AQA

# A-LEVEL
# MATHEMATICS
# 7357/2

Paper 2

**Mark scheme**
June 2018

Version: 1.0 Final

*186A73572/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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AS/A-level Maths/Further Maths assessment objectives

| AO | | Description |
|---|---|---|
| AO1 | AO1.1a | Select routine procedures |
| | AO1.1b | Correctly carry out routine procedures |
| | AO1.2 | Accurately recall facts, terminology and definitions |
| AO2 | AO2.1 | Construct rigorous mathematical arguments (including proofs) |
| | AO2.2a | Make deductions |
| | AO2.2b | Make inferences |
| | AO2.3 | Assess the validity of mathematical arguments |
| | AO2.4 | Explain their reasoning |
| | AO2.5 | Use mathematical language and notation correctly |
| AO3 | AO3.1a | Translate problems in mathematical contexts into mathematical processes |
| | AO3.1b | Translate problems in non-mathematical contexts into mathematical processes |
| | AO3.2a | Interpret solutions to problems in their original context |
| | AO3.2b | Where appropriate, evaluate the accuracy and limitations of solutions to problems |
| | AO3.3 | Translate situations in context into mathematical models |
| | AO3.4 | Use mathematical models |
| | AO3.5a | Evaluate the outcomes of modelling in context |
| | AO3.5b | Recognise the limitations of models |
| | AO3.5c | Where appropriate, explain how to refine models |

# Mark scheme instructions to examiners

## General

The mark scheme for each question shows:

- the marks available for each part of the question
- the total marks available for the question
- marking instructions that indicate when marks should be awarded or withheld including the principle on which each mark is awarded. Information is included to help the examiner make his or her judgement and to delineate what is creditworthy from that not worthy of credit
- a typical solution. This response is one we expect to see frequently. However credit must be given on the basis of the marking instructions.

If a student uses a method which is not explicitly covered by the marking instructions 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.

**Key to mark types**

| | |
|---|---|
| M | mark is for method |
| R | mark is for reasoning |
| A | mark is dependent on M or m marks and is for accuracy |
| B | mark is independent of M or m marks and is for method and accuracy |
| E | mark is for explanation |
| F | follow through from previous incorrect result |

**Key to mark scheme abbreviations**

| | |
|---|---|
| CAO | correct answer only |
| CSO | correct solution only |
| ft | follow through from previous incorrect result |
| 'their' | Indicates that credit can be given from previous incorrect result |
| AWFW | anything which falls within |
| AWRT | anything which rounds to |
| ACF | any correct form |
| AG | answer given |
| SC | special case |
| OE | or equivalent |
| NMS | no method shown |
| PI | possibly implied |
| SCA | substantially correct approach |
| sf | significant figure(s) |
| dp | decimal place(s) |

Examiners should consistently apply the following general marking principles

**No Method Shown**

Where the question specifically requires a particular method to be used, we must usually see evidence of use of this method for any marks to be awarded.

Where the answer can be reasonably obtained without showing working and it is very unlikely that the correct answer can be obtained by using an incorrect method, we must award **full marks**. However, the obvious penalty to students showing no working is that incorrect answers, however close, earn **no marks**.

Where a question asks the student to state or write down a result, no method need be shown for full marks.

Where the permitted calculator has functions which reasonably allow the solution of the question directly, the correct answer without working earns **full marks**, unless it is given to less than the degree of accuracy accepted in the mark scheme, when it gains **no marks**.

**Otherwise we require evidence of a correct method for any marks to be awarded.**

**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.

**Work erased or crossed out**

Erased or crossed out work that is still legible and has not been replaced should be marked. Erased or crossed out work that has been replaced can be ignored.

