A-level
MATHEMATICS
MFP4

UNIT FURTHER PURE 4

Mark scheme

June 2017

Version: 1.0 Final

Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all associates participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every associate understands and applies it in the same correct way. As preparation for standardisation each associate analyses a number of students' scripts. Alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Assessment Writer.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Key to mark scheme abbreviations

M	mark is for method
m or dM	mark is dependent on one or more M marks and is for method
A	mark is dependent on M or m marks and is for accuracy
B	mark is independent of M or m marks and is for method and accuracy
E	mark is for explanation
$\surd$ or ft or F	follow through from previous incorrect result
CAO	correct answer only
CSO	correct solution only
AWFW	anything which falls within
AWRT	anything which rounds to
ACF	any correct form
AG	answer given
SC	special case
OE	or equivalent
A2,1	2 or 1 (or 0) accuracy marks
–x EE	deduct *x* marks for each error
NMS	no method shown
PI	possibly implied
SCA	substantially correct approach
c	candidate
sf	significant figure(s)
dp	decimal place(s)

No Method Shown
Where the question specifically requires a particular method to be used, we must usually see evidence of use of this method for any marks to be awarded.

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

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

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

Q1	Solution	Mark	Total	Comment
(a)	$\mathbf{BA}=\begin{bmatrix}0 & p^2 & -4p\\ 4 & -2p-2 & 10\\ 2 & -3p-1 & 13\end{bmatrix}$	M1 A1 A1	 3	**BA** a 3x3 matrix with **3** elements correct and simplified. At least **6** elements correct and simplified. All correct and simplified.
(b)	$-4\begin{vmatrix}p^2 & -4p\\ -3p-1 & 13\end{vmatrix}+2\begin{vmatrix}p^2 & -4p\\ -2p-2 & 10\end{vmatrix}$	M1		**Correct** expansion of **their** determinant in (a) by row or column (must be 3x3)
	$=-4(13p^2-12p^2-4p)+2(10p^2-8p^2-8p)$	A1		2x2 determinants correctly expanded – **CAO**
	$=-4p^2+16p+4p^2-16p=0$ (so **BA** is always) singular for all p.	A1	3	Fully correct cancelling **and** final comment made. Must reference singular and p.
	Total		6	

Q2	Solution	Mark	Total	Comment
(a)	$\begin{vmatrix}5 & 2 & 11\\ 2 & -1 & 5\\ -3 & 3 & a\end{vmatrix}$			
	$=-3\begin{vmatrix}2 & 11\\ -1 & 5\end{vmatrix}-3\begin{vmatrix}5 & 11\\ 2 & 5\end{vmatrix}+a\begin{vmatrix}5 & 2\\ 2 & -1\end{vmatrix}$	M1		**Correct** expansion by row or column
	$=-9a-72$	A1		Correctly simplified
	$a=-8$	A1	3	**CAO**
(b)	$5x+2y+11z=45$ $2x-y+5z=15$ $-3x+3y+az=b$			
	equation 1 + 2xequation 2 gives $9x + 21z = 75$ 3xequation 2 + equation 3 gives $9x + 21z = 3b + 135$	M1 A1		Elimination of same variable in two equations, using their value of "a". Fully correct, same coefficients on the two variables.
	Hence intersect in a line/sheaf $3b+135=75$ $b=-20$	A1		Configuration correct **and** correct value of b stated.
	Form a prism $3b+135\neq 75$ $b\neq -20$	A1	4	Configuration correct **and** correct value of b stated.

