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AS Level Further Mathematics A
Y531 Pure Core
Sample Question Paper Version 2

Date – Morning/Afternoon
Time allowed: 1 hour 15 minutes

You must have:
- Printed Answer Booklet
- Formulae AS Level Further Mathematics A

You may use:
- a scientific or graphical calculator

* 0 0 0 0 0 0 0 *

INSTRUCTIONS

- Use black ink. HB pencil may be used for graphs and diagrams only.
- Complete the boxes provided on the Printed Answer Booklet with your name, centre number and candidate number.
- Answer **all** the questions.
- **Write your answer to each question in the space provided in the Printed Answer Booklet.** Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Do **not** write in the bar codes.
- You are permitted to use a scientific or graphical calculator in this paper.
- Give non-exact numerical answers correct to 3 significant figures unless a different degree of accuracy is specified in the question.
- The acceleration due to gravity is denoted by $g\,\mathrm{m\,s^{-2}}$. Unless otherwise instructed, when a numerical value is needed, use $g = 9.8$.

INFORMATION

- The total number of marks for this paper is **60**.
- The marks for each question are shown in brackets **[ ]**.
- **You are reminded of the need for clear presentation in your answers.**
- The Printed Answer Booklet consists of **12** pages. The Question Paper consists of **4** pages.

Answer **all** the questions.

1 **In this question you must show detailed reasoning.**

The equation $x^2 + 2x + 5 = 0$ has roots α and β. The equation $x^2 + px + q = 0$ has roots α^2 and β^2. Find the values of p and q. **[3]**

2 **In this question you must show detailed reasoning.**

Given that $z_1 = 3 + 2\text{i}$ and $z_2 = -1 - \text{i}$, find the following, giving each in the form $a + b\text{i}$.

(i) $z_1^* z_2$ **[2]**

(ii) $\dfrac{z_1 + 2z_2}{z_2}$ **[2]**

3 **(i)** You are given two matrices, **A** and **B**, where

$$\mathbf{A} = \begin{pmatrix} 1 & 2 \\ 2 & 1 \end{pmatrix} \text{ and } \mathbf{B} = \begin{pmatrix} -1 & 2 \\ 2 & -1 \end{pmatrix}.$$

Show that $\mathbf{AB} = m\mathbf{I}$, where m is a constant to be determined. **[2]**

(ii) You are given two matrices, **C** and **D**, where

$$\mathbf{C} = \begin{pmatrix} 2 & 1 & 5 \\ 1 & 1 & 3 \\ -1 & 2 & 2 \end{pmatrix} \text{ and } \mathbf{D} = \begin{pmatrix} -4 & 8 & -2 \\ -5 & 9 & -1 \\ 3 & -5 & 1 \end{pmatrix}.$$

Show that $\mathbf{C}^{-1} = k\mathbf{D}$ where k is a constant to be determined. **[2]**

(iii) The matrices **E** and **F** are given by $\mathbf{E} = \begin{pmatrix} k & k^2 \\ 3 & 0 \end{pmatrix}$ and $\mathbf{F} = \begin{pmatrix} 2 \\ k \end{pmatrix}$ where k is a constant.

Determine any matrix **F** for which $\mathbf{EF} = \begin{pmatrix} -2k \\ 6 \end{pmatrix}$. **[5]**

4 Draw the region of the Argand diagram for which $|z - 3 - 4\text{i}| \leq 5$ and $|z| \leq |z - 2|$. **[4]**

5 The matrix **M** is given by $\mathbf{M} = \begin{pmatrix} -\frac{3}{5} & \frac{4}{5} \\ \frac{4}{5} & \frac{3}{5} \end{pmatrix}$.

(i) The diagram in the Printed Answer Booklet shows the unit square *OABC*. The image of the unit square under the transformation represented by **M** is $OA'B'C'$. Draw and clearly label $OA'B'C'$. **[3]**

(ii) Find the equation of the line of invariant points of this transformation. **[3]**

(iii) (a) Find the determinant of **M**. **[1]**

(b) Describe briefly how this value relates to the transformation represented by **M**. **[2]**

6 At the beginning of the year John had a total of £2000 in three different accounts. He has twice as much money in the current account as in the savings account.

- The current account has an interest rate of 2.5% per annum.
- The savings account has an interest rate of 3.7% per annum.
- The supersaver account has an interest rate of 4.9% per annum.

John has predicted that he will earn a total interest of £92 by the end of the year.