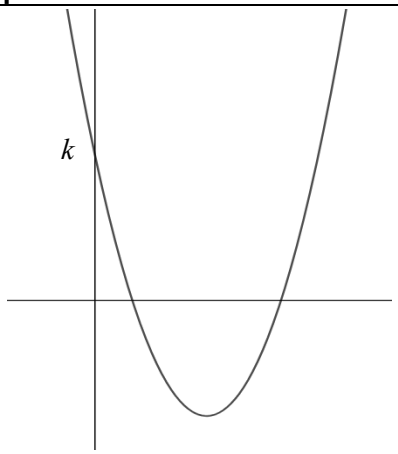
**Choice**

When a choice of answers and/or methods is given and the student has not clearly indicated which answer they want to be marked, mark positively, awarding marks for all of the student's best attempts. Withhold marks for final accuracy and conclusions if there are conflicting complete answers or when an incorrect solution (or part thereof) is referred to in the final answer.

| Q | Marking Instructions | AO | Marks | Typical Solution |
|---|---|---|---|---|
| **1** | Ticks correct option | AO2.5 | B1 | $x = 2 \Rightarrow x^2 = 4$ |
| | **Total** | | **1** | |

| Q | Marking Instructions | AO | Marks | Typical Solution |
|---|---|---|---|---|
| **2** | Circles correct answer | AO1.1b | B1 | 84 |
| | **Total** | | **1** | |

| Q | Marking Instructions | AO | Marks | Typical Solution |
|---|---|---|---|---|
| **3** | Circles correct answer | AO1.1b | B1 | 68 |
| | **Total** | | **1** | |

| Q | Marking Instructions | AO | Marks | Typical Solution |
|---|---|---|---|---|
| **4a** | Sketches graph recalling correct u shape | AO1.2 | B1 |  |
| | Deduces correct relative positions of intersections with axes and with $k$ labelled | AO2.2a | B1 | |
| **b** | Shows evidence of discriminant being used or completing the square to find vertex | AO1.1a | M1 | For distinct roots<br>$b^2 - 4ac > 0$<br>$(-6)^2 - 4 \times 1 \times k > 0$<br>$36 - 4k > 0$<br>$k < 9$ |
| | Obtains $k < 9$<br>Condone $k \leq 9$ | AO1.1b | A1 | |
| | Explains that positive roots and the u shape of the graph (OE) mean the graph must cross the y-axis above 0 or $k > 0$. | AO2.4 | E1 | $k$ is the y-intercept and for positive roots the intercept must be positive |
| | States correct range of values for $k$ | AO2.2a | R1 | $0 < k < 9$ |
| | **Total** | | **6** | |

| Q | Marking Instructions | AO | Marks | Typical Solution |
|---|---|---|---|---|
| **5** | Begins checking for factors to start proof by exhaustion or makes a statement about numbers which don't need to be checked | AO3.1a | M1 | $\sqrt{23} \approx 4.8$ so only need to check 2 and 3<br><br>23 is odd so no need to check 2.<br>23 is not a multiple of 3<br><br>$\therefore$ 23 is prime. |
| | **Completes rigorous argument**, for example:<br>Only need to check primes less than $\sqrt{23}$<br>23 is not divisible by 2 or 3<br>therefore 23 is prime<br>or<br>checks all possible factors<br>or<br>checks more factors than necessary, but argument must be complete. | AO2.1 | R1 | |
| | **Total** | | **2** | |

| Q | Marking Instructions | AO | Marks | Typical Solution |
|---|---|---|---|---|
| **6** | Selects appropriate technique to differentiate | AO3.1a | M1 | $2\left(x+y-2\right)\left(1+\frac{\mathrm{d}y}{\mathrm{d}x}\right)=e^{y}\frac{\mathrm{d}y}{\mathrm{d}x}$<br><br>$\frac{\mathrm{d}y}{\mathrm{d}x}=0 \Rightarrow x+y-2=0$<br><br>$\Rightarrow 0=e^{y}-1$<br><br>$y=0$<br><br>$x=2$ |
| | Differentiates term involving $\mathrm{e}^{y}$ correctly | AO1.1b | B1 | |
| | Differentiates fully correctly | AO1.1b | A1 | |
| | Uses $\frac{\mathrm{d}y}{\mathrm{d}x}=0$ | AO1.1a | M1 | |
| | Eliminates $x$ or $y$ from the equation of the curve | AO1.1a | M1 | |
| | Obtains correct $y$ CAO | AO1.1b | A1 | |
| | Obtains correct $x$ CAO | AO1.1b | A1 | |
| | **Total** | | **7** | |

