 168 ÷ 1200 | 1200 ÷ their 168 |
| | 168 and 200 and No<br>or<br>1008 and No<br>or<br>0.16(6 …) or 0.17 and 0.14 and No<br>or<br>7.14 … and No | | A2 *Ib Ib* | A1   168 and 200<br>     or<br>     1008<br>     or<br>     0.16(6 …) or 0.17 and 0.14<br>     or<br>     7.14<br>or<br>A1ft   correct conclusion for their value(s)<br>      must score M4 including 4th and 5th M1 | |

| Q | Answer | Mark | Comments |
|---|--------|------|----------|
| | | | Additional Guidance |
| **3(b)** | 1032 (from 1200 – 168) implies M4 and could score full marks, <br><br> e.g. 1032 compared with 1000 <br><br> $^{168}/_{1200}$ simplified to $^{7}/_{50}$ with correct conclusion scores full marks with no further work <br><br> <u>misread of 288 (e.g. 228)</u> <br><br> This should still give 45 litre saving for toilet flushes but there could be rounding errors, e.g. <br><br> 228 ÷ 32 = 7.13 (should be 7.125) <br><br> with misread (with or without rounding errors) can score M5A1 or M5 A1ft | | |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| | ~~450 × their 365 ÷ 1000~~<br><br>or<br><br>0.45 × their 365<br><br>or<br><br>their 164 250 ÷ 1000 | ~~M1~~<br>*Ra* | ~~their 365 can be 364, 366 or 360~~<br><br>364 → 163.8<br>366 → 164.7<br>360 → 162 |
| | 164.25 | A1<br>*Aa* | allow 164 if with method |
| **3(c)** | an appropriate reverse method, e.g;<br>164.25 × 1000 ÷ their 365 = 450 | B1ft<br>*Ab* | allow either of these following estimations<br><br>500 × 400 ÷ 1000 = 200<br>or<br>400 × 400 ÷ 1000 = 160 |

**Additional Guidance**

163.8 or 164.7 or 162 scores M1A0

Mark holistically, e.g. if there is an incorrect answer with no method in the main body mark the method and/or answer in the check (and vice versa)

The correct reverse method is only a valid check if the original method is shown

Using approximations can score the checking mark without any other method

All values used to calculate their 164.25 must be used for a reverse method to score the checking mark

If the original method is not shown fully but the correct answer is obtained, do not award the checking mark for a reverse method unless it is complete e.g

    450 × 365 = 164 250 litres = 164.25 m$^3$ (division by 1000 not shown)
    followed by
    164 250 ÷ 450 = 365                      scores M1A1B0

    450 × 365 = 164 250 litres = 164.25 m$^3$ (division by 1000 not shown)
    followed by
    164.25 × 1000 ÷ 450 = 365             scores M1A1B1

| Q | Answer | Mark | Comments |
|---|--------|------|----------|
| **3(d)** | 2.96 × their 164.25 or 486.18 <br> or <br> 2.96 × their 164 or 485.44 | M1 <br> *Rc* | ft their 164(.25) from 3(c) |
| | their 486.18 + 134 or 620.18 <br> or <br> their 485.44 + 134 or 619.44 | M1 <br> *Aa* | |
| | 12 × 53.5(0) or 642 | M1 <br> *Aa* | |
| | 620.18 and 642 or 21.82 and Yes <br> or <br> 619.44 and 642 or 22.56 and Yes | A2ft <br> *Ib* <br> *Ib* | A1ft   620.18 and 642 or 21.82 <br>             or <br>             619.44 and 642 or 22.56 <br> or <br> A1ft   correct conclusion for their values <br>             must score M3 <br> ft their 164(.25) from 3(c) |

### Additional Guidance

'With a water meter is cheaper' implies Yes

ft from 3(c) – allow rounding or truncation of their value

Common examples scoring full follow through marks

| | | |
|---|---|---|
| If their 164(.25) = 163.8 <br>   2.96 × 163.8 = 484.85 <br>   484.85 + 134 = 618.85 <br>   12 × 53.5 = 642 <br>   Yes | If their 164(.25) = 164.7 <br>   2.96 × 164.7 = 487.51 <br>   487.51 + 134 = 621.51 <br>   12 × 53.5 = 642 <br>   Yes | If their 164(.25) = 162 <br>   2.96 × 162 = 479.52 <br>   479.52 + 134 = 613.52 <br>   12 × 53.5 = 642 <br>   Yes |

| Q | Answer | Mark | Comments |
|---|--------|------|----------|
| **4(a)** | **Alternative method 1** | | |
| | the fastest 8 swimmers chosen | B2 *Ra* *Rb* | B1   7 of the fastest 8 swimmers chosen |
| | all of their 8 in correct lanes | B2ft *Rc* *Aa* | B1ft  the fastest of their 8 in lane 4      or       Jack in lane 4 |
| | **Alternative method 2** (only times given) | | |
| | B3   the 8 fastest times in 'correct' lanes | B3 *Ra* *Rb* *Rc* | B2    the 8 fastest times in time order  or  B1    the 8 fastest times given |

