

Level 3 Certificate

Mathematics

H868/02: Critical Maths

OCR Level 3 Certificate Core Maths A (MEI)

Mark Scheme for June 2025

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

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MARKING INSTRUCTIONS

PREPARATION FOR MARKING RM ASSESSOR

1. Make sure that you have accessed and completed the relevant training packages for on-screen marking: *RM Assessor Online Training: OCR Essential Guide to Marking*.
2. Make sure that you have read and understood the mark scheme and the question paper for this unit. These are available in RM Assessor
3. Log-in to RM Assessor and mark the **required number** of practice responses (“scripts”) and the **required number** of standardisation responses.

MARKING

1. Mark strictly to the mark scheme.
2. Marks awarded must relate directly to the marking criteria.
3. The schedule of dates is very important. It is essential that you meet the RM Assessor 50% and 100% (traditional 40% Batch 1 and 100% Batch 2) deadlines. If you experience problems, you must contact your Team Leader (Supervisor) without delay.
4. If you are in any doubt about applying the mark scheme, consult your Team Leader by telephone, email or via the RM Assessor messaging system.
5. **Crossed-Out Responses**
Where a candidate has crossed out a response and provided a clear alternative then the crossed-out response is not marked. Where no alternative response has been provided, examiners may give candidates the benefit of the doubt and mark the crossed-out response where legible.

Rubric Error Responses – Optional Questions

Where candidates have a choice of question across a whole paper or a whole section and have provided more answers than required, then all responses are marked and the highest mark allowable within the rubric is given. Enter a mark for each question answered into RM Assessor, which will select the highest mark from those awarded. (*The underlying assumption is that the candidate has penalised themselves by attempting more questions than necessary in the time allowed.*)

Multiple-Choice Question Responses

When a multiple-choice question has only a single, correct response and a candidate provides two responses (even if one of these responses is correct), then no mark should be awarded (as it is not possible to determine which was the first response selected by the candidate).

When a question requires candidates to select more than one option/multiple options, then local marking arrangements need to ensure consistency of approach.

Contradictory Responses

When a candidate provides contradictory responses, then no mark should be awarded, even if one of the answers is correct.

Short Answer Questions (requiring only a list by way of a response, usually worth only one mark per response)

Where candidates are required to provide a set number of short answer responses then only the set number of responses should be marked. The response space should be marked from left to right on each line and then line by line until the required number of responses have been considered. The remaining responses should not then be marked. Examiners will have to apply judgement as to whether a 'second response' on a line is a development of the 'first response', rather than a separate, discrete response. *(The underlying assumption is that the candidate is attempting to hedge their bets and therefore getting undue benefit rather than engaging with the question and giving the most relevant/correct responses.)*

Short Answer Questions (requiring a more developed response, worth two or more marks)

If the candidates are required to provide a description of, say, three items or factors and four items or factors are provided, then mark on a similar basis – that is downwards (as it is unlikely in this situation that a candidate will provide more than one response in each section of the response space).

Longer Answer Questions (requiring a developed response)

Where candidates have provided two (or more) responses to a medium or high tariff question which only required a single (developed) response and not crossed out the first response, then only the first response should be marked. Examiners will need to apply professional judgement as to whether the second (or a subsequent) response is a 'new start' or simply a poorly expressed continuation of the first response.

6. Always check the pages (and additional objects if present) at the end of the response in case any answers have been continued there. If the candidate has continued an answer there, then add the annotation 'SEEN' to confirm that the work has been seen and mark any responses using the annotations in section 11.

7. There is a NR (**No Response**) option. Award NR (No Response):

- if there is nothing written at all in the answer space
- OR if there is a comment which does not in any way relate to the question (e.g., 'can't do', 'don't know')
- OR if there is a mark (e.g., a dash, a question mark) which is not an attempt at the question.

Note: Award 0 marks – for an attempt that earns no credit (including copying out the question).

8. The RM Assessor **comments box** is used by your Team Leader to explain the marking of the practice responses. Please refer to these comments when checking your practice responses. **Do not use the comments box for any other reason.**

9. Assistant Examiners will send a brief report on the performance of candidates to their Team Leader (Supervisor) via email by the end of the marking period. The report should contain notes on particular strengths displayed as well as common errors or weaknesses. Constructive criticism of the question paper/mark scheme is also appreciated.