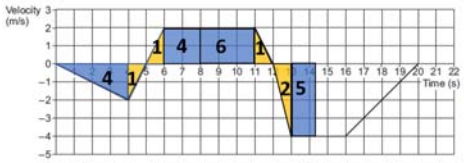
| Q | Marking Instructions | AO | Marks | Typical Solution |
|---|---|---|---|---|
| 7 | Integrates using integration by parts | AO3.1a | M1 | $y = \int (x-1)\mathrm{e}^x \mathrm{d}x$<br>$u = x-1 \qquad \frac{\mathrm{d}v}{\mathrm{d}x} = 1$<br>$\frac{\mathrm{d}v}{\mathrm{d}x} = \mathrm{e}^x \qquad v = \mathrm{e}^x$ |
| | Applies integration by parts formula correctly to either of $(x-1)\mathrm{e}^x$ or $x\mathrm{e}^x$ | AO1.1a | M1 | |
| | Obtains fully correct integral, condone missing constant. | AO1.1b | A1 | $y = (x-1)\mathrm{e}^x - \int \mathrm{e}^x \mathrm{d}x$<br>$y = (x-1)\mathrm{e}^x - \mathrm{e}^x + c$ |
| | Explains clearly why the minimum y value is e with reference to the range of the function OE | AO2.4 | E1 | Range $\geq \mathrm{e} \Rightarrow$ at min $y = \mathrm{e}$ |
| | Uses $\frac{\mathrm{d}y}{\mathrm{d}x} = 0$ to find *x* coordinate of minimum | AO1.1a | M1 | Min point when $\frac{\mathrm{d}y}{\mathrm{d}x} = 0 \therefore x = 1$<br>So curve passes through $(1, \mathrm{e})$<br>$\mathrm{e} = (1-1)\mathrm{e}^1 - \mathrm{e}^1 + c$ |
| | Deduces that the curve passes through the point $(1, \mathrm{e})$ | AO2.2a | A1 | $c = 2\mathrm{e}$ |
| | Uses their minimum point to find their $c$ | AO1.1a | M1 | $\therefore \mathrm{f}(x) = (x-2)\mathrm{e}^x + 2\mathrm{e}$ |
| | States the correct equation in any correct form<br>Condone $y$ instead of $\mathrm{f}(x)$<br>CAO | AO1.1b | A1 | |
| | **Total** | | **8** | |

| Q | Marking Instructions | AO | Marks | Typical Solution |
|---|---|---|---|---|
| **8(a)** | Compares with $R\cos(x\pm\alpha)$ or $R\sin(x\pm\alpha)$ | AO3.1a | M1 | $\sqrt{3}\sin x-3\cos x\equiv R\sin(x-\alpha)$<br>$\equiv R\sin x\cos\alpha-R\cos x\sin\alpha$ |
| | Obtains two correct equations for $R$ and $\alpha$ for example<br>$R\cos\alpha=\sqrt{3}$<br>$R\sin\alpha=3$<br>Must be explicitly seen | AO3.1a | M1 | $R\cos\alpha=\sqrt{3}$<br>$R\sin\alpha=3$ |
| | Obtains correct $R$<br>Condone AWRT 3.46 PI by description of stretch | AO1.1b | B1 | $R=\sqrt{12}=2\sqrt{3}$ |
| | Obtains correct $\alpha$ in radians or degrees PI by description of translation | AO1.1b | B1 | $\tan\alpha=\sqrt{3}$<br>$\alpha=\frac{\pi}{3}$ |
| | Interprets their values of $R$ and $\alpha$ to form an equation of the form $y=R\sin(x\pm\alpha)+4$ or $y=R\cos(x\pm\alpha)+4$ | AO3.2a | B1F | $y=2\sqrt{3}\sin(x-\frac{\pi}{3})+4$<br>Translation $\begin{pmatrix}\frac{\pi}{3}\\0\end{pmatrix}$<br>Stretch in the y-direction scale factor $2\sqrt{3}$ |
| | Interprets 'their' equation to identify a transformation | AO3.2a | E1F | |
| | Identifies all required transformations in a correct order CAO | AO3.2a | A1 | Translation $\begin{pmatrix}0\\4\end{pmatrix}$ |
| **(b)(i)** | Deduces the least value occurs when their $\sin(x-\frac{\pi}{3})=1$<br>Using 'their' values of $R$ and α<br>PI by sight of $\frac{1}{2\sqrt{3}+4}$ | AO2.2a | M1 | $\frac{1}{\sqrt{3}\sin x-3\cos x+4}=\frac{1}{2\sqrt{3}\sin(x-\frac{\pi}{3})+4}$<br>Least value when $\sin(x-\frac{\pi}{3})=1$<br>∴ least value is given by |
| | Completes rigorous argument to obtain $\frac{1}{2\sqrt{3}+4}$ and then the given answer | AO2.1 | R1 | $\frac{1}{2\sqrt{3}+4}=\frac{2-\sqrt{3}}{2}$ |
| **(b)(ii)** | Deduces the greatest value<br>Using 'their' values of R and α<br>ACF $\frac{1}{-2\sqrt{3}+4}=\frac{2+\sqrt{3}}{2}$ | AO2.2a | B1F | Greatest value = $\frac{2+\sqrt{3}}{2}$ |
| | **Total** | | **10** | |

