GCE

Mathematics A

H240/01: Pure Mathematics

A Level

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.

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
BP	Blank Page
Seen	
Highlighting	

Other abbreviations in mark scheme	Meaning
dep*	Mark dependent on a previous mark, indicated by *. The * may be omitted if only one previous M mark
cao	Correct answer only
oe	Or equivalent
rot	Rounded or truncated
soi	Seen or implied
www	Without wrong working
AG	Answer given
awrt	Anything which rounds to
BC	By Calculator
DR	This question included the instruction: In this question you must show detailed reasoning.

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.

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)		$2x^{-\frac{1}{4}}$	**B1** **[1]**	**1.1**	Correct expression	Or $2x^{-0.25}$ Could be implied by $p = 2$, $q = -0.25$
1	(b)		$125\ldots$ $\ldots x^{\frac{9}{2}}$	**B1** **B1** **[2]**	**1.1** **1.1**	Obtain 125 Obtain $x^{\frac{9}{2}}$	Could be implied by $p = 125$ Allow $4\frac{1}{2}$ or 4.5 Could be implied by $q = 4.5$ Allow **SC B1** if 0 scored but $x\sqrt{x}$ is seen as $x^{\frac{3}{2}}$ oe
1	(c)		$4\ldots$ $\ldots x^4$	**B1** **B1** **[2]**	**1.1** **1.1**	Obtain 4 Obtain x^4	Could be implied by $p = 4$ Could be implied by $q = 4$ Allow **SC B1** if 0 scored but $\sqrt{16x^8}$ seen
1	(d)		$\left(27x^6\right)^{\frac{1}{3}} = 3x^2$ $x^5 \times 3x^2 = 3x^7$	**M1*** **M1dep*** **A1** **[3]**	**1.1** **1.1** **1.1**	Obtain either ax^2 or $3x^b$ Correctly combine x^5 and their $3x^2$ Obtain correct answer	 Obtain either ax^7 following their a, or $3x^{(5+b)}$ following their b Could be implied by $p = 3$, $q = 7$

Question			Answer	Marks	AO	Guidance	
2	(a)		(b =) 6	B1 [1]	2.2a		
2	(b)		$a < 0$	B1 [1]	2.2a	oe in words eg a is negative	**B0** for $a \leq 0$ **B0** if left as $2a < 0$
2	(c)		(y =) $-9a$	B1 [1]	1.1	Mark final answer, so **B0** if $-9a$ is then changed to $9a$ Must be given as a single term, not eg $9a - 18a$	
2	(d)		$x < 3$	B1 [1]	1.2	Accept $x \leq 3$	oe in words Do not penalise errors if set notation is attempted, as long as intention is clear

Question			Answer	Marks	AO	Guidance	
3	(a)	(i)	$u_2 = 4$	B1	1.1		No need to label terms as u_2 etc, and condone 3 appearing at start of list ie 3, 4… would be **B1**
			$u_3 = 11$, $u_4 = 116$	B1FT [2]	1.1	Both correct **FT** their u_2	Ignore any further terms given
3	(a)	(ii)	Increasing or diverging	B1 [1]	2.4	**B0** if additional incorrect statement such as 'diverging AP' or 'increasing exponentially'	'Increasing monotonically' is fine, but **B0** if just 'monotonic'
3	(b)		$r = \frac{2}{3}$ oe	M1	3.1a	Attempt to find r	Attempts at a and r could be in either order, with M1 awarded for a correct method with a possibly incorrect a or r
			$a = 18$	M1	2.1	Attempt to find a	Correct a and/or r seen in formula for sum to infinity would imply the **M** mark(s)
			$S_\infty = \frac{18}{1-\frac{2}{3}} = 54$	A1 [3]	1.1	Use correct a and r to obtain sum to infinity as 54	'**Determine**' so some method needed. Minimum is $\frac{18}{\frac{1}{3}} = 54$. **SC B1** for 54 with no working shown.

Question			Answer	Marks	AO	Guidance	
4	(a)		magnitude is $\sqrt{0.5^2 + 0.5^2} = \sqrt{0.5}$	M1	1.1	Attempt to find magnitude (or magnitude ^{2}) of given vector	Pythagoras or trigonometry
			$\sqrt{0.5}$ (or 0.707) $\neq 1$ OR $0.5 \neq 1^2$ OR would need to be $\frac{1}{2}\sqrt{2}\,\mathbf{i} - \frac{1}{2}\sqrt{2}\,\mathbf{j}$ hence not unit vector	A1 [2]	2.1	Make comparison using definition of a unit vector, and conclude that it is not a unit vector Any values seen must be correct	Accept $0.5 \neq 1$ as evidence Geometric arguments can gain full credit, as long as fully reasoned and convincing eg to have a length of 1 unit the two components would have to be collinear, but this is not possible as they have to be perpendicular
4	(b)		$(\tan^{-1}1 =) 45^o$	M1	1.1	Attempt to find a useful angle soi Could be using their magnitude from **(a)** with sin or cos	Implied by -45^o **BOD** for any incorrect diagrams seen Allow 0.785 (radians)
			hence direction is 315^o	A1 [2]	1.1	Obtain correct direction	**A0** for -45^o Condone both 315^o and -45^o given **A0** if in radians

