Mark scheme

Vector geometry

Mathematics 0580 · Questions from Paper 1, Paper 2 and Paper 4

Total marks

54

MARKS FOR EACH QUESTION

1	2	3	4	5	6	7	8	9	10	Total
4	2	3	6	6	5	5	6	8	9	**54**

Question 1 **[4]**

1(a)	$(-1, 4)$	**1**	
1(b)	Q marked at $(2, 2)$	**1**	
1(c)	$\begin{pmatrix}-6\\-5\end{pmatrix}$	**1**	**FT** *their* point Q
1(d)	PR	**1**	

Question 2 **[2]**

2	$\frac{2}{3}\mathbf{p} + \frac{1}{3}\mathbf{q}$	**2**	**M1** for correct route e.g. $\overrightarrow{OT}$ or $\overrightarrow{OQ} + \overrightarrow{QT}$ or for $\overrightarrow{QT} = \frac{2}{3}(-\mathbf{q} + \mathbf{p})$ oe or for $\overrightarrow{PT} = \frac{1}{3}(-\mathbf{p} + \mathbf{q})$ oe

Question 3 **[3]**

3 **(a)** **(i)**	$\mathbf{p} + \frac{1}{2}\mathbf{r}$	**1**	
(ii)	$2\mathbf{p} + \mathbf{r}$	**1ft**	$2 \times$ *their* (i)
(b)	Midpoint of RQ	**1**	

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Question 4 [6]

4	**(a)** 2**p** 3**p** + **q** …….. 5**p** + 3**q** cao	1, 1, 1	
	(b) **(i)** all 4 plotted correctly ft	2	**B1** 2 or 3 correct
	(ii) a (straight) line	1	Allow linear, collinear

Question 5 [6]

5	**(a)** –2**a** – 2**c** oe	**2**	**M1** for **BO** = –**a** – **c** or for any correct route or correct unsimplified expression
	(b) 2**a** + **c**	**2**	**M1** for any correct route or correct unsimplified expression
	(c) **–a – c** oe	**2FT**	FT *their* **(a)** or correct answer Or **M1** for a correct non direct route from O to E or for correct unsimplified expression or for correct FT unsimplified

Question 6 [5]

6(a)(i)	2**m** – **n**	**1**	
6(a)(ii)	2**m** + **n**	**1**	
6(b)	$\overrightarrow{CD} = 10\mathbf{m} - 5\mathbf{n}$	**M2**	Allow **M2** for equivalents $\overrightarrow{CD} = -2\mathbf{n} + 10\mathbf{m} - 3\mathbf{n}$ or $\overrightarrow{CD} = -(2\mathbf{m} + \mathbf{n}) + 2\mathbf{m} - \mathbf{n} + 10\mathbf{m} - 3\mathbf{n}$ For **M2**, FT *their* **(a)** e.g. $\overrightarrow{CD} = \textit{their}\ \overrightarrow{CO} + \textit{their}\ \overrightarrow{OA} + 10\mathbf{m} - 3\mathbf{n}$ or **M1** for correct route for $\overrightarrow{CD}$ using the lines of the diagram with $\overrightarrow{AD}$ e.g. $\overrightarrow{CD} = \overrightarrow{CA} + \overrightarrow{AD}$ oe
	$\overrightarrow{CD} = 5\overrightarrow{OA}$ leading to *CD* is parallel to *OA* [$\therefore$ *OACD* is a trapezium]	**A1**	Dependent on **M2**

Question 7 [5]

7	**(a) (i)** **-r + q** or **q – r** **(ii)** ½(3**q** – **r**) oe **(b)** correct working	**1** **1** **3**	 Must be simplified **M1** for ***MX*** = ½ **r** + ¾ their (**–r + q**) **M1** using a different route for ***XS*** or ½ ***MS*** **E1** dep correct simplification and conclusion

Question 8 [6]

8	**(a) (i)**	**–b** + **a**	**1**	
	(ii)	**b** + $\frac{1}{2}$**a**	**1**	
	(b)	$[\overrightarrow{OX} =]$ **b** + $\frac{1}{3}$(**–b** + **a**) oe	**M1**	
		$\frac{1}{3}$**a** + $\frac{2}{3}$**b** oe	**A1**	
		2 statements from: $\overrightarrow{OM} =$ **b** + $\frac{1}{2}$**a** oe or $[\overrightarrow{OX} =]$ $\frac{2}{3}$(**b** + $\frac{1}{2}$**a**) oe or $\overrightarrow{OX} = \frac{2}{3}\overrightarrow{OM}$ oe	**B2**	**B1** for any one of these statements

Question 9 [8]

9(a)	2.5 and – 2.5 oe	**3**	**M2** for $1681m^2 = \frac{42025}{4}$ oe or **M1** for $(9m)^2 + (40m)^2$ oe
9(b)(i)(a)	**c** – **a** final answer	**1**	
9(b)(i)(b)	$\frac{3}{4}$**a** final answer	**1**	
9(b)(i)(c)	**c** + $\frac{3}{4}$**a** final answer	**1**	**FT c** + *their* **(b)(i)(b)**, must be a vector in terms of **a** and/or **c** in its simplest form
9(b)(ii)	**a** + $\frac{4}{3}$**c** oe	**2**	**B1** for $[\overrightarrow{BQ} =]$ $\frac{1}{3}$**c** or $[\overrightarrow{AQ} =]$ $\frac{4}{3}$**c** or **M1** for a correct route or for answer **a** + *k***c** oe, where $k > 1$

Question 10 **[9]**

10	**(a)**	(5, 3)	**1**	
	(b) (i)	$3\mathbf{a} + \mathbf{c}$	**1**	
	(ii)	$3\mathbf{a} + \frac{1}{2}\mathbf{c}$ **or** $\frac{1}{2}(6\mathbf{a} + \mathbf{c})$	**2**	**M1** for $\overrightarrow{OM}$ oe e.g $OA+AM$ or correct unsimplified answer
	(iii)	$\mathbf{a} + \mathbf{c}$	**1**	
	(iv)	$\frac{3}{2}\mathbf{a} + \frac{1}{2}\mathbf{c}$ or $\frac{1}{2}(3\mathbf{a} + \mathbf{c})$	**2**	**M1** for $-\mathbf{c} + \frac{3}{2}\times$ their (iii) or $\mathbf{a} + \frac{1}{2}\times$ their (iii) or correct unsimplified answer or any correct route e.g. $CE + ED$
				Part (c) dependent on simplified (i) and (iv)
	(c)	(CD) parallel (to OB) oe cao	**1dep**	Dep on (i) = $k \times$ (iv)
		$CD = \frac{1}{2}\ OB$ oe cao	**1dep**	Dep on (i) = 2 × (iv) must be scalars

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