UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS GCE Advanced Subsidiary Level and GCE Advanced Level

MARK SCHEME for the May/June 2010 question paper

for the guidance of teachers

9709 MATHEMATICS

9709/33

Paper 33, maximum raw mark 75

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

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

• CIE will not enter into discussions or correspondence in connection with these mark schemes.

CIE is publishing the mark schemes for the May/June 2010 question papers for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level syllabuses and some Ordinary Level syllabuses.



UNIVERSITY of CAMBRIDGE International Examinations

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Mark Scheme Notes

Marks are of the following three types:

- M Method mark, awarded for a valid method applied to the problem. Method marks are not 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. Correct application of a formula without the formula being quoted obviously earns the M mark and in some cases an M mark can be implied from a correct answer.
- 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).
- B Mark for a correct result or statement independent of method marks.
- When a part of a question has two or more "method" steps, the M marks are generally independent unless the scheme specifically says otherwise; and similarly when there are several B marks allocated. The notation DM or DB (or dep*) is used to indicate that a particular M or B mark is dependent on an earlier M or B (asterisked) mark in the scheme. When two or more steps are run together by the candidate, the earlier marks are implied and full credit is given.
- The symbol √ implies that the A or B mark indicated is allowed for work correctly following on from previously incorrect results. Otherwise, A or B marks are given for correct work only. A and B marks are not given for fortuitously "correct" answers or results obtained from incorrect working.
- Note: B2 or A2 means that the candidate can earn 2 or 0. B2/1/0 means that the candidate can earn anything from 0 to 2.

The marks indicated in the scheme may not be subdivided. If there is genuine doubt whether a candidate has earned a mark, allow the candidate the benefit of the doubt. Unless otherwise indicated, marks once gained cannot subsequently be lost, e.g. wrong working following a correct form of answer is ignored.

- Wrong or missing units in an answer should not lead to the loss of a mark unless the scheme specifically indicates otherwise.
- For a numerical answer, allow the A or B mark if a value is obtained which is correct to 3 s.f., or which would be correct to 3 s.f. if rounded (1 d.p. in the case of an angle). As stated above, an A or B mark is not given if a correct numerical answer arises fortuitously from incorrect working. For Mechanics questions, allow A or B marks for correct answers which arise from taking *g* equal to 9.8 or 9.81 instead of 10.

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The following abbreviations may be used in a mark scheme or used on the scripts:

- AEF Any Equivalent Form (of answer is equally acceptable)
- AG Answer Given on the question paper (so extra checking is needed to ensure that the detailed working leading to the result is valid)
- BOD Benefit of Doubt (allowed when the validity of a solution may not be absolutely clear)
- CAO Correct Answer Only (emphasising that no "follow through" from a previous error is allowed)
- CWO Correct Working Only often written by a 'fortuitous' answer
- ISW Ignore Subsequent Working
- MR Misread
- PA Premature Approximation (resulting in basically correct work that is insufficiently accurate)
- SOS See Other Solution (the candidate makes a better attempt at the same question)
- SR Special Ruling (detailing the mark to be given for a specific wrong solution, or a case where some standard marking practice is to be varied in the light of a particular circumstance)

Penalties

- MR –1 A penalty of MR –1 is deducted from A or B marks when the data of a question or part question are genuinely misread and the object and difficulty of the question remain unaltered. In this case all A and B marks then become "follow through $\sqrt{"}$ marks. MR is not applied when the candidate misreads his own figures this is regarded as an error in accuracy. An MR –2 penalty may be applied in particular cases if agreed at the coordination meeting.
- PA –1 This is deducted from A or B marks in the case of premature approximation. The PA –1 penalty is usually discussed at the meeting.

Page 4				Paper	
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EĽ	equ Ma	e or imply non-modular inequality $(x-3)^2 > (2(x+1))^2$, or correation, or pair of linear equations $(x-3) = \pm 2(x+1)$ ke reasonable solution attempt at a 3-term quadratic, or solve twain critical values -5 and $\frac{1}{3}$		B1	
OR	2: Obt or b Obt	e answer $-5 < x < \frac{1}{3}$ ain the critical value $x = -5$ from a graphical method, or by insp y solving a linear equation or inequality ain the critical value $x = \frac{1}{3}$ similarly e answer $-5 < x < \frac{1}{3}$	ection,	A1 B1 B2 B1	[4
	[Do	not condone \leq for \leq ; accept 0.33 for $\frac{1}{3}$.]			
(i)	State or	imply $3 \ln y = \ln A + 2x$ at any stage		B1	
	State gra	dient is $\frac{2}{3}$, or equivalent		B1	[2
(ii)	Substitu	e $x = 0$, ln $y = 0.5$ and solve for A		M1	
	Obtain A	= 4.48		A1	[2
Att	tempt to us	e tan($A \pm B$) formula and obtain an equation in tan x		M1	
		n quadratic 2 $\tan^2 x + 3 \tan x - 1 = 0$, or equivalent		A1	
	tain answe	n quadratic and find a numerical value of x r 15.7°		M1 A1	
Ob	tain answe	r 119.3° and no others in the given interval ers outside the given interval. Treat answers in radians, 0.274 an	id 2.08, as a m	A1	[:
		ables correctly		B1	
Ob	tain term <i>l</i>	$\ln(4-x^2)$, or terms $k_1 \ln(2-x) + k_2 \ln(2+x)$		B1	
Ob	tain term -	$-2 \ln(4-x^2)$, or $-2 \ln(2-x) - 2 \ln(2+x)$, or equivalent or equivalent		B1 B1	
		instant or use limits $x = 1$, $t = 0$ in a solution containing terms a l	$\ln(4-x^2)$ and l		
or	terms c ln($(2 - x), d \ln(2 + x)$ and bt		M1	
		t solution in any form, e.g. $-2 \ln(4 - x^2) = t - 2 \ln 3$		A1	-
Rea	arrange an	d obtain $x^2 = 4 - 3\exp(-\frac{1}{2}t)$, or equivalent (allow use of 2 ln 3	= 2.20)	A1	[
(i)		ivative $-e^{-x} - (-2)e^{-2x}$, or equivalent		B1 + B1	
	-	erivative to zero and solve for $x = \ln 2$, or exact equivalent		M1 A1	[
(ii)	State inc	efinite integral $-e^{-x} - (-\frac{1}{2})e^{-2x}$, or equivalent		B1 + B1	
	Substitu	e limits $x = 0$ and $x = p$ correctly		M1	
		iven answer following full and correct working		A1	[