Question			Answer	Marks	AO	Guidance	
4	(c)		$3^2 + (c + 0.5)^2 = 5^2$	M1	3.1a	Attempt distance equation involving c, and equate to 5^2 oe Allow one sign error eg $3^2 + (c – 0.5)^2 = 5^2$	If spotting that the y difference is 4 then must still link to c for **M1**
			$c^2 + c – 15.75$ (= 0)	A1	1.1	Correct quadratic equation	Brackets expanded, but not necessarily simplified
			$c = 3.5$, $c = – 4.5$ oe	A1	1.1	Obtain both correct values	
				[3]			**SC** if no method shown then **B1** for each correct value of c, as '**determine**'
			Alt method for final two marks				
			$(c + 0.5)^2 = 16$ $c + 0.5 = 4$ $c = 3.5$ oe	A1		Solve to obtain one correct value for c	
			$c + 0.5 = – 4$ $c = – 4.5$ oe	A1		Obtain second correct value, and no others	

Question			Answer	Marks	AO	Guidance	
5	(a)		$2a + b = 87$, $5a + b = 108$	B1	3.3	State two correct equations soi	
			$3a = 21$	M1	3.1a	Attempt to solve their two linear simultaneous equations	As far as eliminating one variable **M1** implied by correct final answer, if no method shown
			$a = 7$	A1	1.1	Obtain correct value for a	
			$14 + b = 87$ $b = 73$	A1	1.1	Obtain correct value for b	
			Alternative method (graphical approach)				
			gradient = $\frac{108-87}{5-2}$ oe	M1		Attempt gradient of line	**M1** implied by correct a
			gradient = $a = 7$	A1		Obtain $a = 7$	
			$87 = 14 + b$ or $108 = 35 + b$	M1		Attempt to find value for b	Intercept of line or algebraic method **M1** implied by correct b
			$b = 73$	A1		Obtain $b = 73$	
				[4]			
5	(b)	(i)	$h = 7 \times 4 + 73$	M1	3.4	Substitute $t = 4$ into their model	
			= 101 (cm)	A1FT	1.1	Condone no units, but **A0** if incorrect eg 101m **FT** their model	Or 1.01 (m)
				[2]			

Question			Answer	Marks	AO	Guidance	
5	(b)	(ii)	Model only for 'average' height so will be variations Sam could be exactly 4 years old or 4 years and 364 days – their height won't stay the same throughout	**B1** **[1]**	**3.5a**	Any sensible reason as to why the model for 'average height' may, or may not, be accurate in predicting Sam's height eg height varies a lot between children of the same age eg could depend on different diets and lifestyle eg might be accurate as long as Sam is 'average' **See appendix for exemplars**	**B0** for interpolation, including comments about Sam's height being between 87cm and 108cm
5	(c)		Increase in growth unlikely to continue as a linear model	**B1** **[1]**	**3.5b**	Any sensible comment eg growth spurt at 12 due to puberty eg people grow quicker when younger **See appendix for exemplars**	Extrapolation not reliable **B0** for comments about individual variations as question refers to 'average height' model

Question			Answer	Marks	AO	Guidance	
6	(a)		$\frac{1}{2}\times 6^2\times\theta = 14.4$ $18\theta = 14.4$ $\theta = 0.8$ (radians) **AG**	**B1** **[1]**	**2.1**	Use the correct formula for the area of a sector to obtain 0.8 www Must be 0.8 and not equivalent fractions	Condone verification Must work exactly throughout so **B0** if via decimals
6	(b)		$\frac{1}{2}\times 6\times AC\times\sin 0.8 = 3\times 14.4$ $AC = 20.1$	**M1** **A1** **[2]**	**1.1** **1.1**	Attempt use of correct formula for area of a triangle or any equiv complete method Obtain correct AC	Using 0.8 radians or 45.8° 3sf or better (awrt 20.1)
6	(c)		arc $BD = 6 \times 0.8 = 4.8$ $(BC)^2 =$ $6^2 + 20.07^2 - 2 \times 6 \times 20.07 \times \cos 0.8$ $BC = 16.4659\ldots$ perimeter = 4.8 + (20.07 – 6) + 16.47 = 35.3 (cm)	**B1** **M1** **A1** **M1** **A1** **[5]**	**1.1** **3.1a** **1.1** **3.1a** **1.1**	Correct arc length (possibly unsimplified) soi Attempt use of correct cosine rule, or any equiv complete method Obtain correct BC (awrt 16.5) soi Attempt full method for perimeter Obtain correct perimeter (awrt 35.3)	Condone awrt 4.8, if working in degrees Their **arc** BD + (their AC – 6) + their BC **NB** using BD = 4.7 (or better) is likely to be **chord** BD so **M0** unless evidence that arc has actually been attempted Accept without units