(i) Model this situation as a matrix equation. **[2]**

(ii) Find the amount that John had in each account at the beginning of the year. **[2]**

(iii) In fact, the interest John will receive is £92 **to the nearest pound**. Explain how this affects the calculations. **[2]**

7 **In this question you must show detailed reasoning.**

It is given that $\mathrm{f}(z) = z^3 - 13z^2 + 65z - 125$.

The points representing the three roots of the equation $\mathrm{f}(z) = 0$ are plotted on an Argand diagram.

Show that these points lie on the circle $|z| = k$, where *k* is a real number to be determined. **[9]**

8 Prove that $n! > 2^n$ for $n \geq 4$. **[5]**

9 **(i)** Find the value of k such that $\begin{pmatrix}1\\2\\1\end{pmatrix}$ and $\begin{pmatrix}-2\\3\\k\end{pmatrix}$ are perpendicular. **[2]**

Two lines have equations $l_1 : \mathbf{r} = \begin{pmatrix}3\\2\\7\end{pmatrix} + \lambda\begin{pmatrix}1\\-1\\3\end{pmatrix}$ and $l_2 : \mathbf{r} = \begin{pmatrix}6\\5\\2\end{pmatrix} + \mu\begin{pmatrix}2\\1\\-1\end{pmatrix}$.

(ii) Find the point of intersection of l_1 and l_2. **[4]**

(iii) The vector $\begin{pmatrix}1\\a\\b\end{pmatrix}$ is perpendicular to the lines l_1 and l_2.

Find the values of a and b. **[5]**

END OF QUESTION PAPER

OCR
Oxford Cambridge and RSA

…day June 20XX – Morning/Afternoon

AS Level Further Mathematics A

Y531 Pure Core

SAMPLE MARK SCHEME

Duration: 1 hour 15 minutes

MAXIMUM MARK 60

This document consists of 16 pages

Text Instructions

1. Annotations and abbreviations

Annotation in scoris	Meaning
✓and ✗	
BOD	Benefit of doubt
FT	Follow through
ISW	Ignore subsequent working
M0, M1	Method mark awarded 0, 1
A0, A1	Accuracy mark awarded 0, 1
B0, B1	Independent mark awarded 0, 1
SC	Special case
^	Omission sign
MR	Misread
Highlighting	
Other abbreviations in mark scheme	**Meaning**
E1	Mark for explaining a result or establishing a given result
dep*	Mark dependent on a previous mark, indicated by *
cao	Correct answer only
oe	Or equivalent
rot	Rounded or truncated
soi	Seen or implied
www	Without wrong working
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.

2. Subject-specific Marking Instructions for AS Level Further Mathematics A

a Annotations should be used whenever appropriate during your marking. The A, M and B annotations must be used on your standardisation scripts for responses that are not awarded either 0 or full marks. It is vital that you annotate standardisation scripts fully to show how the marks have been awarded. For subsequent marking you must make it clear how you have arrived at the mark you have awarded.

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

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

E
Mark for explaining a result or establishing a given result. This usually requires more working or explanation than the establishment of an unknown result.

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

d When a part of a question has two or more 'method' steps, the M marks are in principle independent unless the scheme specifically says otherwise; and similarly where there are several B marks allocated. (The notation 'dep*' is used to indicate that a particular mark is dependent on an earlier, asterisked, mark in the scheme.) Of course, in practice it may happen that when a candidate has once gone wrong in a part of a question, the work from there on is worthless so that no more marks can sensibly be given. On the other hand, when two or more steps are successfully run together by the candidate, the earlier marks are implied and full credit must be given.

e The abbreviation FT implies that the A or B mark indicated is allowed for work correctly following on from previously incorrect results. Otherwise, A and B marks are given for correct work only – differences in notation are of course permitted. A (accuracy) marks are not given for answers obtained from incorrect working. When A or B marks are awarded for work at an intermediate stage of a solution, there may be various alternatives that are equally acceptable. In such cases, what is acceptable will be detailed in the mark scheme. If this is not the case please, escalate the question to your Team Leader who will decide on a course of action with the Principal Examiner.
Sometimes the answer to one part of a question is used in a later part of the same question. In this case, A marks will often be 'follow through'. In such cases you must ensure that you refer back to the answer of the previous part question even if this is not shown within the image zone. You may find it easier to mark follow through questions candidate-by-candidate rather than question-by-question.