Pag		ige 5	Mark Scheme: Teachers' version	Syllabus	Paper	
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6 (i)		Use corre	ct quotient or product rule		M1	
		Obtain co	rrect derivative in any form, e.g. $\frac{1}{x(x+1)} - \frac{\ln x}{(x+1)^2}$		A1	
			rivative to zero and obtain the given equation correctly		A1	
		Consider	the sign of $x - \frac{(x+1)}{\ln x}$ at $x = 3$ and $x = 4$, or equivalent		M1	
		Complete	the argument with correct calculated values		A1	[5
	(ii)	Obtain fir	erative formula correctly at least once, using or reaching a va nal answer 3.59		(3, 4) M1 A1	
			ficient iterations to at least 4 d.p. to justify its accuracy to 2 here is a sign change in the interval (3.585, 3.595)	a.p.,	A1	[3
	(i)		ct $cos(A + B)$ formula to express $cos 3\theta$ in terms of trig fund		M1	
			ct trig formulae and Pythagoras to express $\cos 3\theta$ in terms o	$f\cos\theta$	M1	
			correct expression in terms of $\cos \theta$ in any form e given identity correctly		A1 A1	[4
		[SR: Give then M1A	E M1 for using correct formulae to express RHS in terms of A1 for expressing in terms of either only $\cos 3\theta$ and $\cos \theta$, or d $\sin \theta$, and A1 for obtaining the given identity correctly.]		,	L
	(ii)	Use ident	ity and integrate, obtaining terms $\frac{1}{4}(\frac{1}{3}\sin 3\theta)$ and $\frac{1}{4}(3\sin \theta)$), or equivalent	B1 + B1	
		Use limits	s correctly in an integral of the form $k\sin 3\theta + l\sin \theta$		M1	
		Obtain an	swer $\frac{2}{3} - \frac{3}{8}\sqrt{3}$, or any exact equivalent		A1	[4
			Substitute $1 \pm \frac{1}{2}$ attempt complete supersides of the u^3	and u^2 tarms	M1	
)	(a)	EITHER:	Substitute $1 + i\sqrt{3}$, attempt complete expansions of the x^3 Use $i^2 = -1$ correctly at least once	and x terms	M1 B1	
			Complete the verification correctly		A1	
			State that the other root is $1 - i\sqrt{3}$		B1	
		<i>OR</i> 1:	State that the other root is $1 - i\sqrt{3}$		B1	
			State quadratic factor $x^2 - 2x + 4$		B1	
			Divide cubic by 3-term quadratic reaching partial quotient	t 2x + k	M1	
		OR2:	Complete the division obtaining zero remainder State factorisation $(2x + 3)(x^2 - 2x + 4)$, or equivalent		A1 B1	
		OK2.	Make reasonable solution attempt at a 3-term quadratic an	id use $i^2 = -1$	M1	
			Obtain the root $1+i\sqrt{3}$		A1	
			State that the other root is $1 - i\sqrt{3}$		B1	[4
	(b)	Show poi	nt representing $1+i\sqrt{3}$ in relatively correct position on an A	Argand diagram	B1	
	. /	_	the with centre at $1+i\sqrt{3}$ and radius 1		B1√	
			e for arg $z = \frac{1}{3}\pi$ making $\frac{1}{3}\pi$ with the real axis		B1	
		Show line	e from origin passing through centre of circle, or the diameter	which would cont		
		•	if produced		B1	/ r <i>c</i>
		Shade the	relevant region		B1v	