10. For answers marked by levels of response: Not applicable in F501

To determine the level – start at the highest level and work down until you reach the level that matches the answer

To determine the mark within the level, consider the following

Descriptor	Award mark
On the borderline of this level and the one below	At bottom of level
Just enough achievement on balance for this level	Above bottom and either below middle or at middle of level (depending on number of marks available)
Meets the criteria but with some slight inconsistency	Above middle and either below top of level or at middle of level (depending on number of marks available)
Consistently meets the criteria for this level	At top of level

11. Annotations

Annotation	Meaning
✓ and ✕	
BOD	Benefit of doubt
FT	Follow through
ISW	Ignore subsequent working
M0, M1	Method mark awarded 0, 1
A0, A1	Accuracy mark awarded 0, 1
B0, B1	Independent mark awarded 0, 1
SC	Special case
^	Omission sign
MR	Misread
Highlighting	

Other abbreviations in mark scheme	Meaning
E1	Mark for explaining
U1	Mark for correct units
G1	Mark for a correct feature on a graph
M1 dep*	Method mark dependent on a previous mark, indicated by *
cao	Correct answer only
oe	Or equivalent
rot	Rounded or truncated
soi	Seen or implied
www	Without wrong working

12. Subject Specific Marking Instructions

- a. Annotations must be used during your marking. For a response awarded zero (or full) marks a single appropriate annotation (cross, tick, M0 or ^) is sufficient, but not required.

For responses that are not awarded either 0 or full marks, you must make it clear how you have arrived at the mark you have awarded and all responses must have enough annotation for a reviewer to decide if the mark awarded is correct without having to mark it independently.

It is vital that you annotate standardisation scripts fully to show how the marks have been awarded.

Award NR (No Response)

- if there is nothing written at all in the answer space and no attempt elsewhere in the script
- OR if there is a comment which does not in any way relate to the question (e.g. 'can't do', 'don't know')
- OR if there is a mark (e.g. a dash, a question mark, a picture) which isn't an attempt at the question.

Note: Award 0 marks only for an attempt that earns no credit (including copying out the question).

If a candidate uses the answer space for one question to answer another, for example using the space for 8(b) to answer 8(a), then give benefit of doubt unless it is ambiguous for which part it is intended.

- b. An element of professional judgement is required in the marking of any written paper. Remember that the mark scheme is designed to assist in marking incorrect solutions. Correct solutions leading to correct answers are awarded full marks but work must not always be judged on the answer alone, and answers that are given in the question, especially, must be validly obtained; key steps in the working must always be looked at and anything unfamiliar must be investigated thoroughly. Correct but unfamiliar or unexpected methods are often signalled by a correct result following an apparently incorrect method. Such work must be carefully assessed. When a candidate adopts a method which does not correspond to the mark scheme, escalate the question to your Team Leader who will decide on a course of action with the Principal Examiner.

If you are in any doubt whatsoever you should contact your Team Leader.

- c. The following types of marks are available.

M

A suitable method has been selected and applied in a manner which shows that the method is essentially understood. Method marks are not usually lost for numerical errors, algebraic slips or errors in units. However, it is not usually sufficient for a candidate just to indicate an intention of using

some method or just to quote a formula; the formula or idea must be applied to the specific problem in hand, e.g. by substituting the relevant quantities into the formula. In some cases the nature of the errors allowed for the award of an M mark may be specified.

A method mark may usually be implied by a correct answer unless the question includes the DR statement, the command words “Determine” or “Show that”, or some other indication that the method must be given explicitly.

A

Accuracy mark, awarded for a correct answer or intermediate step correctly obtained. Accuracy marks cannot be given unless the associated Method mark is earned (or implied). Therefore M0 A1 cannot ever be awarded.

B

Mark for a correct result or statement independent of Method marks.

E

A given result is to be established or a result has to be explained. This usually requires more working or explanation than the establishment of an unknown result.