f Unless units are specifically requested, there is no penalty for wrong or missing units as long as the answer is numerically correct and expressed either in SI or in the units of the question. (e.g. lengths will be assumed to be in metres unless in a particular question all the lengths are in km, when this would be assumed to be the unspecified unit.) 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. This rule should be applied to each case. When a value is not given in the paper accept any answer that agrees with the correct value to 2 s.f. Follow through should be used so that only one mark is lost for each distinct accuracy error, except for errors due to premature approximation which should be penalised only once in the examination. There is no penalty for using a wrong value for *g*. E marks will be lost except when results agree to the accuracy required in the question.

g Rules for replaced work: if a candidate attempts a question more than once, and indicates which attempt he/she wishes to be marked, then examiners should do as the candidate requests; if there are two or more attempts at a question which have not been crossed out, examiners should mark what appears to be the last (complete) attempt and ignore the others. NB Follow these maths-specific instructions rather than those in the assessor handbook.

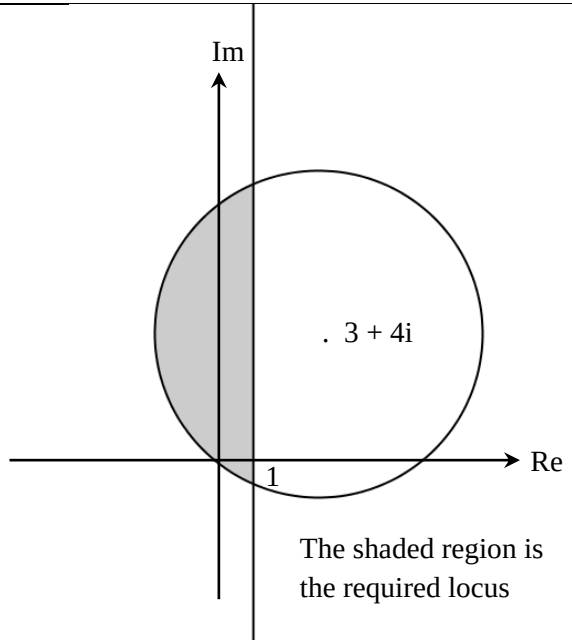
h For a genuine misreading (of numbers or symbols) which is such that the object and the difficulty of the question remain unaltered, mark according to the scheme but following through from the candidate's data. A penalty is then applied; 1 mark is generally appropriate, though this may differ for some papers. This is achieved by withholding one A mark in the question. Marks designated as cao may be awarded as long as there are no other errors. E marks are lost unless, by chance, the given results are established by equivalent working. 'Fresh starts' will not affect an earlier decision about a misread. 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, of course, that there is nothing in the wording of the question specifying that analytical methods are required). 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			**DR** $\alpha+\beta=-2,\ \alpha\beta=5$	**B1**	1.2		Allow alternative methods e.g. using complex roots or substituting $x=\sqrt{y}$
			$\alpha^2+\beta^2=(\alpha+\beta)^2-2\alpha\beta,\ \ \alpha^2\beta^2=(\alpha\beta)^2$	**M1**	1.1a	Both used, must be seen	
			$\Rightarrow p=6,\ q=25$	**A1** **[3]**	1.1		
2	(i)		**DR** $z_1^{\ *}z_2=(3-2\mathrm{i})(-1-\mathrm{i})=-3+2\mathrm{i}-3\mathrm{i}+2\mathrm{i}^2$	**M1**	1.1	Find conjugate, then multiply out brackets	Working must be seen
			$=-5-\mathrm{i}$	**A1** **[2]**	1.1		
2	(ii)		**DR** $\dfrac{z_1+2z_2}{z_2}=\dfrac{3+2i-2-2i}{-1-\mathrm{i}}=\dfrac{1}{-1-\mathrm{i}}.\dfrac{-1+\mathrm{i}}{-1+\mathrm{i}}$	**M1**	1.1	Multiply by $\dfrac{-1+\mathrm{i}}{-1+\mathrm{i}}$	Must be seen
			$=\dfrac{-1+\mathrm{i}}{2}=-\dfrac{1}{2}+\dfrac{1}{2}\mathrm{i}$	**A1** **[2]**	1.1		