9 (i) State or imply partial fractions of the form $\frac{A}{1-2x} + \frac{B}{2+x} + \frac{C}{(2+x)^2}$ B1 Use any relevant method to determine a constant M1 Obtain one of the values $A = 1, B = 1, C = -2$ A1 Obtain a second value A1 Obtain the third value A1 [The form $\frac{A}{1-2x} + \frac{Dx + E}{(2+x)^2}$, where $A = 1, D = 1, E = 0$, is acceptable scoring B1M1A1A1A1 as above.] (ii) Use correct method to obtain the first two terms of the expansion of $(1-2x)^{-1}, (2+x)^{-1}, (2+x)^{-2}, (1+\frac{1}{2}x)^{-1}, or (1+\frac{1}{2}x)^{-2}$ M1 Obtain correct unsimplified expansions up to the term in x^2 of each partial fraction $A1\sqrt{+} A1\sqrt{+} A1\sqrt{-}$ Obtain answer $1 + \frac{9}{4}x + \frac{15}{4}x^2$, or equivalent A1 [Symbolic binomial coefficients, e.g. $\binom{-1}{1}$, are not sufficient for the M1. The f.t. is on A, B, C .] [For the A, D, E form of partial fractions, give M1A1 $\sqrt{1}\sqrt{1}$ for the expansions then, if $D \neq 0$, M1 for multiplying out fully and A1 for the final answer.] [In the case of an attempt to expand $(4+5x-x^2)(1-2x)^{-1}(2+x)^{-2}$, give M1A1A1 for the expansions M1 for multiplying out fully, and A1 for the final answer.] [SR: If B or C omitted from the form of fractions, give B0M1A0A0A0 in (i); M1A1 $\sqrt{A1}\sqrt{1}$ in (ii).] [SR: If D or E omitted from the form of fractions, give B0M1A0A0A0 in (i); M1A1 $\sqrt{A1}\sqrt{1}$ in (ii).] [SR: If D or E omitted from the form of fractions, give B0M1A0A0A0 in (i); M1A1 $\sqrt{A1}\sqrt{1}$ in (ii).] [SR: If D or E omitted from the form of fractions, give B0M1A0A0A0 in (i); M1A1 $\sqrt{A1}\sqrt{1}$ in (ii).] [SR: If D or E omitted from the form of fractions, give B0M1A0A0A0 in (i); M1A1 $\sqrt{A1}\sqrt{1}$ in (ii).] [SR: if B or C omitted from the form of fractions, give B0M1A0A0A0 in (i); M1A1 $\sqrt{A1}\sqrt{1}$ in (ii).] [SR: if B or C omitted from the form of fractions, give B0M1A0A0A0 in (i); M1A1 $\sqrt{A1}\sqrt{1}$ in (ii).] [SR: if B or C omitted from the form of fractions, give B0M1A0A0A0 in (i); M1A1 $\sqrt{A1}\sqrt{1}$ in (ii).] [SR: if B or C omitted from the form of fractions,		Page 6				Paper	
Use any relevant method to determine a constant M1 Obtain one of the values $A = 1, B = 1, C = -2$ A1 Obtain a second value A1 Obtain the third value A1 [The form $\frac{A}{1-2x} + \frac{Dx + E}{(2+x)^2}$, where $A = 1, D = 1, E = 0$, is acceptable scoring B1M1A1A1A1 as above.] (ii) Use correct method to obtain the first two terms of the expansion of $(1-2x)^{-1}, (2+x)^{-1}$, $(2+x)^{-2}, (1+\frac{1}{2}x)^{-1}, \text{ or } (1+\frac{1}{2}x)^{-2}$ M1 Obtain correct unsimplified expansions up to the term in x^2 of each partial fraction $A1\sqrt{4} + A1\sqrt{4} + A1\sqrt{4}$ Obtain answer $1 + \frac{9}{9}x + \frac{15}{4}x^2$, or equivalent A1 [5] [Symbolic binomial coefficients, e.g. $\binom{-1}{1}$, are not sufficient for the M1. The f.t. is on A, B, C .] [For the A, D, E form of partial fractions, give M1A11 $\sqrt{A1\sqrt{4}}$ for the expansions then, if $D \neq 0$, M1 for multiplying out fully and A1 for the final answer.] [In the case of an attempt to expand $(4+5x-x^2)(1-2x)^{-1}(2+x)^{-2}$, give M1A1A1 $\sqrt{A1\sqrt{1}}$ in (ii).] [SR: If $B \circ C$ omitted from the form of fractions, give B0M1A0A0A0 in (i); M1A1 $\sqrt{A1\sqrt{1}}$ in (ii).] [SR: If $B \circ C$ omitted from the form of fractions, give B0M1A0A0A0 in (i); M1A1 $\sqrt{A1\sqrt{1}}$ in (ii).] [SR: If $D \circ C$ and the process for the moduli, divide the scalar product of A and anomal for p M1 Obtain position vector 4i + 3j, or equivalent A1 (ii) State or imply a correct vector normal to the plane, e.g. $3i - j + 2k$ B1 Using the correct process, evaluate the scalar product of $x + 2p - 4 + 2\lambda$.) B1 (iii) EITTHER: State $A + 2b + 2c = 0$ or $3a - b + 2c = 0$ (bit in answer 26.5° (or 0.402 radians) A1 (bit an answer 26.5° (or 0.402 radians) A1 (contain answer 26.5° (or 0.402 ra				GCE AS/A LEVEL – May/June 2010	9709	33	
Obtain one of the values $A = 1, B = 1, C = -2$ A1Obtain a second valueA1Obtain the third valueA1[1] The form $\frac{A}{1-2x} + \frac{Dx + E}{(2+x)^2}$, where $A = 1, D = 1, E = 0$, is acceptablescoring BIMIAIAIAI a solve.](ii) Use correct method to obtain the first two terms of the expansion of $(1-2x)^{-1}, (2+x)^{-1}$, $(2+x)^{-2}, (1+\frac{1}{2}x)^{-1}, or (1+\frac{1}{2}x)^{-2}M1Obtain correct unsimplified expansions up to the term in x^2 of each partial fraction A1\sqrt{+} A1\sqrt{+} A1\sqrt{-}Obtain correct unsimplified expansions up to the term in x^2 of each partial fraction A1\sqrt{+} A1\sqrt{+} A1\sqrt{-}Obtain answer 1 + \frac{9}{4}x + \frac{15}{4}x^2, or equivalent[1] For the A, D, E form of partial fractions, give M1A1\sqrt{A1\sqrt{-1}} for the expansions then, if D \neq 0, M1 for multiplying out fully and A1 for the final answer.][1] In the case of an attempt to expand (4+5x-x^2)(1-2x)^{-1}(2+x)^{-2}, give M1A1A1 for the expansions M1 for multiplying out fully, and A1 for the