## AQA – Further vectors – A2 Further Mathematics P1

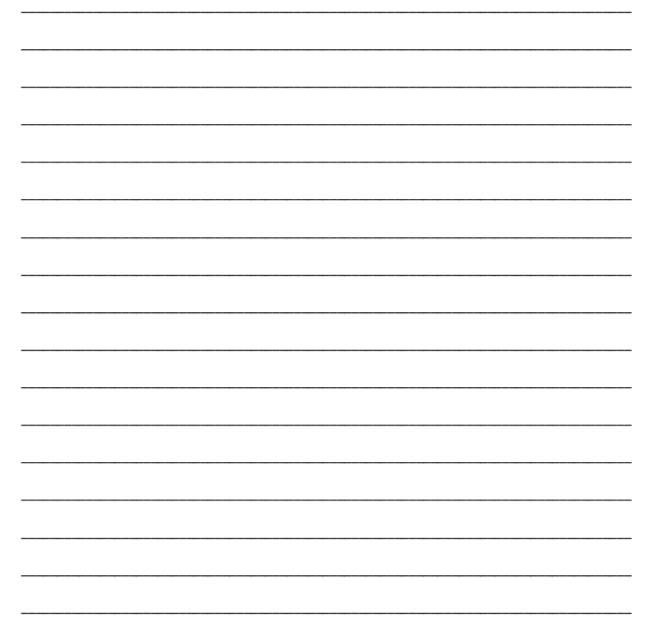
1. June/2020/Paper\_1/No.7

Three planes have equations

$$(4k + 1)x - 3y + (k - 5)z = 3$$
  
(k - 1)x + (3 - k)y + 2z = 1  
7x - 3y + 4z = 2

(a) The planes do **not** meet at a unique point.

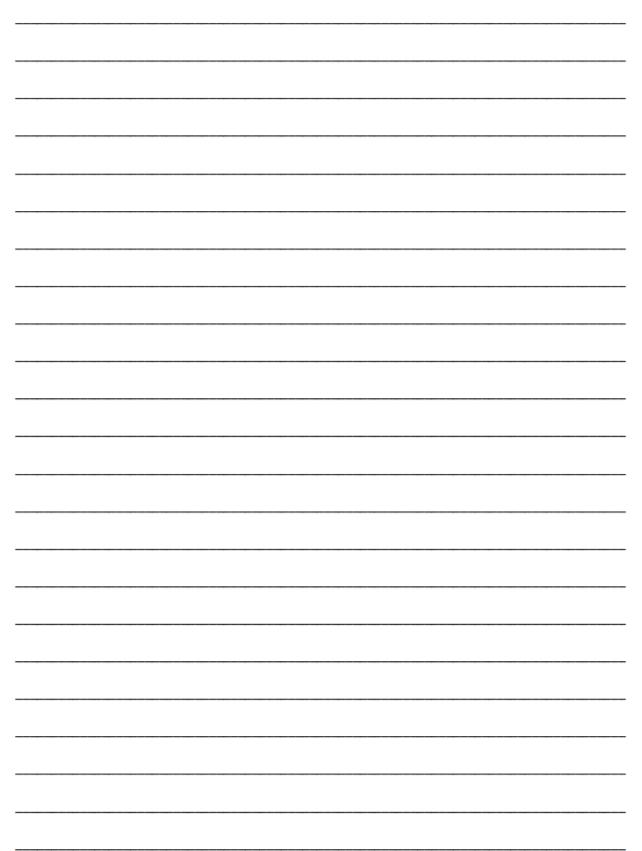
Show that k = 4.5 is one possible value of k, and find the other possible value of k. [3 marks]



(b) For each value of k found in part (a), identify the configuration of the given planes.

In each case fully justify your answer, stating whether or not the equations of the planes form a consistent system.

[4 marks]



## **2.** June/2020/Paper\_1/No.11

The lines  $l_1$ ,  $l_2$  and  $l_3$  are defined as follows.

$$l_{1}: \begin{pmatrix} \mathbf{r} - \begin{bmatrix} 1\\5\\-1 \end{bmatrix} \end{pmatrix} \times \begin{bmatrix} -2\\1\\-3 \end{bmatrix} = \mathbf{0}$$
$$l_{2}: \begin{pmatrix} \mathbf{r} - \begin{bmatrix} -3\\2\\7 \end{bmatrix} \end{pmatrix} \times \begin{bmatrix} 2\\-1\\3 \end{bmatrix} = \mathbf{0}$$
$$l_{3}: \begin{pmatrix} \mathbf{r} - \begin{bmatrix} -5\\12\\-4 \end{bmatrix} \end{pmatrix} \times \begin{bmatrix} 4\\0\\9 \end{bmatrix} = \mathbf{0}$$

(a) (i) Explain how you know that two of the lines are parallel.

[1 mark]

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(a) (ii)	) Show that the perpendicular distance betwee correct to three significant figures.	n these two parallel lines is 7.95 units,
		[5 marks

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(b)	Show that the lines $l_1$ and $l_3$ meet, and find the coordinates of their point of intersection.	F
		[5 marks]

**3.** June/2019/Paper\_1/No.5

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A plane has equation \mathbf{r} \cdot \begin{bmatrix} 1\\1\\1 \end{bmatrix} = 7
A line has equation \mathbf{r} = \begin{bmatrix} 2\\0\\1 \end{bmatrix} + \mu \begin{bmatrix} 1\\0\\1 \end{bmatrix}
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Calculate the acute angle between the line and the plane.

Give your answer to the nearest 0.1°

[3 marks]

4.	June/2019/Paper_1/No.10 The points $A(5, -4, 6)$ and $B(6, -6, 8)$ lie on the line $L$ . The point $C$ is (15, -5, 9)		
	(a)	D is the point on L that is closest to C.	
		Find the coordinates of <i>D</i> . [6 marks]	

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(b)	Hence find, in exact form, the shortest distance from C to L.	[2 marks]

## 5. June/2019/Paper\_1/No.12

Three planes have equations

$$4x - 5y + z = 8$$
$$3x + 2y - kz = 6$$
$$(k - 2)x + ky - 8z = 6$$

where k is a real constant.

The planes do not meet at a unique point.

(a) Find the possible values of k.

[3 marks]

(b) For each value of k found in part (a), identify the configuration of the given planes.

Fully justify your answer, stating in each case whether or not the equations of the planes form a consistent system.

[5 marks]