Question			Answer	Marks	AO	Guidance	
7	(a)		**DR**				
			$\frac{dx}{dt} = 3t^2 + 2t$, $\frac{dy}{dt} = 2t + 2$, $\frac{dy}{dx} = \frac{\frac{dy}{dt}}{\frac{dx}{dt}}$	**M1**	**1.1a**	Attempt to find $\frac{dy}{dx}$	Correctly combine attempts at algebraic or numerical derivatives
			$\frac{dy}{dx} = \frac{2t+2}{3t^2+2t}$	**A1**	**2.1**	Correct $\frac{dy}{dx}$	Algebraic or numerical (ie $\frac{4}{5}$) www
			$t = 1$	**B1**	**3.1a**	Correct t stated or explicitly used	Ignore any additional t values
			$y - 3 = \frac{4}{5}(x - 2)$	**M1**	**1.1**	Attempt equation of tangent, using (2, 3) and their numerical gradient (from clearly using their t value in their attempt at parametric differentiation)	If using $y = mx + c$ then **M1**is awarded when value for c is obtained **M0** if using $x = 3$, $y = 2$
			$5y = 4x + 7$ **AG**	**A1**	**2.1**	Obtain given answer www	
				[5]		If trying to start with a Cartesian equation there are a number of different, correct, solutions. To gain any credit it would have to be a valid attempt in obtaining the initial equation, condoning only a slip. Please consult with your TL if seen.	

Question			Answer	Marks	AO	Guidance	
7	(b)		**DR**				
			$5(t^2 + 2t) = 4(t^3 + t^2) + 7$	**M1***	**3.1a**	Attempt to solve equations of tangent and curve simultaneously	Or **valid** attempt to obtain an equation in x or y only
			$4t^3 - t^2 - 10t + 7\ (= 0)$	**A1**	**2.1**	Obtain correct cubic Brackets expanded and like terms collected	Some **(**usually **BC)** methods may not explicitly state **simplified** cubic; if **M1** awarded and $t = -\frac{7}{4}$ seen www then allow first **A1 BOD**, with then possibly **SCB1**
			$(t - 1)(t - 1)(4t + 7)$ $t = -\frac{7}{4}$	**M1dep***	**3.1a**	Attempt to solve cubic to obtain t value other than $t = 1$ **DR** so method needed	Factorise to 3 linear factors and solve oe, eg using division If using $(t - 1)^2$ as repeated factor, **M1** for $(t - 1)^2 (4t \pm 7)$ If using $(t - 1)$ as linear factor then need both attempt at quadratic factor (factorisation or division) and also attempt to solve quadratic – **BOD** for slips
			$\left(-\frac{147}{64}, -\frac{7}{16}\right)$ oe	**A1** **[4]**	**2.1**	Obtain correct coordinates, in exact form, www See comment in part **(a)** with regard to using Cartesian equation	Ignore (2, 3) if also given, but **A0** if other point(s) as well If **M1 A1** awarded for correct cubic, but no method shown to solve either cubic, or quadratic from $(t - 1)$(quadratic factor), then **SC B1** for correct coordinates www ie max of 3 marks

Question			Answer	Marks	AO	Guidance	
8	(a)		$\left(1+\frac{1}{2}x\right)^{-3}=1+(-3)\left(\frac{1}{2}x\right)$	B1	1.1	Correct first two terms	Possibly unsimplified
			$+\frac{(-3)(-4)}{2}\left(\frac{1}{2}x\right)^2$	M1	1.1	Attempt third term	Must be expanding $\left(1+\frac{1}{2}x\right)^{-3}$ Allow $\frac{1}{2}x^2$ for $\left(\frac{1}{2}x\right)^2$
				A1	1.1	Obtain correct third term	Possibly unsimplified
			$(2+x)^{-3}=\frac{1}{8}\left(1-\frac{3}{2}x+\frac{3}{2}x^2\right)=\frac{1}{8}-\frac{3}{16}x+\frac{3}{16}x^2$	B1FT	1.1	Multiply their three term expansion by $\frac{1}{8}$	Bracket expanded and coefficients simplified Terms could be listed or summed If **B1M1A1** awarded, but attempt to simplify then goes wrong, **B1FT** is **not** also awarded ISW once correct expansion seen
				[4]			
8	(b)		$(1+4x)^{\frac{1}{2}}=1+\left(\frac{1}{2}\right)(4x)+\frac{\left(\frac{1}{2}\right)\left(-\frac{1}{2}\right)}{2}(4x)^2$	M1	3.1a	Attempt expansion of $(1+4x)^{\frac{1}{2}}$	To obtain $1 + 2x + kx^2$ (allow unsimplified)
			$=1+2x-2x^2$	A1	1.1	Obtain correct, simplified, expansion	Ignore any terms beyond x^2
			$\left(1+2x-2x^2\right)\left(\frac{1}{8}-\frac{3}{16}x+\frac{3}{16}x^2\right)$ $=\frac{1}{8}-\frac{3}{16}x+\frac{3}{16}x^2+\frac{1}{4}x-\frac{3}{8}x^2-\frac{1}{4}x^2$	M1	1.1	Attempt product of their two expansions ie their answer to **(a)** and their attempt at $(1+4x)^{\frac{1}{2}}$ 'Hence' so **M0** for division attempts	To obtain attempts at the six relevant terms (ie 1 constant term, 2 terms in x and 3 terms in x^2, but not necessarily all correct) Ignore higher powers
			$\frac{1}{8}+\frac{1}{16}x-\frac{7}{16}x^2$	A1	1.1	Obtain correct three terms	Terms could be listed or summed
				[4]			