	ALTERNATIVE – 1 Putting a value of x, y or z into **their** equations and attempt to solve.	**(M1)**		Must have correct value of “a” for any of the A marks.
	Correct values of other two variables.	**(A1)**		Eg $x=0, y=20/7, z=25/7$ $x=20, y=0, z=-5$ $x=25/3, y=5/3, z=0$
	Line/sheaf $b=-20$	**(A1)**		
	Prism $b \neq -20$	**(A1)**	**(4)**	
	ALTERNATVE – 2 $\begin{bmatrix} 5 & 2 & 11 & 45 \\ 2 & -1 & 5 & 15 \\ -3 & 3 & -8 & b \end{bmatrix}$			
	$\begin{bmatrix} 5 & 2 & 11 & 45 \\ 0 & -9 & 3 & -15 \\ 0 & 21 & -7 & 5b+135 \end{bmatrix}$	**(M1)** **(A1)**		Elimination of one variable in order to consider constant term, using their value of “a”. Fully correct, same coefficients on the two variables **or** line of three zeros. Leading to $\begin{bmatrix} 5 & 2 & 11 & 45 \\ 0 & -9 & 3 & -15 \\ 0 & 0 & 0 & 15b+300 \end{bmatrix}$
	or $\begin{bmatrix} 5 & 2 & 11 & 45 \\ 9 & 0 & 21 & 75 \\ -21 & 0 & -49 & 2b-135 \end{bmatrix}$			Leading to $\begin{bmatrix} 5 & 2 & 11 & 45 \\ 9 & 0 & 21 & 75 \\ 0 & 0 & 0 & 6b+120 \end{bmatrix}$
	or $\begin{bmatrix} 5 & 2 & 11 & 45 \\ -3 & -21 & 0 & -60 \\ 7 & 49 & 0 & 11b+360 \end{bmatrix}$			Leading to $\begin{bmatrix} 5 & 2 & 11 & 45 \\ -3 & -21 & 0 & -60 \\ 0 & 0 & 0 & 33b+660 \end{bmatrix}$
	Intersect in a line/sheaf $15b+300=0$ $b=-20$	**(A1)**		Configuration correct **and** correct value of b stated.
	Form a prism $15b+300 \neq 0$ $b \neq -20$	**(A1)**	**(4)**	Configuration correct **and** correct value of b stated**.**
	Total		**7**	

Q3	Solution	Mark	Total	Comment
(a)	$\mathbf{a}\times\mathbf{b}=\begin{bmatrix}2\\-p\\-1\end{bmatrix}\times\begin{bmatrix}0\\2p+1\\-1\end{bmatrix}=\begin{bmatrix}3p+1\\2\\4p+2\end{bmatrix}$	M1		Vector product attempted **– all** components correct (could be unsimplified).
	$(\mathbf{a}\times\mathbf{b}).\mathbf{c}=\begin{bmatrix}3p+1\\2\\4p+2\end{bmatrix}\cdot\begin{bmatrix}p-1\\4\\3\end{bmatrix}$			
	$=(3p+1)(p-1)+8+3(4p+2)$	A1		Correct scalar product expansion.
	$=3p^2+10p+13$	A1	3	**CAO**
	ALTERNATIVE			
	$\begin{vmatrix}2 & 0 & p-1\\-p & 2p+1 & 4\\-1 & -1 & 3\end{vmatrix}$			
	$=2\begin{vmatrix}2p+1 & 4\\-1 & 3\end{vmatrix}+(p-1)\begin{vmatrix}-p & 2p+1\\-1 & -1\end{vmatrix}$	(M1)		Correct expansion of determinant by row or column.
	$=2(6p+3+4)+(p-1)(p+2p+1)$	(A1)		Correct expansion of 2x2 determinants.
	$=3p^2+10p+13$	(A1)	(3)	**CAO**
(b)	Either $3p^2+10p+13=13$ $p(3p+10)=0$ $p=0$ or $-\dfrac{10}{3}$	M1 A1		Solving **their** quadratic to find **two** solutions. Both required .
	Or			
	$3p^2+10p+13=-13$ Gives $3p^2+10p+26=0$	M1		Considering negative value of given volume.
	No further (real) solutions as $b^2-4ac=-212<0$	A1	4	Correctly **justified** conclusion using b^2-4ac **or** finding correct complex roots of $-\dfrac{5}{3}\pm\dfrac{\sqrt{53}}{3}i$
	Total		7	