Unless otherwise indicated, marks once gained cannot subsequently be lost, e.g. wrong working following a correct form of answer is ignored. Sometimes this is reinforced in the mark scheme by the abbreviation isw. However, this would not apply to a case where a candidate passes through the correct answer as part of a wrong argument.

- d. When a part of a question has two or more ‘method’ steps, the M marks are in principle independent unless the scheme specifically says otherwise; and similarly where there are several B marks allocated. (The notation ‘dep*’ is used to indicate that a particular mark is dependent on an earlier, asterisked, mark in the scheme.) Of course, in practice it may happen that when a candidate has once gone wrong in a part of a question, the work from there on is worthless so that no more marks can sensibly be given. On the other hand, when two or more steps are successfully run together by the candidate, the earlier marks are implied and full credit must be given.
- e. The abbreviation FT implies that the A or B mark indicated is allowed for work correctly following on from previously incorrect results. Otherwise, A and B marks are given for correct work only – differences in notation are of course permitted. A (accuracy) marks are not given for answers obtained from incorrect working. When A or B marks are awarded for work at an intermediate stage of a solution, there may be various alternatives that are equally acceptable. In such cases, what is acceptable will be detailed in the mark scheme. If this is not the case please, escalate the question to your Team Leader who will decide on a course of action with the Principal Examiner.

Sometimes the answer to one part of a question is used in a later part of the same question. In this case, A marks will often be 'follow through'. In such cases you must ensure that you refer back to the answer of the previous part question even if this is not shown within the image zone. You may find it easier to mark follow through questions candidate-by-candidate rather than question-by-question.

- f. We are usually quite flexible about the accuracy to which the final answer is expressed; over-specification is usually only penalised where the scheme explicitly says so.
- When a value is given in the paper only accept an answer correct to at least as many significant figures as the given value.
 - When a value is not given in the paper accept any answer that agrees with the correct value to 3 s.f. unless a different level of accuracy has been asked for in the question, or the mark scheme specifies an acceptable range.
- NB for Specification B (MEI) the rubric is not specific about the level of accuracy required, so this statement reads "2 s.f".

Follow through should be used so that only one mark in any question is lost for each distinct accuracy error.

Candidates using a value of 9.80, 9.81 or 10 for g should usually be penalised for any final accuracy marks which do not agree to the value found with 9.8 which is given in the rubric.

- g. Rules for replaced work and multiple attempts:
- If one attempt is clearly indicated as the one to mark, or only one is left uncrossed out, then mark that attempt and ignore the others.
 - If more than one attempt is left not crossed out, then mark the last attempt unless it only repeats part of the first attempt or is substantially less complete.
 - if a candidate crosses out all of their attempts, the assessor should attempt to mark the crossed out answer(s) as above and award marks appropriately.
- h. For a genuine misreading (of numbers or symbols) which is such that the object and the difficulty of the question remain unaltered, mark according to the scheme but following through from the candidate's data. A penalty is then applied; 1 mark is generally appropriate, though this may differ for some units. This is achieved by withholding one A or B mark in the question. Marks designated as cao may be awarded as long as there are no other errors.
- If a candidate corrects the misread in a later part, do not continue to follow through. Note that a miscopy of the candidate's own working is not a misread but an accuracy error.
- i. If a calculator is used, some answers may be obtained with little or no working visible. Allow full marks for correct answers, provided that there is nothing in the wording of the question specifying that analytical methods are required such as the bold "In this question you must show detailed

reasoning”, or the command words “Show” or “Determine”. Where an answer is wrong but there is some evidence of method, allow appropriate method marks. Wrong answers with no supporting method score zero. If in doubt, consult your Team Leader.

- j. If in any case the scheme operates with considerable unfairness consult your Team Leader.