Question			Answer	Marks	AO	Guidance	
8	(c)		$(1+\frac{1}{2}x)^{-3}$ requires $\left\|\frac{1}{2}x\right\|<1$ hence $\|x\|<2$ $(1+4x)^{\frac{1}{2}}$ requires $\|4x\|<1$ hence $\|x\|<\frac{1}{4}$	**B1***	**2.5**	Both conditions correct oe eg $-2<x<2$ and $-\frac{1}{4}<x<\frac{1}{4}$	Allow $\left\|\frac{1}{2}x\right\|<1$ and/or $\|4x\|<1$ oe ie conditions on $\|kx\|$ not $\|x\|$ $\|x\|<\frac{1}{4}$ could also be $\|x\|\leq\frac{1}{4}$ oe, as $n>0$
			Select tighter condition, hence $\|x\|<\frac{1}{4}$	**B1dep***	**2.3**	Correct conclusion; reason needed that identifies that $\|x\|<\frac{1}{4}$ is contained within $\|x\|<2$ eg $\|x\|<\frac{1}{4}$ is a subset of $\|x\|<2$ eg nested interval eg $\frac{1}{4}<2$	Must now be $\|x\|<\frac{1}{4}$ not $\|4x\|<1$ **B0** for vague statements such as 'so that both are valid' without any further clarification Or $\|x\|\leq\frac{1}{4}$
				[2]			

Question			Answer	Marks	AO	Guidance	
9	(a)		$R^2 = 25$ $R = 5$	**M1**	**1.1**	Attempt correct process to find R	
			$R\cos\alpha = 3$, $R\sin\alpha = 4$ hence $\tan\alpha = \frac{4}{3}$	**M1**	**1.1a**	Attempt correct process to find $\tan\alpha$ (or equiv with $\sin\alpha$ or $\cos\alpha$)	Condone $\cos\alpha = 3$, $\sin\alpha = 4$ seen in method, leading to $\tan\alpha = \frac{4}{3}$ **M0** for $\tan\alpha = \frac{3}{4}$
			$5\cos(2x - 53.1)$	**A1**	**1.1**	Obtain $5\cos(2x - 53.1)$ Could be implied by $R = 5$ and $\alpha = 53.1$ (awrt 53.1)	Condone not being written out in required form, and ISW any error when attempting to do so **A0** for $\alpha = 0.927$ radians
				[3]			
9	(b)		**DR**				
			$5\cos(2x - 53.1) + 6 = 4(5\cos(2x - 53.1) - 1)$ $15\cos(2x - 53.1) = 10$	**M1**	**3.1a**	Clear fraction, attempt to rearrange and gather like terms	
				A1FT	**2.1**	Obtain correct harmonic equation, with like terms gathered **FT** their $R\cos(2x - \alpha)$	Could still be in terms of $\cos 2x$ and $\sin 2x$ eg $9\cos 2x + 12\sin 2x - 10$ (= 0)
			$\cos(2x - 53.1) = \frac{2}{3}$ $2x - 53.1 = 48.2$ $2x = 101.3$ $x = 50.7$	**M1***	**1.1**	Correct process to find at least one value for x Must be solving equation of the form $\cos(2x \pm \alpha) = k$	Allow substitution soi eg n = their $5\cos(2x - 53.1)$ to obtain $3n = 10$
				A1	**1.1**	Obtain at least one correct value	Likely to be using 48.2