final answer.][38: If B or C omitted from the form of fractions, give B0M1A0A0A0 in (i); M1A1\sqrt{A1\sqrt{1}} in (ii).][58: If B or C omitted from the form of fractions, give B0M1A0A0A0 in (i); M1A1\sqrt{A1\sqrt{1}} in (ii).][58: If B or C omitted from the form of fractions, give B0M1A0A0A0 in (i); M1A1\sqrt{A1\sqrt{1}} in (ii).][58: If B or C omitted from the form of fractions, give B0M1A0A0A0 in (i); M1A1\sqrt{A1\sqrt{1}} in (ii).][58: If B or C omitted from the form of fractions, give B0M1A0A0A0 in (i); M1A1\sqrt{A1\sqrt{1}} in (ii).][58: If B or C omitted from the form of fractions, give B0M1A0A0A0 in (i); M1A1\sqrt{A1\sqrt{1}} in (ii).][58: If B or C omitted from the form of fractions, B^2 - \frac{1}{2} + \frac{2}{2} - \frac{2}{$	9	(i)	State or in	nply partial fractions of the form $\frac{A}{1-2x} + \frac{B}{2+x} + \frac{C}{(2+x)^2}$		B1	
Obtain a second valueA1Obtain the third valueA1[The form $\frac{A}{1-2x} + \frac{Dx + E}{(2+x)^2}$, where $A = 1, D = 1, E = 0$, is acceptablescoring B1M1A1A1A1 as above.](ii) Use correct method to obtain the first two terms of the expansion of $(1-2x)^{-1}, (2+x)^{-1}$, $(2+x)^{-2}, (1+\frac{1}{2}x)^{-1}$, or $(1+\frac{1}{2}x)^{-2}$ M1Obtain correct unsimplified expansions up to the term in x^2 of each partial fraction $A1\sqrt{4} + A1\sqrt{4} + A1\sqrt{4}$ Obtain answer $1 + \frac{9}{4}x + \frac{15}{4}x^2$, or equivalentA1[Symbolic binomial coefficients, e.g. $\binom{-1}{1}$, are not sufficient for the M1. The f.t. is on A, B, C .][For the A, D, E form of partial fractions, give $M1A1\sqrt{4}\sqrt{1}\sqrt{4}$ for the expansions then, if $D \neq 0$, M1 for multiplying out fully and A1 for the final answer.][In the case of an attempt to expand $(4 + 5x - x^2)(1 - 2x)^{-1}(2 + x)^{-2}$, give $M1A1A1$ for the expansions M1 for multiplying out fully, and A1 for the final answer.][SR: If B or C omitted from the form of fractions, give $B0M1A0A0A0$ in (i); $M1A1\sqrt{A1\sqrt{1}}$ in (ii).][SR: If D or E omitted from the form of fractions, give $B0M1A0A0A0$ in (i); $M1A1\sqrt{A1\sqrt{1}}$ in (ii).][SR: If D or C comitted from the form of fractions, give $B0M1A0A0A0$ in (i); $M1A1\sqrt{A1\sqrt{1}}$ in (ii).][SR: If D or E omitted from the form of f and any equivalent(ii) State or imply a correct vector normal to the plane, e.g. $3i - j + 2k$ B1Using the correct process, evaluate the scalar product of a direction vector for f and a normal for p M1Ubtain answer 26.5° (or 0.462 radians)A1(iii) EITHER: State $a + 2b + 2c = 0$ or $3a - b + 2c = 0$ </td <td></td> <td></td> <td>Use any re</td> <td>elevant method to determine a constant</td> <td></td> <td>M1</td> <td></td>			Use any re	elevant method to determine a constant		M1	
Obtain the third valueA1[1][The form $\frac{A}{1-2x} + \frac{Dx+E}{(2+x)^2}$, where $A = 1, D = 1, E = 0$, is acceptable[1]scoring B1M1A1A1A1 as above.](ii) Use correct method to obtain the first two terms of the expansion of $(1-2x)^{-1}, (2+x)^{-1}$, $(2+x)^{-2}, (1+\frac{1}{2}x)^{-1}$, or $(1+\frac{1}{2}x)^{-2}$ M1Obtain correct unsimplified expansions up to the term in x^2 of each partial fraction $A1\sqrt{1} + A1\sqrt{1} + A1\sqrt{1}$ Obtain answer $1+\frac{9}{4}x+\frac{15}{4}x^2$, or equivalentA1[Symbolic binomial coefficients, e.g. $\binom{-1}{1}$, are not sufficient for the M1. The f.t. is on A, B, C .][For the A, D, E form of partial fractions, give $M1A1\sqrt{A1\sqrt{1}}$ for the expansions then, if $D \neq 0$, M1 for multiplying out fully, and A1 for the final answer.][In the case of an attempt to expand $(4+5x-x^2)(1-2x)^{-1}(2+x)^{-2}$, give $M1A1A1$ for the expansions M1 for multiplying out fully, and A1 for the final answer.][SR: If B or C omitted from the form of fractions, give $B0M1A0A0A0$ in (i); $M1A1\sqrt{A1\sqrt{1}}$ in (ii).][SR: If B or C mitted from the form of fractions, give $B0M1A0A0A0$ in (i); $M1A1\sqrt{A1\sqrt{1}}$ in (ii).][SR: If B or C express general point of the line in component form, e.g. $(2 + \lambda, -1 + 2\lambda, -4 + 2\lambda)$ B1Substitute in plane equation and solve for λ M1Obtain position vector $41 + 3$, or equivalentM2(iii) State or imply a correct vector norma to the plane, e.g. $3i - j + 2k$ B1Using the correct process, evaluate the scalar product of a direction vector for A an aromali for P M1Using the correct process for the moduli, divide the scalar product by the product of the moduli and evaluate the inverse cosine or inverse sine of the							