Question			Answer	Marks	AO	Guidance
1	(a)		Suitable reason eg - It does not show an overall % of adults who approve of the change - The percentages do not add up to 100% (or add up to >100) - The percentages do not match proportions of the pie chart - It's easy to confuse the ages and percentages - Breaking it down by age group isn't helpful because the age groups are different sizes - We don't know how many people are in any of the groups - There's no description to help interpret the chart	B1	AO3	Suitable reason in context <u>Accept: eg</u> "it's confusing / difficult" with a reason <u>Do not accept: eg</u> "it's confusing / difficult" without a reason "some age groups voted more than others" "it doesn't show % who didn't approve/agree" "the chart doesn't give us numbers in any groups"
1	(b)		Bar chart / bar graph	B1	AO2	Must be a display / visualisation <u>Allow</u> Column chart / column graph Pictogram with a key <u>Do not accept</u> pie chart histogram cumulative frequency diagram scatter graph table

1	(c)		Use $\text{time} = \frac{\text{distance}}{\text{speed}}$ in a calculation	M1	AO2	Seen or implied by a correct statement about time to cover any distance at 20mph or 30mph • eg 10 miles takes half an hour at 20mph • eg 60 miles takes 3 hours at 20mph • eg 1 mile takes 3 minutes at 20mph OR implied by a correct algebraic expression eg $t_{20} = \frac{d}{20}$
			Evaluates the time at both speeds for a specific distance	M1	AO2	Working out time for a specific distance at both 20mph and 30 mph • eg 10 miles takes half an hour at 20mph and 20 minutes at 30mph • eg 60 miles takes 3 hours at 20mph and 2 hours at 30mph • eg 1 mile takes 3 mins at 20mph and 2 mins at 30mph OR implied by two correct algebraic expressions eg $t_{20} = \frac{d}{20}$ and $t_{30} = \frac{d}{30}$ <u>Possible alternative for method marks</u> Ratio of <u>speeds</u> is $\frac{20}{30} = \frac{2}{3}$ M1 → Ratio of <u>times</u> is $1 \div \frac{2}{3} = 1.5$ M1
			No, the resident is incorrect [time is 50% more]	A1	AO3	Correct conclusion following from <u>their correct</u> working Need not say 50% more as long as it is clearly shown that it is not one third more OR $\frac{d}{20} \div \frac{d}{30} = 1.5$ or $t_{20} = \frac{3}{2}t_{30}$
				[3]		

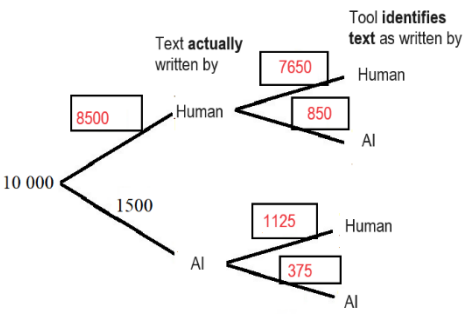
Question			Answer	Marks	AO	Guidance
2	(a)		Lowest point circled	B1 [1]	AO3	
2	(b)		(weak) Negative CAO	B1 [1]	AO3	
2	(c)		Countries with high emissions will tend to reduce emissions OR Countries with low emissions will tend to increase emissions	B1 [1]	AO2	Oe correct answer in <u>context</u> of emissions eg countries with above mean CO2 will reduce emissions oe eg countries with below mean CO2 will increase emissions oe Allow: extreme values will tend to get closer to the mean Do not accept: emissions are close to the mean
2	(d)		(Two) Countries with <u>high</u> emissions have <u>negative</u> growth OR (Some) Countries with <u>low</u> emissions tend to have <u>positive</u> growth	B1 [1]	AO3	Accept a relevant comment about <u>any one</u> point/country from the diagram <u>Do not accept:</u> eg negative correlation eg clustering/bunching around one point [zero] on the diagram

Question			Answer	Marks	AO	Guidance
2	(e)		Suitable explanation: You cannot have a country which reduced its carbon dioxide by over 100% or eg [two] points are below -100 [on the vertical scale] and it's impossible to reduce growth by more than 100% eg the scale goes down to -140 which is not possible for % decrease	B1	AO2	Must explain why the scale <u>on this chart</u> cannot be % eg with reference to the vertical scale going below (-)100 or either of the points plotted below -100 Can explain with a calculation from either of the lower points: eg 120% of 5000 → 6000 reduction which is not possible <u>Do not accept:</u> You cannot have a negative % growth
				[1]		
2	(f)		16 [tonnes per person] 5200 million [tonnes] [5200 ÷ 16 =] 325 million people	B1	AO2	Allow range 15.5 to 17 (from fig 2.2) <u>Not:</u> 16 million
				B1FT	AO2	Range 5000 to 5500 (from fig 2.1) Correct or FT value from their point in 2(a) eg using 9000
				B1	AO2	294 million to 355 million (not from wrong working) Rounded to no more than 4sf eg 5200 ÷ 17 = 305 900 000 Answer in given range seen as final answer scores all 3 marks
				[3]		