Question			Answer	Marks	AO	Guidance	
			$2x - 53.1 = -48.2, 48.2, 311.8, 408.2$ $2x = 4.94, 101.3, 364.9, 461.3$	**M1dep***	**1.1**	Correct process to find (at least) one further value for x	Allow answers in range [50.6, 50.7] – see later **A1** detail for range for other solutions
			$x = 2.47, 50.7, 182.5, 230.7$	**A1**	**1.1**	Obtain one further correct value	Correct process to find x from a second value for their $\cos^{-1}(\frac{2}{3})$ Or their first solution + 180° oe
				A1	**1.1**	Obtain all 4 correct values, and no others in given range	Answers in range [2.46, 2.48], [182, 183], [230, 231]
				[7]			Answers in range [2.46, 2.48], [182, 183], [230, 231]
			Alt method if not harmonic form				
			$3\cos 2x + 4\sin 2x + 6 = 12\cos 2x + 16\sin 2x - 4$ $9\cos 2x + 12\sin 2x - 10 (= 0)$	**M1**	**3.1a**	Clear fraction, attempt to rearrange and gather like terms	Could have terms in $\cos 2x$ and $\sin 2x$ or even $\tan x$, $\cos x$, $\sin x$, $\cos x \sin x$ (if double angle formulae used)
			$225\sin^2 2x - 240\sin 2x + 19 (= 0)$ $225\cos^2 2x - 180\cos 2x - 44 (= 0)$ $19\tan^2 x - 24\tan x + 1 (= 0)$ $900\cos^4 x - 1260\cos^2 x + 361 (= 0)$ $900\sin^4 x - 540\sin^2 x + 1 (= 0)$	**A1FT**	**2.1**	Obtain correct equation in a **single** trig ratio, with like terms gathered	Could be in terms of $\sin x$ or $\cos x$, if double angle formulae used but equation never seen in terms of just $\cos 2x$ or $\sin 2x$

Question			Answer	Marks	AO	Guidance	
				M1*	**1.1**	Correct process to find at least one value for x	Solving a 3 term quadratic (or possibly quartic) in a single trig ratio (condone **BC**) and **also** attempt x
				A1	**1.1**	Obtain at least one correct value	Allow answers in range [50.6, 50.7] – see later **A1** detail for range for other solutions
				M1dep*	**1.1**	Correct process to find one further value for x Must be finding a secondary value from their principal value	**M0** if just finding principal value from other quadratic root
			$x = 2.47, 50.7, 182.5, 230.7$	**A1**	**1.1**	Obtain one further correct value	Answers in range [2.46, 2.48], [182, 183], [230, 231]
				A1	**1.1**	Obtain all 4 correct values, and no others in given range	Answers in range [2.46, 2.48], [182, 183], [230, 231]

Question			Answer	Marks	AO	Guidance	
10	**(a)**	**(i)**	$\frac{1}{2}$ oe	**B1** **[1]**	**1.2**	State correct scale factor	
	(a)	**(ii)**	parallel to the x-axis / in the x-direction	**B1**	**2.5**	Identify direction – correct language needed	Allow 'horizontal' **B0** for 'in', 'on' or 'along' the x-axis, or for right / left Could be implied by $\begin{pmatrix} k \\ 0 \end{pmatrix}$

Question			Answer	Marks	AO	Guidance	
			$\frac{1}{2}$ oe	**B1**	**1.2**	Correct magnitude of translation	Not dep on previous **B1**, but must have indicated horizontal translation in some way, including informal language
				[2]		Do not penalise mentioning the stretch from **(a)(i)** again in **(a)(ii)**	$\begin{pmatrix}\frac{1}{2}\\0\end{pmatrix}$ is **B2**
10	**(b)**		e^{-1}	**B1**	**3.1a**	State correct scale factor	Any exact equiv
				[1]			
10	**(c)**		$\frac{dy}{dx} = 2e^{2x-1}$	**M1**	**1.1**	State either correct derivative or $\frac{1}{2}e^{2x-1}$	
			at $x = \frac{1}{2}$, gradient = 2 oe	**A1**	**2.1**	Obtain correct gradient, following correct derivative	'**Show that**' so correct derivative must be seen first
			$y = e^0 = 1$	**B1**	**1.1**	State, or use, correct y-value	
			$y - 1 = 2(x - \frac{1}{2})$ $y = 2x$ **AG**	**A1**	**2.1**	Use correct numerical m, x and y values to obtain given equation of tangent	Could also use $y = mx + c$ to obtain $c = 0$ and hence given equation
				[4]			
10	**(d)**		$\int e^{2x-1}dx = \frac{1}{2}e^{2x-1}$	**B1**	**1.1**	State correct integral	Any equiv exact form Could be in terms of u if using substitution
			$\left[\frac{1}{2}e^{2x-1}\right]_0^{\frac{1}{2}} = \frac{1}{2}\left(e^0 - e^{-1}\right)$	**M1***	**1.1a**	Attempt use of correct limits	Correct order and subtraction, working with exact values Could be using u limits (must be -1 and 0)