[The form $\frac{A}{1-2x} + \frac{Dx + E}{(2+x)^2}$, where $A = 1, D = 1, E = 0$, is acceptable scoring B1M1A1A1A1 as above.] (ii) Use correct method to obtain the first two terms of the expansion of $(1-2x)^{-1}, (2+x)^{-1}, (2+x)^{-2}, (1+\frac{1}{2}x)^{-2}$ M1 Obtain correct unsimplified expansions up to the term in x^2 of each partial fraction $A1\sqrt{1} + A1\sqrt{1} + A1\sqrt{1}$ Obtain correct unsimplified expansions up to the term in x^2 of each partial fraction $A1\sqrt{1} + A1\sqrt{1} + A1\sqrt{1}$ Obtain answer $1 + \frac{9}{4}x + \frac{15}{4}x^2$, or equivalent A1 [Symbolic binomial coefficients, e.g. $(-\frac{1}{1})$, are not sufficient for the M1. The f.t. is on A, B, C .] [For the A, D, E form of partial fractions, give M1A1 $\sqrt{1}\sqrt{1}$ for the expansions then, if $D \neq 0$, M1 fd multiplying out fully and A1 for the final answer.] [In the case of an attempt to expand $(4+5x-x^2)(1-2x)^{-1}(2+x)^{-2}$, give M1A1A1 for the expansions M1 for multiplying out fully, and A1 for the final answer.] [SR: If <i>B</i> or <i>C</i> omitted from the form of fractions, give B0M1A0A0A0 in (i); M1A1 $\sqrt{1}\sqrt{1}$ in (ii).] [SR: If <i>D</i> or <i>E</i> omitted from the form of fractions, give B0M1A0A0A0 in (i); M1A1 $\sqrt{1}\sqrt{1}\sqrt{1}$ in (ii).] [SR: If <i>D</i> or <i>E</i> omitted from the form of fractions, give B0M1A0A0A0 in (i); M1A1 $\sqrt{1}\sqrt{1}\sqrt{1}$ in (ii).] [State or imply a correct vector normal to the plane, e.g. $3i - j + 2k$ B1 Using the correct process, evaluate the scalar product of a direction vector for <i>I</i> and a normal for <i>p</i> M1 Using the correct process (rule moduli, divide the scalar product of a direction vector for <i>I</i> and a normal for <i>p</i> M1 Using the correct process for the moduli, divide the scalar product of a direction vector of the moduli and evaluate the inverse cosine or inverse sine of the result M1 Obtain asswer 26.5° (or 0.462 radians) A1 [c (iii) <i>EITHER</i> : State $a + 2b + 2c = 0$ or $3a - b + 2c = 0$ Obtain two relevant equations and solve for one ratio, e.g. $a : b$ M1 Obtain asswer 26.5° (or 0.462 radians) A1 [c (<i>R</i> : Attempt to calculate vector produ							[6]
scoring BIMIAIAIAI as above.] (ii) Use correct method to obtain the first two terms of the expansion of $(1-2x)^{-1}$, $(2+x)^{-1}$, $(2+x)^{-2}$, $(1+\frac{1}{2}x)^{-1}$, or $(1+\frac{1}{2}x)^{-2}$ MI Obtain correct unsimplified expansions up to the term in x^2 of each partial fraction $AI\sqrt{+}AI\sqrt{+}AI\sqrt{+}AI\sqrt{-}$ Obtain answer $1+\frac{9}{4}x+\frac{15}{4}x^2$, or equivalent AI [2] [Symbolic binomial coefficients, e.g. $\binom{-1}{1}$, are not sufficient for the MI. The f.t. is on <i>A</i> , <i>B</i> , <i>C</i> .] [For the <i>A</i> , <i>D</i> , <i>E</i> form of partial fractions, give M1AI $\sqrt{A}I\sqrt{-}$ for the expansions then, if $D \neq 0$, MI for multiplying out fully and AI for the final answer.] [In the case of an attempt to expand $(4+5x-x^2)(1-2x)^{-1}(2+x)^{-2}$, give M1A1A1 for the expansions MI for multiplying out fully, and AI for the final answer.] [SR: If <i>B</i> or <i>C</i> omitted from the form of fractions, give B0M1A0A0A0 in (i); M1A1 $\sqrt{A}I\sqrt{I}$ in (ii).] [SR: If <i>D</i> or <i>E</i> omitted from the form of fractions, give B0M1A0A0A0 in (i); M1A1 $\sqrt{A}I\sqrt{I}$ in (ii).] [SR: If <i>D</i> or <i>E</i> omitted from the form of fractions, give B0M1A0A0A0 in (i); M1A1 $\sqrt{A}I\sqrt{I}$ in (ii).] [SR: If <i>D</i> or <i>E</i> omitted from the form of fractions, give B0M1A0A0A0 in (i); M1A1 $\sqrt{A}I\sqrt{I}$ in (ii).] [Sk: If <i>D</i> or <i>E</i> omitted from the form of fractions, give B0M1A0A0A0 in (i); M1A1 $\sqrt{A}I\sqrt{I}$ in (ii).] [Sk: if <i>D</i> or <i>E</i> omitted from the form of fractions, give B0M1A0A0A0 in (i); M1A1 $\sqrt{A}I\sqrt{I}$ in (ii).] [Sk: if <i>D</i> or <i>E</i> omitted from the form of fractions, give B0M1A0A0A0 in (i); M1A1 $\sqrt{A}I\sqrt{I}$ in (ii).] [Sk: if <i>D</i> or <i>E</i> omitted from the form of fractions, give B0M1A0A0A0 in (ii); M1A1 $\sqrt{A}I\sqrt{I}$ in (iii).] [Sk: if <i>D</i> or <i>E</i> omitted from the scalar product of a direction vector for <i>I</i> and a normal for <i>p</i> MI Using the correct process for the moduli, divide the scalar product by the product of the moduli and evaluate the inverse cosine or inverse sine of the result MI Obtain answer 26.5° (or 0.462 radians) A1 [2] (iii) <i>EITHER</i> : State $a + 2b + 2c = 0$ or $3a - b + 2c = $			Obtain the	A Dr + E		AI	[5]
(ii) Use correct method to obtain the first two terms of the expansion of $(1-2x)^{-1}$, $(2+x)^{-1}$, $(2+x)^{-1}$, $(2+x)^{-1}$, $(2+x)^{-1}$, $(2+x)^{-2}$, $(1+\frac{1}{2}x)^{-1}$, or $(1+\frac{1}{2}x)^{-2}$ M1 Obtain correct unsimplified expansions up to the term in x^2 of each partial fraction $A \ \sqrt{+}A\ \sqrt{+}A\ \sqrt{-}A\ \sqrt$			[The form	$\frac{A}{1-2x} + \frac{Dx+D}{(2+x)^2}$, where $A = 1, D = 1, E = 0$, is acceptable	;		
$\begin{array}{cccccccccccccccccccccccccccccccccccc$			scoring B	1M1A1A1A1 as above.]			