Question			Answer	Marks	AO	Guidance	
3	(i)		$\mathbf{AB} = \begin{pmatrix} 1 & 2 \\ 2 & 1 \end{pmatrix}\begin{pmatrix} -1 & 2 \\ 2 & -1 \end{pmatrix} = \begin{pmatrix} 3 & 0 \\ 0 & 3 \end{pmatrix}$	**M1**	1.1	Or BC	**OR** **M1** $\mathbf{A}^{-1} = \frac{1}{1-4}\begin{pmatrix} 1 & -2 \\ -2 & 1 \end{pmatrix}$ $= \frac{1}{-3}\begin{pmatrix} 1 & -2 \\ -2 & 1 \end{pmatrix} = \frac{1}{3}\mathbf{B}$
			So **AB** = 3**I** and $m = 3$	**E1** **[2]**	1.1		**E1** So **AB** = 3**AA**$^{-1}$ = 3**I** and $m = 3$
3	(ii)		$\mathbf{CD} = \begin{pmatrix} 2 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 2 \end{pmatrix}$ so $\mathbf{C}^{-1} = \frac{1}{2}\mathbf{D}$ and $k = \frac{1}{2}$	**B1** **E1** **[2]**	1.1 2.2a	BC	**OR** **B1** $\mathbf{C}^{-1} = \begin{pmatrix} -2 & 4 & -1 \\ -2.5 & 4.5 & -0.5 \\ 1.5 & -2.5 & 0.5 \end{pmatrix}$ BC **E1** so $\mathbf{C}^{-1} = \frac{1}{2}\mathbf{D}$ and $k = \frac{1}{2}$
3	(iii)		$\mathbf{EF} = \begin{pmatrix} k & k^2 \\ 3 & 0 \end{pmatrix}\begin{pmatrix} 2 \\ k \end{pmatrix} = \begin{pmatrix} 2k + k^3 \\ 6 \end{pmatrix}$ $\Rightarrow \begin{pmatrix} 2k + k^3 \\ 6 \end{pmatrix} = \begin{pmatrix} -2k \\ 6 \end{pmatrix}$ $\Rightarrow 2k + k^3 = -2k$ $k = 0,\ 2\text{i},\ -2\text{i}$ **F**= $\begin{pmatrix} 2 \\ 0 \end{pmatrix}, \begin{pmatrix} 2 \\ 2\text{i} \end{pmatrix}$ or $\begin{pmatrix} 2 \\ -2\text{i} \end{pmatrix}$	**M1** **M1** **A1** **A1** **A1** **[5]**	1.1a 2.1 2.2a 1.1 1.1	Both multiplications attempted BC www If **A0**, allow SC1for one matrix only	

Question	Answer	Marks	AO	Guidance	
4	 The shaded region is the required locus	**M1** **A1** **B1** **B1** **[4]**	1.1 1.1 1.1 1.1	A circle with centre $3+4i$, passing through origin. A line parallel to *y*-axis through 1 Correct shading and continuous lines	Accept the correct minor arc alone Accept the correct line segment alone Must state which region is the required locus.

Question			Answer	Marks	AO	Guidance	
5	(i)		A' is $\left(-\frac{3}{5},\frac{4}{5}\right)$, B' is $\left(\frac{1}{5},\frac{7}{5}\right)$ and C' is $\left(\frac{4}{5},\frac{3}{5}\right)$	**B1** **B1** **B1** **[3]**	2.2a 1.1 1.1	Coordinates of any two images seen Coordinates of third image seen; completely correct labelled diagram, must include indication of coordinates	
5	(ii)		$\mathbf{M}\begin{pmatrix}x\\y\end{pmatrix}=\begin{pmatrix}x\\y\end{pmatrix}$ So $-\frac{3}{5}x+\frac{4}{5}y=x$ And $\frac{4}{5}x+\frac{3}{5}y=y$ Both of which lead to $y=2x$	**M1** **M1** **E1** **[3]**	1.1 1.1 2.2a	Seen or implied At least one seen Must conclude from both equations	**OR** **M1** $A'\left(\frac{-3}{5},\frac{4}{5}\right)$ $A\ (1,0)$ **M1**$\Rightarrow$ midpoint is $\left(\frac{1}{5},\frac{2}{5}\right)$ **E1** $\Rightarrow y=2x$
5	(iii)	(a)	Det $\mathbf{M}=-1$	**B1** **[1]**	1.1		
5	(iii)	(b)	It means that area remains the same … but that the orientation of the image has changed oe	**B1** **B1** **[2]**	2.2a 2.4	Accept ‘sense’, ‘order of labelling’ oe	