Question			Answer	Marks	AO	Guidance	
			$\frac{1}{2}\left(1-e^{-1}\right)-\frac{1}{2}\times1\times\frac{1}{2}$	**M1dep***	**3.1a**	Attempt area of region ie their definite integral minus attempt at area of triangle Could be implied by their definite integral minus 0.25 www Must be using exact values	Area of a triangle must either be $\frac{1}{2}\times\frac{1}{2}\times$ their y or from $\int_0^{0.5} 2x\,dx$
			$\frac{1}{4}-\frac{1}{2e}$	**A1**	**1.1**	Correct area, in any exact form with like terms combined	Must have worked exactly throughout
				[4]			
			Alternative method (integrating wrt *y*)				
			$\int\left(\frac{1}{2}\ln y+\frac{1}{2}\right)dy=\frac{1}{2}y\ln y$	**M1**		Change subject and attempt **full** integration by parts(using correct parts)	
			$\left[\frac{1}{2}y\ln y\right]_{e^{-1}}^{1}=\left(\frac{1}{2}\ln1-\frac{1}{2}e^{-1}\ln e^{-1}\right)$	**M1***		Attempt use of correct limits	Correct order and subtraction, working with exact values Must use correct y limits
			$\frac{1}{2}\times1\times\frac{1}{2}-\frac{1}{2}e^{-1}$	**M1dep***		Attempt area of region ie attempt at area of triangle minus their definite integral Could be implied by 0.25 minus their definite integral www Must be using exact values	Area of a triangle must either be $\frac{1}{2}\times\frac{1}{2}\times$ their y or from $\int_0^{1}\frac{1}{2}y\,dy$
			$\frac{1}{4}-\frac{1}{2e}$	**A1**		Correct area, in any exact form with like terms combined	Must have worked exactly throughout
				[4]			

Question			Answer	Marks	AO	Guidance	
11	(a)		a and b are positive integers	B1	2.3	Correct condition Accept use of $\mathbb{Z}^+$, or $\mathbb{Z}$ with $b \neq 0$, when describing a and b	Allow 'a and b are integers' only if also stated that $b \neq 0$
			a and b have no common factors (other than 1)	B1	2.3	Correct condition ('not 1' is not required) a and b are coprime The HCF of a and b is 1	Condone $\frac{a}{b}$ is **fully** simplified (or in its simplest form) Could be implied by 'Euclid's infinite descent' in **(c)**
				[2]			
11	(b)		b^2 is an integer, and $a^2 = 5b^2$ hence a^2 is a multiple of 5	B1*	2.2a	Identify that a^2 is a multiple of 5	eg 5 is a factor of a^2 eg $\frac{a^2}{5}$ is an integer
			a square number must have pairs of the same factor, so a^2 must be a multiple of 5^2 hence a is a multiple of 5	B1dep*	2.4	Explain why a must also be a multiple of 5 Could refer to prime factors or factors of square numbers	eg $\frac{a \times a}{5}$ is an integer, so a must be a multiple of 5 Not just a^2 is a multiple of 5 hence a is a multiple of 5 as well, as this is given in the question
				[2]		**See appendix for exemplars**	

Question			Answer	Marks	AO	Guidance	
11	(c)		$(5k)^2 = 5b^2$ $25k^2 = 5b^2$	M1	2.1	Correctly use $a = 5k$ to obtain an equation with no brackets	
			$b^2 = 5k^2$ hence b^2 is a multiple of 5, so b is a multiple of 5	A1	2.4	Simplify and state condition on b	Condone statement about b, with no reference to b^2 first
			This means that a and b share a **common factor** of 5, which **contradicts** the original assumption that a and b had no common factors. Hence $\sqrt{5}$ cannot be written as $\frac{a}{b}$ so must be **irrational**.	A1	2.2a	Conclude appropriately, dep on (2^{nd}) **B1** in part **(a)** for 'no common factors' oe If **B0** for 'no common factors' in part **(a)** then this mark is **A0**, as no assumption to contradict Need reference to 'common factor' (or simplest form), 'contradiction' and 'irrational' in conclusion	Or eg $\frac{a}{b} = \frac{5k}{5m}$ hence not in simplest form (as alternative evidence for sharing a common factor)
				[3]			

Question			Answer	Marks	AO	Guidance	
12	(a)		$\frac{2+4x}{x(1+x)(1-x)} = \frac{A}{x} + \frac{B}{1+x} + \frac{C}{1-x}$	B1	3.1a	Identify correct partial fractions	
			$A(1+x)(1-x) + Bx(1-x) + Cx(1+x) = 2 + 4x$	M1	1.1	Clear fractions and attempt (at least) one coefficient	From using their 3 distinct linear factors
			$A = 2, B = 1, C = 3$	A1	1.1	Obtain one correct value www	
			$\frac{2+4x}{x(1-x^2)} = \frac{2}{x} + \frac{1}{1+x} + \frac{3}{1-x}$	A1	2.1	Obtain fully correct partial fractions	Possibly implied by $A = 2$ etc
				[4]			