Q4	Solution	Mark	Total	Comment
(a)	$3a + 8 = -10$	**M1** **A1**		Set up equation one error only. Set up equation correct.
	$a = -6$	**A1**	**3**	Correct single value stated.
(b)	Using $y = mx + c$ gives $x' = 3x - 2(mx + c)$ $y' = 4x - 6(mx + c)$	**B1F**		Correct substitution of **their** $y = mx + c$ (Need to see x', y' **or** substituted correctly to get *).
	Then using $y' = mx' + c$ gives $4x - 6y = m[3x - 2y] + c$	**M1**		Substitution of **their** $y' = mx' + c$
	$4x - 6(mx + c) = m[3x - 2(mx + c)] + c$ $(2m^2 - 9m + 4)x + c(2m - 7) = 0$ $(2m - 1)(m - 4)x + c(2m - 7) = 0$	* **A1**		Fully correct simplification – collecting x and non x terms appropriately.
	Hence $m = \frac{1}{2}$ $m = 4$	**A1**		Factorising and solving to find **two** values for m.(Not 3 values)
	When $m = \frac{1}{2}$ $c - 7c = 0$ $c = 0$ When $m = 4$ $8c - 7c = 0$ $c = 0$	**dM1**		Clear and justified working to determine c in each case.
	Hence only invariant lines are $y = \frac{1}{2}x$ $y = 4x$	**A1**	**6**	**CSO** – both equations correctly stated (must have **dM1**).

	ALTERNATIVE			
	$0=\begin{vmatrix}3-\lambda & -2\\ 4 & -6-\lambda\end{vmatrix}$ $=\lambda^2+3\lambda-10$	**(B1F)**		
	$=(\lambda-2)(\lambda+5)$ $\lambda=2$ or $\lambda=-5$	**(M1)**		For solving **their** equation correctly.
	$\underline{\lambda=2}$ $\begin{pmatrix}0\\0\end{pmatrix}=\begin{pmatrix}1 & -2\\ 4 & -8\end{pmatrix}\begin{pmatrix}x\\y\end{pmatrix} \quad \to \quad y=\frac{1}{2}x$	**(A1)**		OE
	$\underline{\lambda=-5}$ $\begin{pmatrix}0\\0\end{pmatrix}=\begin{pmatrix}8 & -2\\ 4 & -1\end{pmatrix}\begin{pmatrix}x\\y\end{pmatrix} \quad \to \quad y=4x$	**(A1)**		OE
	As $\lambda\neq1$ no LoIP's	**(E1)**		
	$\therefore$ no Inv. Lines not through origin.	**(E1)**	**(6)**	
	Total		**9**	

Q5	Solution	Mark	Total	Comment
(a)(i)	$\lambda = -3$ gives $2(-3)^3 + (-3)^2 + k(-3) + 6 = 0$ $k = -13$	**M1** **A1**	 **2**	Correct substitution of $\lambda = -3$ **CAO**
	(ALTERNATIVE) Factorising gives $(\lambda+3)(2\lambda^2 - 5\lambda + 2) = 0$ Comparing coefficients gives $k = -15 + 2$ $k = -13$	 **(M1)** **(A1)**	 **(2)**	 Correct factorisation **and** comparison of coefficients. **CAO**
(a)(ii)	$2\lambda^3 + \lambda^2 - 13\lambda + 6$ $= (\lambda+3)(2\lambda^2 - 5\lambda + 2)$ $= (\lambda+3)(\lambda-2)(2\lambda-1)$	**M1**		Attempt at factorisation, either of these two lines. {If used ALT in (a)(i) only need to see $(\lambda-2)(2\lambda-1)$ }
	Hence $\lambda = \dfrac{1}{2}$ $\lambda = 2$ $(\lambda = -3)$	**A1**	**2**	Both other eigenvalues found. **NMS** = 0 marks
(b)(i)	$(-3)^2\begin{bmatrix}-4\\3\\1\end{bmatrix} = 9\begin{bmatrix}-4\\3\\1\end{bmatrix} = \begin{bmatrix}-36\\27\\9\end{bmatrix}$	**B1**	**1**	Correct evaluation – with or without factor.
(ii)	$x = 4/3, y = -1, z = -1/3$	**B1**	**1**	Can have $\begin{bmatrix}x\\y\\z\end{bmatrix} = \begin{bmatrix}\frac{4}{3}\\-1\\-\frac{1}{3}\end{bmatrix}$
	Total		**6**	