| Q | Marking instructions | AO | Mark | Typical solution |
|---|---|---|---|---|
| **9(a)** | Translates proportionality into a differential equation involving $\frac{dx}{dt}$, *t*, *x* and a constant of proportionality. | AO3.3 | B1 | $\frac{dx}{dt} = \frac{k(8-t)}{x}$ |
| | Substitutes $t = 2$, $x = 336$, $\frac{dx}{dt} = 72$ to find *k* | AO1.1a | M1 | $72 = \frac{k(8-2)}{336}$<br>$k = 4032$<br>$\frac{dx}{dt} = \frac{4032(8-t)}{x}$ |
| | Obtains correct value of *k* shows given result<br>**AG** | AO2.1 | R1 | $x\frac{dx}{dt} = 4032(8 - t)$ |
| **(b)** | Integrates one side correctly | AO1.1a | M1 | $\int x\,dx = \int 4032(8-t)\,dt$<br>$\frac{1}{2}x^2 = 4032\left(8t - \frac{t^2}{2}\right) + c$ |
| | Integrates both sides correctly condone missing *c* | AO1.1b | A1 | $\frac{1}{2}\times 336^2 = 4032\left(8\times 2 - \frac{2^2}{2}\right) + c$<br>$c = 0$<br>$x^2 = 64512t - 4032t^2$ |
| | Uses conditions to show *c*=0 and correctly obtains given result.**AG** | AO2.1 | R1 | $\therefore x^2 = 4032t(16-t)$ |
| **(c)(i)** | Translates rate of growth into $\frac{dx}{dt} = 24$ and uses in model for rate of sales | AO3.3 | M1 | $24x = 4032(8-t)$<br>$x = 168(8-t)$<br>$(168(8-t))^2 = 4032t(16-t)$ |
| | Eliminates $x$ to form quadratic equation or inequality in $t$ | AO3.1a | M1 | $t^2-16t+56 = 0$ |
| | Obtains correct equation or inequality in *t*<br>Need not be simplified | AO1.1b | A1 | $t = 5.171..$ or $10.828…$ |
| | Obtains *t*=5.17 | AO1.1b | A1 | 5 hours 10 minutes |
| | Converts their *t* into hours and minutes | AO3.4 | A1 | Earliest time 14:40 |
| | Interprets the closing time as 14:40<br>09:30+their converted time | AO3.2a | R1F | |
| **(c)(ii)** | Explains in context that when the stall opens there will be zero sales | AO3.5a | E1 | When the stall opens there are zero sales |
| | Explains that when *x*=0 the model is undefined | AO3.5a | E1 | When x=0 $\frac{dx}{dt}$ is undefined as the denominator is zero |
| | | **Total** | **14** | |

| Q | Marking Instructions | AO | Marks | Typical Solution |
|---|---|---|---|---|
| **10** | Circles correct answer | AO1.1b | B1 | 0.0071 m $s^{-2}$ |
| | **Total** | | **1** | |

| Q | Marking Instructions | AO | Marks | Typical Solution |
|---|---|---|---|---|
| **11** | Circles correct answer | AO1.1b | B1 | 1.6 m |
| | **Total** | | **1** | |

| Q | Marking Instructions | AO | Marks | Typical Solution |
|---|---|---|---|---|
| **12(a)** | Finds the steepest gradient.<br>Ignore units.<br>Do not allow -4. | AO1.1b | B1 | 4 m $s^{-2}$ |
| **12(b)** | Shows evidence of determining areas above and below the time axis for values of t between 7 and 9 inclusive<br>Evidence may include values or indication on a diagram | AO3.1b | M1 |  |
| | Deduces $t_1$ value correctly. | AO2.2a | A1 | $t_1 = 8$ |
| | Shows evidence of determining areas above and below the time axis for values of t between 13 and 15 inclusive<br>Evidence may include values or indication on a diagram | AO1.1a | M1 | $t_2 = 14.25$ |
| | Deduces $t_2$ value correctly | AO2.2a | A1 | |
| | **Total** | | **5** | |