Question			Answer	Marks	AO	Guidance	
12	(b)		$\int \tan y \mathrm{d}y = \int \frac{2+4x}{x(1+x)(1-x)} \mathrm{d}x$	M1*	3.1a	Attempt to separate variables to obtain $\int f(y)\mathrm{d}y = \int g(x)\mathrm{d}x$	Condone no integral signs **BOD** if no dx and/or dy or still present as a single operator
			$\int\left(\frac{2}{x}+\frac{1}{1+x}+\frac{3}{1-x}\right)\mathrm{d}x =$ $2\ln\lvert x\rvert + \ln\lvert 1+x\rvert - 3\ln\lvert 1-x\rvert \quad (+c)$	B1FT	2.1	Correct integration of their 3 linear partial fractions from part **(a)** **B0** if any y term still on RHS	Condone no constant of integration Condone brackets not modulus signs Brackets / modulus could be implied by further working, otherwise **B0**
			$\int \tan y \mathrm{d}y = \ln\lvert\sec y\rvert$	B1	3.1a	Correct integration of tan$y$ **B0** if any x term on LHS, or if tan$y$ is still in term on RHS	$\ln\lvert\sec y\rvert$ or $-\ln\lvert\cos y\rvert$
			$\ln\sec y = \ln\frac{kx^2(1+x)}{(1-x)^3}$ $\sec y = \frac{kx^2(1+x)}{(1-x)^3}$ or $\cos y = \frac{(1-x)^3}{kx^2(1+x)}$	M1dep*	3.1a	Correct process to combine **all** terms and remove logs Must deal correctly with indices and correctly use rules for combining logs	Must include constant of integration (could be e^c rather than k). but could be numerical already (possibly incorrect)
				A1FT	2.1	Obtain a correct equation no longer involving logs **FT** on an incorrect numerical constant of integration only **NB** $(x-1)^3$ not $(1-x)^3$ is **A0**	All algebraic terms must be fully correct (no FT on these)
			$\sqrt{2} = \frac{\frac{1}{4}\times\frac{3}{2}k}{\frac{1}{8}}$, $\frac{1}{2}\sqrt{2} = \frac{\frac{1}{8}}{\frac{1}{4}\times\frac{3}{2}\times k}$ so $k = \frac{1}{3}\sqrt{2}$	M1dep*	1.1	Use $\left(\frac{1}{2}, \frac{1}{4}\pi\right)$ in a correct equation to attempt to find k	Could be awarded before combining terms
			$\cos y = \frac{3\sqrt{2}(1-x)^3}{2x^2(1+x)}$	A1	2.1	Obtain fully correct equation, in required form	Surd may not be rationalised, but no fractions within fractions
				[7]			

APPENDIX

Exemplar responses for Q5(b)(ii)

Response	Mark	Comment
Doesn't take into account factors that affect height, such as genetics	**B1**	Assume relevant to Sam
Not accurate as not all people will be the same height at the same age.	**B1**	Implies that Sam may not be the average height.
Not likely to be accurate as equation only predicts the average height. People have different heights so unlikely Sam has exactly the same height as the average.	**B1**	Comment that model is about average height and Sam may not be average
Sam may have a condition that stunts his growth. Therefore, he may not have the average height of a 4 year old.	**B1**	Comment that model is about average height and Sam may not be average
Not accurate as a lot of children will be below or above the average height.	**B1**	Comment that model is about average height and Sam may not be average
It is an average height prediction of 4 yr olds, so won't be exactly accurate	**B1**	Implies Sam may differ from the model
Model doesn't consider if Sam has just turned 4 or is nearly 5.	**B1**	Comment dealing with Sam's age not being a discrete value
Inaccurate as children are unlikely to grow at a constant rate throughout their life.	**B0**	Not relevant to predicting Sam's height at 4
Accurate since it is within the range of data.	**B0**	Interpolation
Not quite accurate as things like gender could affect height.	**B0**	Commenting on model not prediction
Inaccurate as children are unlikely to grow at a constant rate throughout their life.	**B0**	Not relevant to predicting Sam's height at 4

Exemplar responses for Q5(c)

Response	Mark	Comment
157cm is a very large average for a 12 year old as growth slows and comes to a stop at an age which this model doesn't show.	**B1**	For second comment acknowledging a change in the growth rate.
At 12 children start having growth spurts so don't grow at the same rate as those aged 2 - 5	**B1**	References change in growth rate
The child will not grow at the same rate throughout childhood	**B1**	References change in growth rate for children
Does not take into account the gender of the child as boys and girls can have growth spurts at different ages due to puberty	**B1**	References growth rate changing in all children due to puberty (only gender is not enough)
12 year olds will grow at a slower rate than toddlers	**B1**	References change in growth rate
Child may stop growing at age 12	**B1**	References change in growth rate
Children do not grow at a constant speed	**B0**	Does not reference a change in the model and seems to imply original model is wrong. "...continue to grow at constant speed.." would be **B1**
12 years of age is when children tend to hit puberty therefore the average height tends to vary very much	**B0**	Does not reference change in growth rate
7(12) + 73 = 157cm which is too tall for a 12 year old	**B0**	Does not refer to a limitation of the model
Around 12 years old the different sexes start to display large differences in height so this would not be an accurate average	**B0**	Does not reference growth rate
Some children may grow slower than others due to different lifestyle	**B0**	References individual children rather than the average
At puberty boys tend to grow faster than girls	**B0**	Gender difference is not relevant as model is about average
Does not take into account the gender of the child	**B0**	Gender difference is not relevant as model is about average