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

<table>
<tr><td colspan="4" align="center"><strong>Additional Guidance</strong></td></tr>
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mark the table only

**4(a)**

| Name | Time | Lane in final |
|------|------|---------------|
| Jack | 52.83 | 4 |
| Kev | 52.88 | 5 |
| Ahmed | 52.92 | 3 |
| Paul | 52.93 | 6 |
| Cheng | 52.97 | 2 |
| Zain | 53.14 | 7 |
| Dai | 53.20 | 1 |
| Tom | 53.23 | 8 |
| Ian | 53.26 | |
| Mike | 53.28 | |
| Yan | 53.28 | |
| Ralf | 53.37 | |
| Simon | 53.49 | |
| Louis | 53.57 | |
| Greg | 53.66 | |
| Harry | 53.70 | |

| Lane 1 | Dai | 53.20 |
|--------|-----|-------|
| Lane 2 | Cheng | 52.97 |
| Lane 3 | Ahmed | 52.92 |
| Lane 4 | Jack | 52.83 |
| Lane 5 | Kev | 52.88 |
| Lane 6 | Paul | 52.93 |
| Lane 7 | Zain | 53.14 |
| Lane 8 | Tom | 53.23 |

| Q | Answer | Mark | Comments |
|---|--------|------|----------|
| **4(b)** | 0.37 secs | B1<br>*Aa* | |
| | an appropriate reverse method, e.g.<br>51.91 + 0.37 = 52.28<br>or<br>52.28 – 0.37 = 51.91 | B1ft<br>*Ab* | or this estimation  51.9 – 52.3 = 0.4<br>or alternative methods, e.g.<br>52.28 – 51.91 = 0.37<br>and<br>51.91→ + 0.09→52→ + 0.28→52.28<br>and<br>0.09 + 0.28 = 0.37 |
| | **Additional Guidance** | | |
| | must see method for 0.37 to score checking mark using reverse or alternative method<br><br>an alternative correct answer is 370 milliseconds | | |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| | **Alternative method 1** | | |
| 4(c) | **Beth**<br>65.7 + 66.6 + 67.4 + 63.6 + 65.2 + 64.8 + 66.5 + 64.9 + 68.5 + 66.8 or 660<br>or<br>**Daisy**<br>62.5 + 63.2 + 67.4 + 62.6 + 64.2 + 66.2 + 64.8 + 65.9 or 516.8 | M1<br>*Ra* | |
| | their 660 ÷ 10 or 66<br>or<br>their 516.8 ÷ 8 or 64.6 | M1<br>*Aa* | |
| | 66 and 64.6 and Daisy | A2<br>*lb*<br>*lb* | A1 66 and 64.6<br>or<br>A1ft correct conclusion for their values must score M2 |
| | **Alternative method 2** | | |
| | **Beth**<br>63.6, 64.8, 64.9, 65.2, 65.7, 66.5, 66.6, 66.8, 67.4, 68.5<br>or<br>**Daisy**<br>62.5, 62.6, 63.2, 64.2, 64.8 ,65.9, 66.2, 67.4 | M1<br>*Ra* | Arranges in order and indicates middle |
| | (65.7 + 66.5) ÷ 2 or 66.1<br>or<br>(64.2 + 64.8) ÷ 2 or 64.5 | M1<br>*Aa* | |
| | 66.1 and 64.5 and Daisy | A2<br>*lb*<br>*lb* | A1 66.1 and 64.5<br>or<br>A1ft correct conclusion for their values must score M2 |