Question			Answer	Marks	AO	Guidance
3	(a)		[25 - 17 =] 8 [%]	B1 [1]	AO1	
3	(b)		$\frac{8}{17}$ [$\times 100 = 0.4705\dots$] Or $\frac{25}{17}$ [= 1.4705 ...] So a 47% increase AG	M1 A1 [2]	AO2 AO3	Allow with their “8” from 3(a) or 17×0.47 [= 7.99] or 17×1.47 [= 24.99] Convincing completion Sight of 47(.0588..) is sufficient for A1 or eg $17 + 7.9(9) = 24.9(9)$ and this is $\approx$ 25 or eg $1.47 \times 17 = 24.9(9)$ and this is $\approx$ 25
3	(c)		2 % points increase a year $\frac{75}{2}$ [= 37.5 $\rightarrow$ 2016 + 37.5] OR $\frac{83}{2}$ [= 41.5 $\rightarrow$ 2012 + 41.5] 2054	M1 M1 A1 [3]	AO2 AO2 AO3	Soi Oe Alternative list approach M1 : 2017 $\rightarrow$ 27 M1 : 2053 $\rightarrow$ 99 or 2054 $\rightarrow$ 101 Correct year (rounded up) from relevant workings <u>Check at top</u> for final answer
3	(d)		Relevant comment explaining <u>why</u> the prediction might not happen eg: - You can’t extrapolate this far into the future - Exams / degrees might get harder - Universities won’t let everyone get first class degrees	B1 [1]	AO3	<u>Allow</u> : eg Not everyone is capable of achieving the highest grade eg Grade boundaries will be adjusted to stop this eg This trend might / will not continue eg The 2% increase might not happen every year in the future

Question	Answer	Marks	AO	Guidance
4	Increase of value means voucher is worth 1.2×30	M1	AO1	Correct method to find 20% of 30 or to increase 30 by 20%
	£36	A1	AO1	
	Price reduction means £30 now buys $30 \div 0.8$ oe or eg $80\% = £30 \rightarrow 10\% = £3.75$	M1	AO2	Correct method to consider how much can be bought with 20% reduction. Note: <u>only</u> considering $0.8 \times 30 = 24$ is not sufficient and scores M0 or M1: reducing eg $0.8 \times £36 [= 28.8]$ or M1: reducing eg £36 by 20% $\rightarrow £7.20$ saved $[= 28.8]$ or M1: reducing eg £37 by 20% $\rightarrow £7.40$ saved $[= 29.6]$
	£37.5(0)	A1	AO1	Correct answer for their 20% reduction which allows comparison to be made eg from <u>correctly</u> reducing by 20% any value in range £36 to £37.50
	Option B is better	B1	AO3	Correction conclusion from correct working If correct working but without £36 and £37.50 then a short explanation is required to justify B eg B: $£36 \times 0.8 = £28.80$ which is less than £30 so B is better value SC max3: value of goods requires extra money Choose value eg £100 Option A: $1.2 \times 30 \rightarrow$ price to pay = $100 - 36 = £64$: B1 Option B: $0.8 \times 100 \rightarrow$ price to pay = $80 - 30 = £50$: B1 Correction conclusion from correct working : B1 <u>Note:</u> Candidates do not need to tick the box if their final answer is clear
		[5]		