Question			Answer	Marks	AO	Guidance	
6	(i)		Let x, y and z be the amount invested in each account $\begin{pmatrix} 1 & 1 & 1 \\ 0.025 & 0.037 & 0.049 \\ 1 & -2 & 0 \end{pmatrix}\begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 2000 \\ 92 \\ 0 \end{pmatrix}$	**B2** **[2]**	1.1 3.1b	**B1** for writing down matrix alone	**OR** **B2** Let s be the amount invested in the savings account $\begin{pmatrix} 0.025 & 0.037 & 0.049 \end{pmatrix}\begin{pmatrix} 2s \\ s \\ 2000-3s \end{pmatrix} = 92$
6	(ii)		$\begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 1 & 1 & 1 \\ 0.025 & 0.037 & 0.049 \\ 1 & -2 & 0 \end{pmatrix}^{-1}\begin{pmatrix} 2000 \\ 92 \\ 0 \end{pmatrix}$ $x = 200$, $y = 100$, $z = 1700$ so he invests £200 in the current account £100 in the savings account £1700 in the supersaver account	**M1** **A1** **[2]**	3.1a 1.1	Attempt to find x, y, z BC Interpret in context	**M1** by multiplying out and solving for s. **A1** $s = 100$ so he invests £200 in the current account £100 in the savings account £1700 in the supersaver account
6	(iii)		The 92 in part **(ii)** should be 92 ± 0.5, therefore giving a range of answers for each account	**E1** **E1** **[2]**	3.1b 3.2b		

Question			Answer	Marks	AO	Guidance	
7			$f(5)=0$	**M1**	3.1a	DR	
			$\Rightarrow f(x)=(x-5)(x^2+bx+c)$	**A1**	2.4		**OR M1** divide $x^3-13x^2+65x-125$ by $(x-5)$
			$\Rightarrow f(x)=(x-5)(x^2-8x+25)$	**B1**	1.1		**A1** obtain $(x-5)(x^2-8x+25)$
			Attempt to solve their quadratic	**M1**	2.1		
			$x=4\pm 3i$	**A1**	1.1	FT	
			The roots are 5, 4+3i and 4–3i				
			Attempt to find moduli	**M1**	3.1a		
			$\lvert 5\rvert=5$				
			$\lvert 4+3i\rvert=\sqrt{4^2+3^2}=5$	**A1**	1.1	FT	
			$\lvert 4-3i\rvert=\sqrt{4^2+3^2}=5$	**A1**	1.1	FT	
			Distance from origin for **all** roots is 5 units, so all roots lie on $\lvert z\rvert=k$, where k=5	**E1**	2.4	FT	
				[9]			

Question			Answer	Marks	AO	Guidance	
8			Let $n = 4$, then $4! = 24$ and $2^4 = 16$ so $4! > 2^4$	**B1**	2.1	Basis case for proof by induction	
			Assume true for $n = r$ $r! > 2^r$ for $r \geq 4$	**M1**	2.1	Assumption	
			Then for $n = r + 1$ $(r+1)! = (r+1) \times r! > (r+1) \times 2^r$ by assumption	**M1**	1.1	Add next statement	
			Since $r + 1 > 2$, $(r+1) \times 2^r > 2 \times 2^r = 2^{r+1}$ so $(r+1)! > 2^{r+1}$	**E1**	2.2a	Sufficient working to establish true for $r + 1$	Must state that $r + 1 > 2$ oe
			If true for *r* then true for $r + 1$. Hence, given basis case, the statement is true for all positive integers.	**E1** **[5]**	2.4	Clear conclusion for induction process	A *formal* proof is required for full marks Accept other *complete* methods
9	(i)		$-1 \times -2 + 2 \times 3 + 1 \times k = 0$	**M1**	1.1	Attempt the scalar product and set equal to zero soi	Allow use of **i**, **j**, **k** notation
			$\Rightarrow k = -4$	**A1** **[2]**	1.1		
9	(ii)		Equate *x* and *y* coordinates: $3 + \lambda = 6 + 2\mu \Rightarrow \lambda - 2\mu = 3$ $2 - \lambda = 5 + \mu \Rightarrow \lambda + \mu = -3$	**M1**	3.1a	Use coordinates to find μ and λ.	
			$\Rightarrow \mu = -2, \lambda = -1$	**A1**	1.1		
			Consistent with *z* coordinates since $7 + 3 \times (-1) = 4$ and $2 - (-2) = 4$	**E1**	3.1a	Check consistency with third coordinate	
			So the point of intersection is $(2, 3, 4)$	**A1** **[4]**	1.1		