Q6	Solution	Mark	Total	Comment
(a)	$\begin{vmatrix} a-1 & b+1 & x-1 \\ x^2-b^2 & x^2-a^2 & a^2-b^2 \\ 2 & -2 & 2 \end{vmatrix}$			
	c_1 replaced by $c_1 - c_3$ $\begin{vmatrix} a-x & b+1 & x-1 \\ x^2-a^2 & x^2-a^2 & a^2-b^2 \\ 0 & -2 & 2 \end{vmatrix}$	**M1**		Correct use of column operations to obtain first linear factor.
	$(x-a)\begin{vmatrix} -1 & b+1 & x-1 \\ x+a & x^2-a^2 & a^2-b^2 \\ 0 & -2 & 2 \end{vmatrix}$	**A1**		Correct extraction of linear factor. (Condone missing brackets, but penalise in final A1 CSO, even if recovered).
	c_2 replaced by $c_2 + c_3$ $(x-a)\begin{vmatrix} -1 & x+b & x-1 \\ x+a & x^2-b^2 & a^2-b^2 \\ 0 & 0 & 2 \end{vmatrix}$	**M1**		Correct use of column operations to obtain second linear factor.
	$(x-a)(x+b)\begin{vmatrix} -1 & 1 & x-1 \\ x+a & x-b & a^2-b^2 \\ 0 & 0 & 2 \end{vmatrix}$	**A1**		Correct extraction of second linear factor. (Condone missing brackets, but penalise in final A1 CSO, even if recovered).
		dM1		Correct expansion of **their** resulting determinant to find final factor.
	$\Delta(x) = 2(x-a)(x+b)(b-a-2x)$	**A1**	**6**	Fully correct – must extract the “2” for final **A1**. **CSO**
(b)	$2(x-a)(x+b)(b-a-2x) = 0$	**M1**		Sets **their** determinant equal to 0 **and** obtains one correct value of *x* (PI).
	$(x =)\ a\ ,\ -b\ ,\ \dfrac{b-a}{2}$	**A1**	**2**	All three values obtained **CSO –** must have scored **6 marks** in **(a)**. **SC –** if 5 in (a) due to “2” not extracted can get **M1A1.**
	Total		**8**	

Q7	Solution	Mark	Total	Comment
(a)	$\begin{vmatrix} 2 & 4 & 3 \\ 1 & 1 & 1 \\ 0 & 3 & k+1 \end{vmatrix} = -3\begin{vmatrix} 2 & 3 \\ 1 & 1 \end{vmatrix} + (k+1)\begin{vmatrix} 2 & 4 \\ 1 & 1 \end{vmatrix}$	M1		**Correct** expansion by row or column.
	$=1-2k$ $1-2k=0$ $k=\dfrac{1}{2}$	A1		**Correct** simplification **and** sets equal to zero – correct value found.
	$x'=2x+4y+3z$ $y'=x+y+z$ $z'=3y+1.5z$			
	$3x'-6y'-2z'=$ $3(2x+4y+3z)-6(x+y+z)-2(3y+1.5z)$ $=0$	dM1		Substitutes **their** expressions in given plane equation, must use **their** value for k.
	Therefore each point must lie on the plane $3x'-6y'-2z'=0$	A1	4	Fully shown **– AG**. **Must** see either first three lines **or** concluding statement when the top line is missing.
(b)(i)	$\begin{bmatrix} k-2 & -k-1 & 3 \\ 5-4k & 2k+2 & -6 \\ 1 & 1 & -2 \end{bmatrix}$	M1 A2		M1 one full row **or** column correct. A1 at least **6** entries correct. A2 **all** entries correct.
	$\mathbf{M}^{-1} = \dfrac{1}{1-2k}\begin{bmatrix} k-2 & 5-4k & 1 \\ -k-1 & 2k+2 & 1 \\ 3 & -6 & -2 \end{bmatrix}$	dM1 A1	 5	Transpose of **their** cofactors (with one further error at most) **and** dividing by **their** determinant. Fully correct – **CAO**