Question	Answer	Marks	AO	Guidance
5	The second triangle is a quarter of the first oe	B1	AO2	soi by sight of $\frac{1}{4}$ or “there are 4 triangles in the larger triangle” Using percentages or decimals: sight of 25% or 0.25
	Each (shaded) triangle is one sixteenth of the original oe or better eg straight to $\frac{3}{16}$ or $\frac{1}{64}$	B1	AO2	soi by sight of $\frac{1}{16}$ or $\frac{3}{16}$ or $\frac{1}{4} \times \frac{1}{4}$ or $\frac{1}{64}$ or “there are 16 medium sized triangles” or “64 small triangles” Using percentages or decimals: soi by sight of 6.25% or 0.0625 or better eg 18.75% or 0.1875 or 1.5625 % or 0.015625 <u>Note:</u> sight of 20.3125% or 0.203125 implies B1B1
	$\frac{13}{64}$ CAO [of the original triangle is shaded]	B1	AO2	Must be a fraction. Must be from <u>correct working</u> Examples of correct working include: medium Δ : $\frac{1}{4} \times \frac{1}{4} = \frac{1}{16} \rightarrow$ smallest Δ : $\frac{1}{16} \times \frac{1}{4} = \frac{1}{64} \rightarrow$ Area: $\frac{3}{16} + \frac{1}{64} = \frac{13}{64}$ medium ∇ : $\frac{1}{4}$ of whole area $\rightarrow \frac{13}{16}$ of this is shaded $\rightarrow$ Area: $\frac{1}{4} \times \frac{13}{16} = \frac{13}{64}$ smallest Δ : $\frac{1}{4} \times \frac{1}{4} \times \frac{1}{4} = \frac{1}{64}$ 13 are shaded $\rightarrow$ Area: $= \frac{13}{64}$
	Correct answer <u>and</u> their method <u>explained</u> fully and clearly	B1	AO3	<u>Note:</u> Area “calculations” that are wrong but used for proportions: Allow B1 B1 as above, and 3 rd B1 if correct $\frac{13}{64}$. Fourth mark is available if areas have been developed properly with Pythagoras/trigonometry <u>Alternative by drawing/annotating</u> B1: $\div$ whole shape into (64) small equilateral Δ s or $\div$ one of the four triangles into 16 equilateral Δ s B1: indicating 64 triangles B1: $\frac{13}{64}$ CAO B1: correct and <u>explained</u> (could be from a clear diagram)
		[4]		

Question	Answer	Marks	AO	Guidance
6 (a)		B1 B1 B1 [3]	AO1 AO2 AO2	8500 Correct frequencies on top pair of final branches Correct frequencies on bottom pair of branches
6 (b)	Their 850 + 375 soi [= 1225] $\left[\frac{850+375}{10000} = \right]$ 0.1225 or 12.25%	M1 A1FT [2]	AO2 AO1	Or from probabilities: $0.85 \times 0.1 + 0.15 \times 0.25$ Or $\frac{49}{400}$ or $\frac{1225}{10000}$ Allow 0.123 or 12.3%
6 (c)	Their 1225 as denominator soi $\frac{375}{1225} = \frac{15}{49} = 0.31$ or 31% or better	M1 A1FT [2]	AO2 AO3	OR from probabilities: $\frac{0.15 \times 0.25}{0.85 \times 0.1 + 0.15 \times 0.25}$ or equivalent Note: 30.6(122)
6 (d)	eg No because less than half [31%] of those identified as written by AI were written by AI eg No because most [75%] texts written by AI are identified as written by human eg No because very few [25%] texts written by AI are identified as written by AI	B1 [1]	AO3	No with reason based on data that refers to the AI texts Must not have erroneous figures in their explanation <u>Do not allow</u> eg “It gets most texts wrong” “850 (10%) of the human texts were identified as AI” “It’s not very accurate” “It has false positives”

Question			Answer	Marks	AO	Guidance
7	(a)		Supporting calculation: eg $10 \times 10.42 \times 52 = (£)5418.4(0)$ eg $10 \times 10.42 \times 4 \times 12 = (£)5001.6(0)$ <u>and</u> statement or comparison to the £8670	B1 [1]	AO3	OR $8670 \div 52 = 166.73$ (per week) OR $8670 \div 48 = 180.625$ (per week) <u>and</u> compare to $10 \times 10.42 = £104.20$ (per week) Do not allow $>52\frac{2}{7}$ weeks