Obtain correct unsimplified expansions up to the term in x^2 of each partial fraction $A1\sqrt{+}A1\sqrt{+}A1\sqrt{-}$ Obtain answer $1 + \frac{9}{4}x + \frac{15}{4}x^2$, or equivalent [Symbolic binomial coefficients, e.g. $\binom{-1}{1}$, are not sufficient for the M1. The f.t. is on <i>A</i> , <i>B</i> , <i>C</i> .] [For the <i>A</i> , <i>D</i> , <i>E</i> form of partial fractions, give M1A1 $\sqrt{A1\sqrt{-}}$ for the expansions then, if $D \neq 0$, M1 for multiplying out fully and A1 for the final answer.] [In the case of an attempt to expand($4 + 5x - x^2$)($1 - 2x$) ⁻¹ ($2 + x$) ⁻² , give M1A1A1 for the expansions M1 for multiplying out fully, and A1 for the final answer.] [SR: If <i>B</i> or <i>C</i> omitted from the form of fractions, give B0M1A0A0A0 in (i); M1A1 $\sqrt{A1\sqrt{-}}$ in (ii).] [SR: If <i>D</i> or <i>E</i> omitted from the form of fractions, give B0M1A0A0A0 in (i); M1A1 $\sqrt{A1\sqrt{-}}$ in (ii).] [SR: If <i>D</i> or <i>E</i> omitted from the form of fractions, give B0M1A0A0A0 in (i); M1A1 $\sqrt{A1\sqrt{-}}$ in (ii).] [SR: If <i>D</i> or <i>E</i> omitted from the form of fractions, give B0M1A0A0A0 in (i); M1A1 $\sqrt{A1\sqrt{-}}$ in (ii).] [SR: If <i>D</i> or <i>E</i> omitted from the form of fractions, give B0M1A0A0A0 in (i); M1A1 $\sqrt{A1\sqrt{-}}$ in (ii).] [SR: If <i>D</i> or <i>E</i> omitted from the brow of x^2 models and solve for λ m1 Obtain position vector 4i + 3j, or equivalent (ii) State or imply a correct vector normal to the plane, e.g. $3i - j + 2k$ B1 Using the correct process, evaluate the scalar product of a direction vector for / and a normal for <i>p</i> M1 Using the correct process for the moduli, divide the scalar product by the product of the moduli and evaluate the inverse cosine or inverse sine of the result (btain answer 26.5° (or 0.462 radians) (ii) <i>EITHER</i> : State $a + 2b + 2c = 0$ or $3a - b + 2c = 0$ (btain two relevant equations and solve for one ratio, e.g. $a : b$ M1 Obtain $a : b : c = 6: 4: -7, or equivalent Obtain answer 6x + 4y - 7z = 36, or equivalentOR1: Attempt to calculate vector product of relevant vectors,e.g. (i + 2j + 2k) × (3i - j + 2k)Obtain in correct product, e.g. 6i + 4j $		(ii)			$(1-2x)^{-1}, (2+x)^{-1}$		
Obtain answer $1 + \frac{9}{4}x + \frac{15}{4}x^2$, or equivalentA1[5][Symbolic binomial coefficients, e.g. $\binom{-1}{1}$, are not sufficient for the M1. The f.t. is on A, B, C.][For the A, D, E form of partial fractions, give M1A1 $\sqrt{1}\sqrt{1}$ for the expansions then, if $D \neq 0$, M1 for multiplying out fully and A1 for the final answer.][In the case of an attempt to expand $(4 + 5x - x^2)(1 - 2x)^{-1}(2 + x)^{-2}$, give M1A1A1 for the expansions M1 for multiplying out fully, and A1 for the final answer.][SR: If B or C omitted from the form of fractions, give B0M1A0A0A0 in (i); M1A1 $\sqrt{1}\sqrt{1}$ in (ii).][SR: If B or C omitted from the form of fractions, give B0M1A0A0A0 in (i); M1A1 $\sqrt{1}\sqrt{1}$ in (ii).][SR: If D or E omitted from the form of fractions, give B0M1A0A0A0 in (i); M1A1 $\sqrt{1}\sqrt{1}$ in (ii).]10 (i) Express general point of the line in component form, e.g. $(2 + \lambda, -1 + 2\lambda, -4 + 2\lambda)$ B1Substitute in plane equation and solve for λ M1Obtain position vector 4i + 3j, or equivalentA1(ii) State or imply a correct vector normal to the plane, e.g. $3i - j + 2k$ B1Using the correct process, evaluate the scalar product of a direction vector for l and a normal for p M1Using the correct process, evaluate the scalar product by the product of the moduli and evaluate the inverse cosine or inverse sine of the result(iii) EITHER: State $a + 2b + 2c = 0$ or $3a - b + 2c = 0$ Obtain answer 26.5° (or 0.462 radians)(A1(Ciii) EITHER: State $a + 2b + 2c = 0$ or $3a - b + 2c = 0$ Obtain as wer $6x + 4y - 7z = 36$, or equivalentObtain as wer $6x + 4y - 7z = 36$, or equivalentObtain as wer $6x + 4y - 7z = 36$, or equivalentObtain two correct componen					,		
 [Symbolic binomial coefficients, e.g. (⁻¹/₁), are not sufficient for the M1. The f.t. is on <i>A</i>, <i>B</i>, <i>C</i>.] [For the <i>A</i>, <i>D</i>, <i>E</i> form of partial fractions, give M1A1√A1√ for the expansions then, if <i>D</i> ≠ 0, M1 for multiplying out fully and A1 for the final answer.] [In the case of an attempt to expand (4 + 5x - x²)(1 - 2x)⁻¹(2 + x)⁻², give M1A1A1 for the expansions M1 for multiplying out fully, and A1 for the final answer.] [SR: If <i>B</i> or <i>C</i> omitted from the form of fractions, give B0M1A0A0A0 in (i); M1A1√A1√ in (ii).] [SR: If <i>D</i> or <i>E</i> omitted from the form of fractions, give B0M1A0A0A0 in (i); M1A1√A1√ in (ii).] [SR: If <i>D</i> or <i>E</i> omitted from the form of fractions, give B0M1A0A0A0 in (i); M1A1√A1√ in (ii).] [SR: If <i>D</i> or <i>E</i> omitted from the form of fractions, give B0M1A0A0A0 in (i); M1A1√A1√ in (ii).] [SR: If <i>D</i> or <i>E</i> omitted from the form of fractions, give B0M1A0A0A0 in (i); M1A1√A1√ in (ii).] [SR: If <i>D</i> or <i>E</i> omitted from the form of fractions, give B0M1A0A0A0 in (i); M1A1√A1√ in (ii).] [SR: If <i>D</i> or <i>E</i> omitted from the form of fractions, give B0M1A0A0A0 in (i); M1A1√A1√ in (ii).] [SR: If <i>D</i> or <i>E</i> omitted from the form of fractions, e.g. (2 + λ, -1 + 2λ, -4 + 2λ) B1 Substitute in plane equation and solve for λ M1 Obtain position vector 4i + 3j, or equivalent A1 [2] (ii) State or imply a correct vector normal to the plane, e.g. 3i - j + 2k B1 Using the correct process, evaluate the scalar product of a direction vector for <i>I</i> and a normal for <i>p</i> M1 Using the correct process for the moduli, divide the scalar product by the product of the moduli and evaluate the inverse cosine or inverse sine of the result M1 Obtain answer 26.5° (or 0.462 radians) A1 [2] (iii) <i>EITHER</i>: State <i>a</i> + 2<i>b</i> + 2<i>c</i> = 0 or 3<i>a</i> - <i>b</i> + 2<i>c</i> = 0 Obtain answer 6<i>x</i> + 4<i>y</i> - 7<i>z</i> = 36,					al fraction $A1\sqrt{+}A$	$1\sqrt{+} A1\sqrt{-}$	