Question			Answer	Marks	AO	Guidance	
9	(iii)		The vector product find a mutual perpendicular				OR **M1A1**
			$\begin{pmatrix}1\\-1\\3\end{pmatrix}\times\begin{pmatrix}2\\1\\-1\end{pmatrix}=\begin{pmatrix}-2\\7\\3\end{pmatrix}$	**M1** **A1**	3.1a 1.1	Attempt the vector product, by any valid method BC	$\begin{pmatrix}1\\-1\\3\end{pmatrix}\bullet\begin{pmatrix}1\\a\\b\end{pmatrix}=0$ and $\begin{pmatrix}2\\1\\-1\end{pmatrix}\bullet\begin{pmatrix}1\\a\\b\end{pmatrix}=0$
			$\begin{pmatrix}1\\a\\b\end{pmatrix}=\lambda\begin{pmatrix}-2\\7\\3\end{pmatrix}$	**M1**	3.1a		**A1** $1-a+3b=0$ and $2+a-b=0$ **M1** Solve simultaneous equations
			$\lambda=-\frac{1}{2}$	**M1**	1.1		
			$a=-3.5,\ b=-1.5$	**A1** **[5]**	1.1		**A1** $a=-3.5,\ b=-1.5$

Assessment Objectives (AO) Grid

Question	AO1	AO2	AO3(PS)	AO3(M)	Total
1	3	0	0	0	3
2(i)	2	0	0	0	2
2(ii)	2	0	0	0	2
3(i)	2				2
3(ii)	1	1			2
3(iii)	3	2			5
4	4	0	0	0	4
5(i)	2	1	0	0	3
5(ii)	2	1	0	0	3
5(iii)(a)	1	0	0	0	1
5(iii)(b)	0	2	0	0	2
6(i)	1	0	1		2
6(ii)	1	0	1		2
6(iii)	0	0	2		2
7	4	3	2	0	9
8	1	4	0	0	5
9(i)	2	0	0	0	2
9(ii)	2	0	2	0	4
9(iii)	4	1	0	0	5
Totals	37	15	8	0	60

PS = Problem Solving
M = Modelling

Summary of Updates

Date	Version	Change
October 2019	2	Amendments to the front cover rubric instructions to candidates

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AS Level Further Mathematics A
Y531 Pure Core
Printed Answer Booklet Version 2

Date – Morning/Afternoon
Time allowed: 1 hour 15 minutes

You must have:
- Question Paper Y531 (inserted)
- Formulae AS Level Further Mathematics A

You may have:
- a scientific or graphical calculator

First name									
Last name									
Centre number						**Candidate number**				

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INFORMATION
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1	
2(i)	
2(ii)	

3(i)

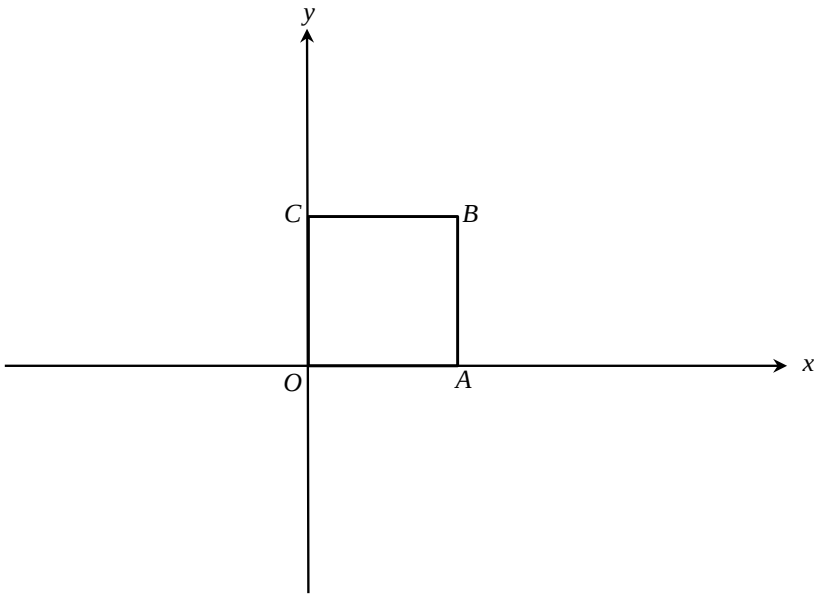
3(ii)

3(iii)

(answer space continued on next page)

3(iii)	**(continued)**
4	

5(i)



5(ii)

5(iii)(a)	
5(iii)(b)	

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6(i)	
6(ii)	
6(iii)	

7	

8

9(i)

9(ii)

9(iii)	

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