| Q | Marking Instructions | AO | Marks | Typical Solution |
|---|---|---|---|---|
| **13(a)** | Uses model for maximum friction $= \mu mg$ | AO3.3 | B1 | $F_{\max} = \mu mg$<br>$= 0.85 \times 20 \times 9.8$<br>$= 166.6\text{N}$ |
| | Makes an appropriate comparison | AO1.1a | M1 | |
| | Explains clearly why crate remains stationary | AO2.4 | E1 | 150 < 166.6<br>∴ crate does not move |
| **13(b)** | Forms an equation by resolving vertically<br>Condone one of sign error or cos error | AO3.1b | M1 | $20g = R + 150\sin 15°$<br>$R = 157.177\text{N}$ |
| | Obtains correct reaction force | AO1.1b | A1 | $F_{\max} = \mu \times 157.177$<br>$= 133.6\text{N}$ |
| | Uses maximum friction $= \mu R$<br>With 'their' reaction force<br>Must identify maximum or limiting friction | AO1.1b | B1F | $150\cos 15° = 145\text{N}$<br>145 > 133.6<br>∴ crate begins to move |
| | Compares $150\cos 15°$ with 'their' maximum friction | AO1.1a | M1 | |
| | Explains, using their values, why the crate begins to move. | AO2.4 | E1F | |
| | **Total** | | **8** | |

| Q | Marking Instructions | AO | Marks | Typical Solution |
|---|---|---|---|---|
| **14(a)** | Obtains correct vector | AO1.1b | B1 | $\begin{pmatrix}-4\\-3\\6\end{pmatrix}$ |
| **14(b)** | Obtains one other edge as vector | AO1.1a | M1 | $\overrightarrow{BC} = \begin{pmatrix}1\\5\\-1\end{pmatrix}$<br>$\overrightarrow{AD} = \begin{pmatrix}1\\5\\-1\end{pmatrix}$<br>$\overrightarrow{DC} = \begin{pmatrix}-4\\-3\\6\end{pmatrix}$<br>$AB = \sqrt{(-4)^2 + (-3)^2 + 6^2}$<br>$= \sqrt{61}$<br>$AD = \sqrt{1^2 + 5^2 + (-1)^2}$<br>$= 3\sqrt{3}$<br>$\overrightarrow{AB} = \overrightarrow{DC}$<br>ABCD must be a parallelogram<br>$AB \neq AD$<br>ABCD is not a rhombus |
| | Obtains $\overrightarrow{DC}$ correctly<br>Or<br>Obtains correctly both $\overrightarrow{BC}$ and $\overrightarrow{AD}$<br>Or<br>Obtains correctly both $\overrightarrow{CB}$ and $\overrightarrow{DA}$ | AO1.1b | A1 | |
| | Obtains length of one edge (or its square) | AO1.1a | M1 | |
| | Obtains two correct lengths of different edges | AO1.1b | A1 | |
| | Completes rigorous argument to show ABCD is a parallelogram and not a rhombus | AO2.1 | R1 | |
| | **Total** | | **6** | |