[For the <i>A</i> , <i>D</i> , <i>E</i> form of partial fractions, give M1A1 $\sqrt{A1}\sqrt{f}$ for the expansions then, if $D \neq 0$, M1 for multiplying out fully and A1 for the final answer.] [In the case of an attempt to expand $(4+5x-x^2)(1-2x)^{-1}(2+x)^{-2}$, give M1A1A1 for the expansions M1 for multiplying out fully, and A1 for the final answer.] [SR: If <i>B</i> or <i>C</i> omitted from the form of fractions, give BOM1A0A0A0 in (i); M1A1 $\sqrt{A1}\sqrt{1}$ in (ii).] [SR: If <i>D</i> or <i>E</i> omitted from the form of fractions, give BOM1A0A0A0 in (i); M1A1 $\sqrt{A1}\sqrt{1}$ in (ii).] [SR: If <i>D</i> or <i>E</i> omitted from the form of fractions, give BOM1A0A0A0 in (i); M1A1 $\sqrt{A1}\sqrt{1}$ in (ii).] [SR: If <i>D</i> or <i>E</i> omitted from the form of fractions, give BOM1A0A0A0 in (i); M1A1 $\sqrt{A1}\sqrt{1}$ in (ii).] [In the case of a equation and solve for λ Obtain position vector 4i + 3j, or equivalent (ii) State or imply a correct vector normal to the plane, e.g. $3i - j + 2k$ Using the correct process, evaluate the scalar product of a direction vector for <i>l</i> and a normal for <i>p</i> M1 Using the correct process for the moduli, divide the scalar product by the product of the moduli and evaluate the inverse cosine or inverse sine of the result (iii) <i>EITHER</i> : State $a + 2b + 2c = 0$ or $3a - b + 2c = 0$ Dotain two relevant equations and solve for one ratio, e.g. $a : b$ M1 Obtain $a : b : c = 6 : 4 : -7$, or equivalent <i>Obtain answer</i> $6x + 4y - 7z = 36$, or equivalent <i>Obtain answer</i> $6x + 4y - 7z = 36$, or equivalent <i>Obtain two cretect</i> product of the product of the moduli Obtain answer $6x + 4y - 7z = 36$, or equivalent <i>Obtain two cretect</i> product $A1$ <i>Obtain two cretect</i> product $A1 = 7k$ <i>Substitute coordinates of a relevant point in $6x + 4y - 7z = d$ and evaluate d <i>Obtain two </i></i>			Obtain and	swer $1 + \frac{9}{4}x + \frac{15}{4}x^2$, or equivalent		A1	[5]
multiplying out fully and A1 for the final answer.] [In the case of an attempt to expand $(4+5x-x^2)(1-2x)^{-1}(2+x)^{-2}$, give M1A1A1 for the expansions M1 for multiplying out fully, and A1 for the final answer.] [SR: If <i>B</i> or <i>C</i> omitted from the form of fractions, give BOM1A0A0A0 in (i); M1A1 $\sqrt{A1}\sqrt{1}$ in (ii).] [SR: If <i>D</i> or <i>E</i> omitted from the form of fractions, give BOM1A0A0A0 in (i); M1A1 $\sqrt{A1}\sqrt{1}$ in (ii).] [SR: If <i>D</i> or <i>E</i> omitted from the form of fractions, give BOM1A0A0A0 in (i); M1A1 $\sqrt{A1}\sqrt{1}$ in (ii).] [SR: If <i>D</i> or <i>E</i> omitted from the form of fractions, give BOM1A0A0A0 in (i); M1A1 $\sqrt{A1}\sqrt{1}$ in (ii).] [SR: If <i>D</i> or <i>E</i> omitted from the form of fractions, give BOM1A0A0A0 in (i); M1A1 $\sqrt{A1}\sqrt{1}$ in (ii).] [SR: If <i>D</i> or <i>E</i> omitted from the form of fractions, give BOM1A0A0A0 in (i); M1A1 $\sqrt{A1}\sqrt{1}$ in (ii).] [SR: If <i>D</i> or <i>E</i> omitted from the form of fractions, give BOM1A0A0A0 in (i); M1A1 $\sqrt{A1}\sqrt{1}$ in (ii).] [SR: If <i>D</i> or <i>E</i> omitted from the form of fractions, give BOM1A0A0A0 in (i); M1A1 $\sqrt{A1}\sqrt{1}$ in (ii).] [SR: If <i>D</i> or <i>E</i> omitted from the form of fractions, give BOM1A0A0A0 in (i); M1A1 $\sqrt{A1}\sqrt{1}$ in (ii).] [SR: If <i>D</i> or <i>E</i> omitted from the form of fractions, give BOM1A0A0A0 in (i); M1A1 $\sqrt{A1}\sqrt{1}$ in (ii).] [SR: If <i>D</i> or <i>E</i> omitted from the form of fractions, give BOM1A0A0A0 in (i); M1A1 $\sqrt{A1}\sqrt{1}\sqrt{1}$ in (ii).] [SR: If <i>D</i> or <i>E</i> omitted from the form of fractions, give BOM1A0A0A0 in (i); M1A1 $\sqrt{A1}\sqrt{1}\sqrt{1}\sqrt{1}\sqrt{1}\sqrt{1}\sqrt{1}\sqrt{1}\sqrt{1}\sqrt{1}$			[Symbolic	binomial coefficients, e.g. $\binom{-1}{1}$, are not sufficient for the l	M1. The f.t. is on A	1, B, C.]	
[In the case of an attempt to expand $(4+5x-x^2)(1-2x)^{-1}(2+x)^{-2}$, give M1A1A1 for the expansions M1 for multiplying out fully, and A1 for the final answer.] [SR: If <i>B</i> or <i>C</i> omitted from the form of fractions, give B0M1A0A0A0 in (i); M1A1 $\sqrt{A1}\sqrt{1}$ in (ii).] [SR: If <i>D</i> or <i>E</i> omitted from the form of fractions, give B0M1A0A0A0 in (i); M1A1 $\sqrt{A1}\sqrt{1}$ in (ii).] [SR: If <i>D</i> or <i>E</i> omitted from the form of fractions, give B0M1A0A0A0 in (i); M1A1 $\sqrt{A1}\sqrt{1}$ in (ii).] [SR: If <i>D</i> or <i>E</i> omitted from the form of fractions, give B0M1A0A0A0 in (i); M1A1 $\sqrt{A1}\sqrt{1}\sqrt{1}$ in (ii).] [SR: If <i>D</i> or <i>E</i> omitted from the form of fractions, give B0M1A0A0A0 in (i); M1A1 $\sqrt{A1}\sqrt{1}\sqrt{1}$ in (ii).] [SR: If <i>D</i> or <i>E</i> omitted from the form of fractions, give B0M1A0A0A0 in (i); M1A1 $\sqrt{A1}\sqrt{1}\sqrt{1}\sqrt{1}\sqrt{1}\sqrt{1}\sqrt{1}\sqrt{1}\sqrt{1}\sqrt{1}$					expansions then, if	$D \neq 0, M$	1 for