7	(b)	If candidate's approach to 7b overlaps the two schemes, mark from <u>only</u> one of EITHER/OR scheme to give the best mark			
		<u>EITHER: Life expectancy</u> 4.25 years (or 51 months) 80 years life expectancy (or 960 months) 0.05 (5%) From clearly stated assumptions here or in 7c	B1 B1 B1	AO2 AO2 AO1	Time interval for age range (allow 4 or 4.5) May be seen in 7(c) Life expectancy (allow 70 years to 100 years) May be seen in 7(c) Answer in range 0.04 to 0.064 Probability as a decimal, or fraction (in a simplified form), or percentage (must have % sign) <u>Not</u> from wrong working and <u>must</u> have come from clear consideration of 9 months to 5 years with: $75 \leq \text{life expectancy} \leq 90$ and $4 < \text{years} < 4.5$ Assumptions may be seen in 7(c)
		<u>OR: Population estimates</u> 70 million 3.5 million 0.05 (5%) From clearly stated assumptions here or in 7c	B1 B1 B1	AO2 AO2 AO1	Estimate for UK population in range 60 to 80 million May be seen in 7(c) Estimate for children in range 2.4 million to 4.5 million May be seen in 7(c) Answer in range 0.04 to 0.064 Probability as a decimal, or fraction (in a simplified form), or percentage (must have % sign) <u>Not</u> from wrong working and <u>must</u> have come from clear consideration of 9 months to 5 years with: $75 \leq \text{life expectancy} \leq 90$ and $4 < \text{years} < 4.5$ Assumptions may be seen in 7(c) Note: eg assumption of 1million per year group is insufficient unless their UK population is linked to life expectancy
			[3]		

7	(c)		<u>EITHER:</u> Using their 7b probability 0.05×70 million 3.5 million	M1 A1FT	AO2 AO1	Their 7(b) $\times$ population of UK (60 to 80 million) <u>Allow</u> FT from their 7(b) estimates to give answer in range 2.4 to 4.5 million
			<u>OR:</u> Not using their 7b probability 70 million 3.5 million With an assumption	B1 B1	AO2 AO1	Estimate for UK population in range 60 to 80 million May be seen in 7(b) Estimate for children in range 2.4 million to 4.5 million Assumption may be seen here or in 7(b): • eg UK population = 70 million • eg age groups are spread evenly across the population Answer in correct range scores first B1 implied and second B1 with sight of an assumption
				[2]		

7	(d)	<u>EITHER:</u> <u>Multiplication route</u> Roughly £8 an hour on average <u>used</u> in calculation Or <u>uses</u> one rate with one age group Or <u>uses</u> both figures with different age groups $30 \times 38 \times 8$ [= (£)9120] Or eg $30 \times 38 \times 5.98$ [= (£)6817.2(0)] Or eg $30 \times 38 \times 10.02$ [= (£)11422.8(0)] 8 billion $\div$ 9120 [= 877 193] Or eg 4 billion $\div$ 6817.2 +4 billion $\div$ 11422.8 [= 586 751 + 350 177] ($\approx$) 877 193 Or eg ($\approx$) 936 928	M1	AO2	Value for hourly childcare between £5.98 and £10.02
			M1	AO2	Calculation of annual cost per child Note: $30 \times 38 = 1140$ Allow M1 if using 52 weeks, but then A0
			M1	AO1	8 billion divided by their annual cost May split the budget into 4 billion for each age group but <u>must add</u> together for this method mark
			A1	AO1	Must be a whole number. Either <u>their</u> correct answer or <u>their</u> answer rounded or <u>their</u> answer from <u>earlier</u> rounding In range 600 000 to 1.2 million (and not from wrong working) <u>Note:</u> If not using budget and pay rates from the article: 0/4
			[4]		