| Q | Marking Instructions | AO | Marks | Typical Solution |
|---|---|---|---|---|
| **15(a)** | Integrates 0.138 $t^2$ twice | AO3.4 | M1 | $v = \int 0.138t^2 \mathrm{d}t$ $= 0.046t^3 + c$ $t = 0, v = 0 \Rightarrow c = 0$ $s = \int 0.046t^3 \mathrm{d}t$ $= 0.0115t^4 + k$ $t = 0, s = 0 \Rightarrow k = 0$ $0.0115t^4 = 100$ $t = 9.657$ |
| | Finds the correct expression for displacement condone no consideration of *c* | AO1.1b | A1 | |
| | Demonstrates at least one constant of integration is zero | AO1.1b | B1 | |
| | Finds the correct time for minibus $A$ | AO1.1b | A1 | |
| **15(b)** | Integrates 0.024 $t^3$ twice | AO1.1a | M1 | $v = \int 0.024t^3 \mathrm{d}t$ $= 0.006t^4 + c$ $t = 0, v = 0 \Rightarrow c = 0$ $s = \int 0.006t^4 \mathrm{d}t$ $= 0.0012t^5 + k$ $t = 0, s = 0 \Rightarrow k = 0$ $0.0012\, t^5 = 100$ $t = 9.642$ 9.642 < 9.657 company chooses minibus B |
| | Finds the correct expression for displacement condone no consideration of *c* | AO1.1b | A1 | |
| | Finds correct time for minibus B | AO1.1b | A1 | |
| | States correct choice consistent with 'their' answers Must have integrated twice in both parts | AO3.2a | E1F | |
| **15(c)** | Explains how reaction times of each driver could change the outcome | AO3.5b | E1 | If Driver B's reaction time is greater than Driver A's then A could travel 100 metres faster than B |
| | **Total** | | **9** | |

| Q | Marking Instructions | AO | Marks | Typical Solution |
|---|---|---|---|---|
| **16(a)** | Uses $v = u + at$ with $v = 0$ for the vertical motion<br>Condone cos or sign error | AO3.4 | M1 | 0 = $u$ sin 35 – 9.81 x 1.5<br>$u = 25.7$ m s$^{-1}$ |
| | Obtains correct equation | AO1.1b | A1 | |
| | Obtains correct $u$ to 3 significant figures<br>**CAO** | AO1.1b | A1 | |
| **16(b)** | Uses $s = ut + \frac{1}{2}at^2$<br>with $s = -10$ and their $u$ for vertical motion<br>Condone cos or sign error | AO3.4 | M1 | $-10 = (25.7\sin 35)t - \frac{1}{2} \times 9.81t^2$<br>t = 3.571<br>Time in flight is 3.57 seconds |
| | Obtains correct equation | AO1.1b | A1F | |
| | Obtains correct time of flight with units<br>AWRT 3.6<br>**CAO** | AO3.2a | A1 | |
| | **Total** | | **6** | |

| Q | Marking Instructions | AO | Marks | Typical Solution |
|---|---|---|---|---|
| **17(a)(i)** | Forms equation of motion with four correct terms<br>Condone sign error | AO3.4 | M1 | 300 – 140 – *R* = 482 x 0.2<br><br>R = 63.6 N |
| | Obtains correct equation. | AO1.1b | A1 | |
| | Obtains correct value of *R*. | AO1.1b | A1 | |
| **17(a)(ii)** | Forms equation of motion with correct terms<br>Condone sign error | AO1.1a | M1 | *T* – 63.6 = 72 x 0.2<br><br>*T* = 78 N |
| | Obtains correct equation<br>Follow through their *R* | AO1.1b | A1F | |
| | Obtains correct value of *T* | AO1.1b | A1 | |
| **17(b)** | States appropriate assumption<br>**NOT friction or air resistance** | AO3.3 | E1 | Rope has no mass **or** is horizontal **or** is inextensible |
| **17(c)(i)** | Forms equation of motion for skater using 'their' *R*<br>Condone sign error | AO3.1b | M1 | -63.6 = 72*a* |
| | Finds correct acceleration for 'their' *R* | AO1.1b | A1F | *a* = -0.883… m s$^{-2}$ |
| | Uses a suitable constant acceleration formula with 'their' *a* | AO1.1a | M1 | u = 6 v =0 a = -0.883 |
| | Obtains $s$ when $v = 0$<br>Or<br>Obtains $v$ or positive $v^2$ when $s = 20$ | AO1.1b | A1F | $0 = 6^2 - 2 \times 0.883s$<br><br>s = 20.4 m |
| | Explains that the skater hits buggy using correct values | AO3.2a | E1 | 20.4 > 20<br>Skater hits buggy |
| **17(c)(ii)** | Explains that the tension is removed from the buggy | AO2.4 | E1 | The rope is released so there is no tension acting on the buggy, so there is a higher resultant force. The driver will notice an increase in acceleration. |
| | Explains that the driver notices an increase in acceleration | AO2.4 | E1 | |
| | **Total** | | **14** | |

| | | | | |
|---|---|---|---|---|
| | **TOTAL** | | **100** | |