M1 for multiplying out fully, and A1 for the final answer.] [SR: If <i>B</i> or <i>C</i> omitted from the form of fractions, give B0M1A0A0A0 in (i); M1A1 $\sqrt{A1}\sqrt{in}$ (ii).] [SR: If <i>D</i> or <i>E</i> omitted from the form of fractions, give B0M1A0A0A0 in (i); M1A1 $\sqrt{A1}\sqrt{in}$ (ii).] [SR: If <i>D</i> or <i>E</i> omitted from the form of fractions, give B0M1A0A0A0 in (i); M1A1 $\sqrt{A1}\sqrt{in}$ (ii).] [SR: If <i>D</i> or <i>E</i> omitted from the form of fractions, give B0M1A0A0A0 in (i); M1A1 $\sqrt{A1}\sqrt{in}$ (ii).] [SR: If <i>D</i> or <i>E</i> omitted from the form of fractions, give B0M1A0A0A0 in (i); M1A1 $\sqrt{A1}\sqrt{in}$ (ii).] [SR: If <i>D</i> or <i>E</i> omitted from the form of fractions, give B0M1A0A0A0 in (i); M1A1 $\sqrt{A1}\sqrt{in}$ (ii).] [SR: If <i>D</i> or <i>E</i> omitted from the form of fractions, give B0M1A0A0A0 in (i); M1A1 $\sqrt{A1}\sqrt{in}$ (ii).] [SR: If <i>D</i> or <i>E</i> omitted from the form of fractions, give B0M1A0A0A0 in (i); M1A1 $\sqrt{A1}\sqrt{in}$ (ii).] [SR: If <i>D</i> or <i>E</i> omitted from the form of fractions, give B0M1A0A0A0 in (i); M1A1 $\sqrt{A1}\sqrt{in}$ (ii).] [SR: If <i>D</i> or <i>E</i> omitted from the form of fractions, give B0M1A0A0A0 in (i); M1A1 $\sqrt{A1}\sqrt{in}$ (ii).] [SR: If <i>D</i> or <i>E</i> omitted from the form of fractions, give B0M1A0A0A0 in (i); M1A1 $\sqrt{A1}\sqrt{in}$ (ii).] [SR: If <i>D</i> or <i>E</i> omitted from the form of fractions, give B0M1A0A0A0 in (i); M1A1 $\sqrt{A1}\sqrt{in}$ (ii).] [SR: If <i>D</i> or <i>E</i> omitted from the form of fractions, give B0M1A0A0A0 in (i); M1A1 $\sqrt{A1}\sqrt{in}$ (ii).] [SR: If <i>D</i> or <i>E</i> omitted from the form 0.] [State a correct vector root on the plane, e.g. $(2 + \lambda, -1 + 2\lambda, -4 + 2\lambda)$ B1 [State a correct equation, e.g. $r = 2i - j - 4k + \lambda(i + 2j + 2k) + \mu(3i - j + 2k)$ A1					give M1A1A1 for t	he expansi	ons,
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(ii) State or imply a correct vector normal to the plane, e.g. $3\mathbf{i} - \mathbf{j} + 2\mathbf{k}$ B1 Using the correct process, evaluate the scalar product of a direction vector for <i>l</i> and a normal for <i>p</i> M1 Using the correct process for the moduli, divide the scalar product by the product of the moduli and evaluate the inverse cosine or inverse sine of the result M1 Obtain answer 26.5° (or 0.462 radians) A1 [4] (iii) <i>EITHER</i> : State $a + 2b + 2c = 0$ or $3a - b + 2c = 0$ B1 Obtain two relevant equations and solve for one ratio, e.g. $a : b$ M1 Obtain $a : b : c = 6 : 4 : -7$, or equivalent A1 Substitute coordinates of a relevant point in $6x + 4y - 7z = d$ and evaluate d M1 Obtain answer $6x + 4y - 7z = 36$, or equivalent A1 Obtain two correct components of the product of relevant vectors, e.g. $(\mathbf{i} + 2\mathbf{j} + 2\mathbf{k}) \times (3\mathbf{i} - \mathbf{j} + 2\mathbf{k})$ M1 Obtain two correct components of the product A1 Obtain answer $6x + 4y - 7z = 36$, or equivalent A1 Obtain $6x + 4y - 1z = 4x + 2x + 2x + 2x + 2x + 2x + $		(-)					
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e.g. $(\mathbf{i} + 2\mathbf{j} + 2\mathbf{k}) \times (3\mathbf{i} - \mathbf{j} + 2\mathbf{k})$ Obtain two correct components of the product Obtain correct product, e.g. $6\mathbf{i} + 4\mathbf{j} - 7\mathbf{k}$ Substitute coordinates of a relevant point in $6x + 4y - 7z = d$ and evaluate d Obtain answer $6x + 4y - 7z = 36$, or equivalent OR2: Attempt to form 2-parameter equation with relevant vectors State a correct equation, e.g. $\mathbf{r} = 2\mathbf{i} - \mathbf{j} - 4\mathbf{k} + \lambda(\mathbf{i} + 2\mathbf{j} + 2\mathbf{k}) + \mu(3\mathbf{i} - \mathbf{j} + 2\mathbf{k})$ A1			OP1	· · ·		AI	
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<i>OR</i> 2: Attempt to form 2-parameter equation with relevant vectors M1 State a correct equation, e.g. $\mathbf{r} = 2\mathbf{i} - \mathbf{j} - 4\mathbf{k} + \lambda(\mathbf{i} + 2\mathbf{j} + 2\mathbf{k}) + \mu(3\mathbf{i} - \mathbf{j} + 2\mathbf{k})$ A1					d and evaluate d		
State a correct equation, e.g. $\mathbf{r} = 2\mathbf{i} - \mathbf{j} - 4\mathbf{k} + \lambda(\mathbf{i} + 2\mathbf{j} + 2\mathbf{k}) + \mu(3\mathbf{i} - \mathbf{j} + 2\mathbf{k})$ A1			0.02				
			OR2:				
State tillet equations in x, y, z, λ, μ AI					$\mathbf{k} + \boldsymbol{\mu}(3\mathbf{I} - \mathbf{J} + 2\mathbf{k})$		
Eliminate λ and μ M1							
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