Exemplar responses for Q11(b) for the B1dep*

Response	Mark	Comment
The only way for a^2 to be a multiple of 5 is if a is a multiple of 5 or $\sqrt{5}$. Since a is defined as in integer, it cannot be a multiple of $\sqrt{5}$ so it must be a multiple of 5.	**B1**	Correct reasoning about the factors of a and a^2
The square root of any multiple of 5 must be a multiple of 5 so $\sqrt{a^2}$ is a multiple of 5	**B0**	No reason given
As a^2 is a multiple of 5, a must also be a multiple of 5 as it is an integer so can't have a factor of $\sqrt{5}$.	**B0**	Does not explain why there has to be a factor of $\sqrt{5}$.
5 is prime, so 5 can only be factor of a^2 if it is also a factor of a. Hence a is a multiple of 5	**B1**	Correctly considers prime factorisation
5 is prime so no other numbers can produce it, therefore must come from product of a and itself to appear in a^2.	**B1**	Uses the fact that 5 is prime
Since 5 is not a square number, a must be a multiple of 5, so that a^2 is a multiple of 25 then and therefore a multiple of 5.	**B1**	Considers repeated factors of square numbers
The factors of a^2 are the same as the factors of a. Therefore if 5 is a factor of a^2, 5 must also be a factor of a, making a a multiple of 5.	**B0**	First statement incorrect.
If a^2 is a multiple of 5 a will also be a multiple of 5 because they both have a common factor of 5	**B0**	No explanation as to why they have a common factor of 5.
a is a multiple of 5 since any prime factor of a^2 is also a factor of a	**B1**	Considers prime factors of square numbers
5 is prime and cannot be split up so must also be a factor of a	**B0**	Does not relate to a^2
a^2 must have units digit 0 or 5 but this cannot happen unless a is a multiple of 5	**B1**	Justifies by considering all possible units digits of multiples of 5
If a is an integer its square will have the same prime factors as a, so if a^2 has a prime factor of 5 so does a	**B1**	Considers prime factors of square numbers
a^2 is a multiple of 5 so some factors of a must multiply to 5, but 5 is prime so the factor in a must be 5	**B1**	Considers prime factors of a^2 and a
a is a multiple of 5 since only a multiple of 5 multiplied by itself gives a multiple of 5	**B1**	Uses properties of multiples of 5

In general the method mark for attempting to solve any 3 term quadratic can be earned as follows, but the detail in the method must be commensurate with any command word used, and in line with the instructions in the mark scheme.	
1.	If factors are used these must give at least 2 of the 3 terms for **their** quadratic. It could be the negative of the terms eg if $1 - x - 6x^2 = 0$ is factorised as $(3x - 1)(2x + 1) = 0$.
2.	If the **correct** general quadratic formula is first stated then condone **one** sign error in its use, as long as it is clear that it is a sign error only eg if solving $x^2 - 5x - 2 = 0$ then $\frac{5 \pm \sqrt{25-8}}{2}$ then **M1** as sign error on $4ac$, but $\frac{5 \pm \sqrt{17}}{2}$ is **M0** as error not explicit.
3.	If an **incorrect** general quadratic formula is first stated and used then it is **M0**.
4.	If the general quadratic formula is **not** first stated then the method shown must be fully correct to earn **M1**. This needs $b^2 - 4ac$ to still be seen as 2 terms in the square root eg if $x^2 - 2x - 5 = 0$ were an incorrect quadratic, and no formula had been stated, then $\frac{2 \pm \sqrt{4+20}}{2}$ **M1** but $\frac{2 \pm \sqrt{24}}{2}$ **M0**.
5.	If completing the square is used they must reach the stage $x = p \pm \sqrt{q}$ form to earn **M1** – condone one sign error (doesn't include omitting the ±).
6.	**No method seen** - correct answers only from the correct quadratic imply any **M1** mark **unless specified otherwise in the mark scheme**. Please check the mark scheme carefully for the detail required if the command words are '**detailed reasoning**', '**determine**' and '**show that**' etc. **No method seen** - there is no need to check answers only from an incorrect quadratic – it scores **M0**.

Finding the gradient / equation of a straight line	
Gradient	They must be attempting to use $\frac{y_2 - y_1}{x_2 - x_1}$ ie $\left(\frac{\text{diff in } y}{\text{diff in } x}\right)$ with the x and y coordinates used consistently; allow one sign slip
Equation	If attempting the equation of a straight line then a numerical m is required, commensurate with any previous method / statement, and the numerical (x_1, y_1) coordinates are used correctly ie not reversed If using $y - y_1 = m(x - x_1)$ then substitution is sufficient for the **M1.** Allow one sign slip. If using $y = mx + c$ then full substitution needed **and** c attempted for the **M1.** The **A1** is awarded for a simplified equation ie brackets expanded and like terms gathered. It could be in any equivalent form eg $y = mx + c$, $ax + by + c = 0$ etc, **unless specified in the question**. It cannot be implied eg $y = 2x + c$ with $c = 3$, but $y = 2x + 3$ never actually stated.

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