(ii)	For invariant points $\begin{bmatrix} 2 & 4 & 3 \\ 1 & 1 & 1 \\ 0 & 3 & k+1 \end{bmatrix}\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} x \\ y \\ z \end{bmatrix}$			
	$2x + 4y + 3z = x$ $x + y + z = y$ $3y + (k+1)z = z$	M1		Use of **Mv** = **v** to give three **correct** equations.
	Gives $x + 4y + 3z = 0$ $x + z = 0$ $3y + kz = 0$			
	eg $x + z = 0$, $2y = -z$	A1		Reduces first two equations to only two variables in each (PI correct equation in k & one variable).
	$-3z - 4kz + 9z = 0$	A1		Elimination to form equation in k & one variable (PI).eg $3y - 2ky = 0, 1.5x - kx = 0$
	$k = 1.5$	A1		Correct value of k.
	Line is $-x = -2y = z$	B1	5	Correct equation OE.
	ALTERNATIVE Eigen value $\lambda = 1$ $\begin{vmatrix} 1 & 4 & 3 \\ 1 & 0 & 1 \\ 1 & 3 & k \end{vmatrix} = 0$	(M1)		Fully correct equation with $\lambda = 1$ substituted in.
	$1\begin{vmatrix} 0 & 1 \\ 3 & k \end{vmatrix} - 1\begin{vmatrix} 4 & 3 \\ 3 & k \end{vmatrix} = 0$	(A1)		Correct expansion by row or column of 3x3 determinant.
	$6 - 4k = 0$	(A1)		Correct equation in k.
	$k = \frac{3}{2}$	(A1)		Correct value of k
	Line is $\frac{x}{2} = y = \frac{z}{-2}$	(B1)	(5)	Correct equation OE.
	Total		**14**	

Q8	Solution	Mark	Total	Comment
(a)	$\begin{bmatrix}0\\3\\1\end{bmatrix}\times\begin{bmatrix}1\\2\\-2\end{bmatrix}=\begin{bmatrix}-8\\1\\-3\end{bmatrix}$	M1 A1		Attempt at vector product with direction vectors – **two** components correct. All correct.
	$\sqrt{8^2+1^2+3^2}=\sqrt{74}$	dM1		Finds modulus of **their** perpendicular vector.
	$(\cos\alpha=)\dfrac{-8}{\sqrt{74}}$ $(\cos\beta=)\dfrac{1}{\sqrt{74}}$ $(\cos\gamma=)\dfrac{-3}{\sqrt{74}}$	A1	4	or $\begin{bmatrix}1\\2\\-2\end{bmatrix}\times\begin{bmatrix}0\\3\\1\end{bmatrix}=\begin{bmatrix}8\\-1\\3\end{bmatrix}$ leading to $(\cos\alpha=)\dfrac{8}{\sqrt{74}}$ $(\cos\beta=)\dfrac{-1}{\sqrt{74}}$ $(\cos\gamma=)\dfrac{3}{\sqrt{74}}$ All three correct. If angles are found and cosines not **clearly** stated as directional cosines then **A0.** No **ISW** here.
(b)	pt (2,0,–1) is common to line & plane			
	$\begin{pmatrix}2\\0\\-1\end{pmatrix}.\begin{pmatrix}1\\b\\-3\end{pmatrix}=d$ which gives $d=5$	M1A1		Must use a correct common point and correct directional vector for M1. Must have "d=5" for A1.
	Direction vectors $\begin{pmatrix}0\\3\\1\end{pmatrix}.\begin{pmatrix}1\\b\\-3\end{pmatrix}=0$ which gives $b=1$	M1A1	4	Uses scalar product of correct vectors **or** uses another correct common point for M1. Must have "b=1" for A1.
	ALTERNATIVE Substituting $\begin{pmatrix}2\\3t\\-1+t\end{pmatrix}\cdot\begin{pmatrix}1\\b\\-3\end{pmatrix}=d$	(M1)		Substitutes parametric form of line into correct plane equation **or** substitutes two points to obtain two equations.
	$5+(3b-3)t=d$	(dM1)		Expands scalar product and collects terms **or** solves simultaneous equations.
	$b=1$ $d=5$	(A1) (A1)	(4)	b correct, must have "b=1" d correct, must have "d=5"