| Q | Answer | Mark | Comments |
|---|--------|------|----------|
| **4(c)** | **Alternative method 3** | | |
| | compare proportion of times under 65 seconds<br><br>Beth $^3/_{10}$ or Daisy $^5/_8$ | M1<br><br>*Ra* | can also compare under 66 seconds<br><br>($^5/_{10}$ and $^6/_8$) |
| | Beth $^3/_{10}$ and Daisy $^5/_8$ | M1<br><br>*Aa* | |
| | 30% and 62.5% and Daisy<br>or<br>$^{12}/_{40}$ and $^{25}/_{40}$ (oe) and Daisy<br>or<br>clear explanation that 5 out of 8 is better than 3 out of 10 and chooses Daisy | A2<br><br>*Ib*<br><br>*Ib* | A1    30% and 62.5%<br>or<br>$^{12}/_{40}$ and $^{25}/_{40}$ (oe)<br>or<br>A1ft  correct conclusion for their values must score M2 |
| | **Alternative method 4** | | |
| | correct comparison of at least two of fastest and/or slowest times with no average used<br>and<br>Daisy | B2<br><br>*Ra*<br><br>*Ib* | B1    comparison of the fastest or the slowe<br>and<br>Daisy<br><br>or<br><br>correct comparison of at least two fas<br>and<br>Beth |
| | **Additional Guidance** | | |
| | one correct average (mean or median) scores M2A1<br><br>correct method with incorrect means can score M2A1ft<br><br>'Daisy has better time' implies Daisy should be chosen | | |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| **4(d)** | **Alternative method 1** | | |
| | (46.95 + 6.50 + 62.95) × 6 <br> or <br> 116.4 × 6 <br> or <br> 698.4 | M1 <br> *Ra* | (46.95 + 6.50 + 62.95) ÷ 100 × 15 <br> or <br> 116.4 ÷ 100 × 15 or 17.46 <br> or <br> 1 – 0.15 or 0.85 |
| | their 698.4 ÷ 100 × 15 or 104.76 <br> or <br> 1 – 0.15 or 0.85 | M1 <br> *Rc* | their 116.4 – 17.46 <br> or <br> their 116.4 × 0.85 |
| | their 698.4 – their 104.76 <br> or <br> their 698.4 × 0.85 <br> or <br> 593.64 | M1 <br> *Rc* | or   their 98.94 × 6 or 593.64 |
| | their 593.64 + 370 = their 963.64 <br> or <br> 1000 – 370 = 630 and their 593.64 | M1 <br> *Aa* | their 593.64 <br>    must be their 85% of their 698.4 <br>    cannot be their 104.76 |
| | 593.64 + 370 = 963.64 <br> or <br> 1000 – 370 = 630 and 593.64 | A1 <br> *Ib* | allow rounding or truncating of their 963.64 or their 593.64 to nearest £ or 10 p if method shown |

| Q | Answer | Mark | Comments |
|---|--------|------|----------|
| **4(d)** | **Alternative method 2** | | |
| | 46.95 × 6 + 6.50 × 6 + 62.95 × 6<br>or<br>281.7 + 39 + 377.7<br>or<br>698.4(0) | M1<br>*Ra* | or  46.95 ÷ 100 × 15 or 7.0425<br>or<br>6.50 ÷ 100 × 15 or 0.975<br>or<br>62.95 ÷ 100 × 15 or 9.4425<br>or<br>1 − 0.15 or 0.85 |
| | their 698.40 ÷ 100 × 15 or 104.76<br>or<br>1 − 0.15 or 0.85 | M1<br>*Rc* | or  46,95 − 7.0425 or 46.95 × 0.85<br>  or 39.9075<br>or<br>6.5 − 0.975 or 6.5 × 0.85 or 5.525<br>or<br>62.95 − 9.4425 or 62.95 × 0.85<br>  or 53.5075 |
| | their 698.40 − their 104.76<br>or<br>their 698.40 × 0.85<br>or<br>593.64 | M1<br>*Rc* | or  (39.9075 + 5.525 + 53.5075) × 6<br>  or<br>  593.64 |
| | their 593.64 + 370 = their 963.64<br>or<br>1000 − 370 = 630 and their 593.64 | M1<br>*Aa* | their 593.64<br>  must be their 85% of their 698.4<br>  cannot be their 104.76 |
| | 593.64 + 370 = 963.64<br>or<br>1000 − 370 = 630 and 593.64 | A1<br>*Ib* | allow rounding or truncating of their 963.64<br>or their 593.64 to nearest £ or 10 p if<br>method shown |

| Q | Answer | Mark | Comments |
|---|--------|------|----------|
| | | | Additional Guidance |
| 4(d) | allow 46.95 + 6.50 + 62.95 × 6 = 431.15 for first M1 | | |

to score M4A1 the full method must be shown apart from the method for deducting 15%

<u>deducting 15%</u>

can score M1M1 if

- rounded or truncated values for 15% are given or used with no method

e.g.   10% = 69.8

    5% = 34.9

    15% = 69.8 + 34.9 = 104.7          M1

    698.4 – 104.7 = 593.7          M1

    593.7 + 370 = 963.7          M1A0

can score M0M1 if

- an incorrect method for finding 15% is given (not + 15)

e.g.   698.4 ÷ 15 = 46.56          M0

    698.4 – 46.56 = 651.84          M1

scores M0M0 if

- an incorrect value for 15% is given with no method shown

e.g.   15% = 46.56          M0

    698.4 – 46.56 = 651.84          M0

15% not deducted can score M1M0M0M1A0

<u>adding 370</u>

if 370 is added to their 698.4 before deducting 15%

- do not award the mark for adding 370

- award any marks for deducting 15%

e.g.   281.6 + 39 + 377.7 + 370 = 1068.4          M1 (method for 698.4 embedded)

    1068.4 × 0.85 or 1068.4 − their 106.26 = 908.14          M2A0