7	(d)		OR: Division route			
			8 billion ÷ £8 per hour [= 1 billion hours] eg 4 billion ÷ £5.98 per hour [= 669 million] eg 4 billion ÷ £10.02 per hour [= 399 million]	M1	AO2	Value for hourly childcare between £5.98 and £10.02 One division May split the budget into 4 billion for each age group
			÷ 38 weeks [= 26.3 million weeks] eg ÷ 38 weeks [= 17.6 million weeks] eg ÷ 38 weeks [= 10.5 million weeks]	M1	AO2	A second division Note: $30 \times 38 = 1140$ Allow M1 if using 52 weeks, but then A0 Or eg $8 \text{ billion} \div 30 \div 38$ [7 017 544] Or eg $4 \text{ billion} \div 30 \div 38$ [3 508 772]
			÷ 30 hours [= 877 193 children] eg $17.6\text{m} \div 30 + 10.5\text{m} \div 30$ [= 586 751 + 350 177]	M1	AO1	A third division and sum if age groups considered separately eg $7 \text{ 017 544} \div 8 = 877 \text{ 193}$ eg $3 \text{ 508 772} \div 5.98 = 586 \text{ 751}$ eg $3 \text{ 508 772} \div 10.02 = 350 \text{ 177}$
			(≈) 877 193 Or eg (≈) 936 928	A1	AO1	Must be a whole number. Either <u>their</u> correct answer or <u>their</u> answer rounded or <u>their</u> answer from <u>earlier</u> rounding In range 600 000 to 1.2 million (and not from wrong working) <u>Note:</u> If not using budget and pay rates from the article: 0/4
				(4)		

7	(e)	Any two appropriate reasons Possible reasons include the following eg: • Not all children have working parents • Not all parents will take up the offer • It might be impossible to find a nursery with free childcare • Not every child is eligible • 7(c) is for whole of UK but 7(d) is for England • The 8 billion budget has been set too low • There might be more under 3's [and the rates are higher for these]	B1, B1	AO3	B1 each <u>distinct</u> correct reason B0: eg The estimations / calculations were wrong
			[2]		

Question			Answer	Marks	AO	Guidance
8	(a)		Clear random method that can be used to allocate students to the two groups	B1 [1]	AO3	Must be random (not alphabetical order, not as students enter room) Can be a simple method, but description must be sufficiently detailed to allow each student to be allocated to one group or the other <u>Note:</u> method does not have to result in equal size groups Accept eg use an online spinner / random number generator, with clear explanation of how students are allocated to A or B Not eg “random name generator” unless explained further Not eg “place all names into a hat and then choose groups” (unless the allocation of students to A and B is described clearly)
8	(b)		A relevant reason that refers to the context: eg it’s better to get a mix of abilities in each group eg to avoid bias from students choosing their preferred learning style	B1 [1]	AO1	Must give a context that refers to a particular factor (eg ability) B0 “to avoid bias” unless a context / example is given
8	(c)		Each <u>student</u> knows what kind of learning they are having eg the students will know if they have to study by computer	B1 [1]	AO1	Can refer to lecturers but needs to be a valid comment eg: “the lecturers will see / know who is attending lectures” <u>Not</u> eg the lecturers need to know the groups to assess / allocate the students

Question			Answer	Marks	AO	Guidance
8	(d)		Disagree with reason eg The university wants to compare the two methods [A and B] not see whether they are better than nothing eg It would be unethical to not teach a whole group eg Students would not put up with it	B1 [1]	AO3	eg Testing someone who has not been taught anything would be irrelevant as all students in this group would do badly eg Group C wouldn't be a control group, because they'd be at a disadvantage straight away
8	(e)	(i)	364.5	B1 [1]	AO1	Must see 364.5, ignore any rounding
8	(e)	(ii)	$\frac{\sqrt{729}}{2}$ 13.5	M1 A1 [2]	AO2 AO1	Oe $\sqrt{\frac{729}{4}}$ 13.5 implies M1A1, ignore any subsequent rounding
8	(e)	(iii)	364.5 + 27 or 364.5 – 27 One of 391.5, 337.5 364.5 + 27 and 364.5 – 27 More than 391 or less than 337 CAO	M1 A1FT M1 A1 [4]	AO2 AO3 AO1 AO3	Adding or subtracting 2sd to/from mean FT their mean ($\neq 729$) and their sd throughout Either value seen FT their mean and their SD <u>Both</u> calculations formed using their mean ($\neq 729$) and their 2sd Both statements needed Do not allow “more than 391 and less than 337”

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