(c)	$\lvert n\rvert = \sqrt{p^2+16}$ $\quad\quad \lvert d\rvert = 3$			
	$\begin{bmatrix} p \\ 4 \\ 0 \end{bmatrix} . \begin{bmatrix} 1 \\ 2 \\ -2 \end{bmatrix} = p+8$	**B1**		Correct expression for **n**.**d**
	Hence $\dfrac{p+8}{3\sqrt{p^2+16}} = k$ OE	**M1**		Forms correct scalar product equation.
	$k = \dfrac{1}{3}$	**B1**		
	$(p+8)^2 = p^2+16$	**dM1**		Squaring both sides of **their** equation.
	$16p = -48$ $p = -3$	**A1**	**5**	Correct value obtained.
	ALTERNATIVE			
	$\mathbf{n}\times\mathbf{d} = \begin{bmatrix} -8 \\ 2p \\ 2p-4 \end{bmatrix}$	**(B1)**		Correct vector product obtained
	$\dfrac{\sqrt{8p^2-16p+80}}{3\sqrt{p^2+16}} = \dfrac{\sqrt{8}}{3}$	**(M1A1)**		Correct LHS **M1** Fully correct **A1**
	$p^2 + 16 = p^2 - 2p + 10$	**(dM1)**		Correctly squaring **their** fractions
	$p = -3$	**(A1)**	**(5)**	Correct value obtained

(d)	**TO GAIN ANY MARKS IN THIS PART p & b MUST BOTH BE REAL.**			
	$\mathbf{b} = \begin{bmatrix} 1 \\ "1" \\ -3 \end{bmatrix} \times \begin{bmatrix} "-3" \\ 4 \\ 0 \end{bmatrix} = \begin{bmatrix} 12 \\ 9 \\ 7 \end{bmatrix}$	**M1** **A1**		Vector product of **their** normals – at least **two** components correct from **their** numerical values of b and p. Fully correct, must have correct values of b and p.
	For common point $z = 0$	**M1**		Finding common point from **their** numerical values of b and p – set one variable to a number **and** attempts to find both others.
	$y = 2$, $x = 3$	**A1**		Correct common point, must have correct values of b and p – some alternatives are $x = 0$, $y = -1/4$, $z = -7/4$ $x = 1/3$, $y = 0$, $z = -14/9$
	$\left(\mathbf{r} - \begin{bmatrix} 3 \\ 2 \\ 0 \end{bmatrix}\right) \times \begin{bmatrix} 12 \\ 9 \\ 7 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}$	**A1F**	**5**	Fully correct format – **their** point and direction in the correct places. Can have **0** on RHS. **Must** have scored both M1's.
	ALTERNATIVE $y = t$	**(M1)**		Set one variable to a parameter **and** attempt to find other variables (using **their** numerical values of b and p).
	$x = \dfrac{4t+1}{3}$ $z = \dfrac{7t-14}{9}$	**(A1)** **(A1)**		A1 for each correct expression for other variables **–** alternatives are: $x = \mu,\ \ y = (3\mu - 1)/4,\ \ z = (7\mu - 21)/12$ $z = \lambda,\ \ x = (12\lambda + 21)/7,\ \ y = (9\lambda + 14)/7$
	$\begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} \frac{1}{3} \\ 0 \\ -\frac{14}{9} \end{pmatrix} + t \begin{pmatrix} \frac{4}{3} \\ 1 \\ \frac{7}{9} \end{pmatrix}$	**(dM1)**		Rewriting to identify point and direction – can be implied.
	$\left(\mathbf{r} - \begin{bmatrix} 3 \\ 2 \\ 0 \end{bmatrix}\right) \times \begin{bmatrix} 12 \\ 9 \\ 7 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}$	**(A1F)**	**(5)**	Fully correct format – **their** point and direction in the correct places.
	Total		**18**	