Vectors Mark Scheme		
1(a)	$2\boldsymbol{a} + \boldsymbol{b}$	[1] Vector representing M to L
1(b)	$\frac{1}{2}(2\boldsymbol{a} + \boldsymbol{b}) = \boldsymbol{a} + \frac{\boldsymbol{b}}{2}$	[1] Vector representing M to P
1(c)	$\overrightarrow{MN} = 4\overrightarrow{MP} = 4\left(\boldsymbol{a} + \frac{\boldsymbol{b}}{2}\right) = 4\boldsymbol{a} + 2\boldsymbol{b}$	[1] Vector representing M to N
2	$\overrightarrow{GF} = 3\boldsymbol{a} - \boldsymbol{a} + 5\boldsymbol{b} + 4\boldsymbol{b}$	[1] Vector representing G to F which is the sum of G to E and E to F
	$\overrightarrow{GF} = 2\boldsymbol{a} + 9\boldsymbol{b}$	[1] Vector representing G to F
	$\overrightarrow{GH} = 3(2\boldsymbol{a} + 9\boldsymbol{b}) = 6\boldsymbol{a} + 27\boldsymbol{b}$	[1] Vector representing G to H which is 3 times G to F
3	$\overrightarrow{FC} = \frac{\boldsymbol{a}}{2}$	[1] Vector representing F to C
	$\overrightarrow{BE} = \frac{3}{4}\boldsymbol{a}$	[1] Vector representing B to E
	$\overrightarrow{FE} = \frac{5}{4}\boldsymbol{a} - \boldsymbol{b}$	[1] $\overrightarrow{FE} = \overrightarrow{FC} + \overrightarrow{CB} + \overrightarrow{BE}$
4(a)	$\overrightarrow{LM} = -2\boldsymbol{a}$, $\overrightarrow{MN} = 2\boldsymbol{a} + 2\boldsymbol{b}$, $\overrightarrow{NK} = 3\boldsymbol{a} + \boldsymbol{b}$.	[1] $\overrightarrow{LK} = \overrightarrow{LM} + \overrightarrow{MN} + \overrightarrow{NK}$
	$\overrightarrow{LK} = -2\boldsymbol{a} + 2\boldsymbol{a} + 2\boldsymbol{b} + 3\boldsymbol{a} + \boldsymbol{b}$ $\overrightarrow{LK} = 3\boldsymbol{a} + 3\boldsymbol{b}$	[1] Vector representing L to K in its simplest form
4(b)	$\overrightarrow{LP} = \frac{1}{3}(3\boldsymbol{a} + 3\boldsymbol{b})$	[1] Vector representing L to P
	$\overrightarrow{LP} = \boldsymbol{a} + \boldsymbol{b}$	[1] Simplifying
	$\overrightarrow{MP} = \overrightarrow{ML} + \overrightarrow{LP} = 2\boldsymbol{a} + \boldsymbol{a} + \boldsymbol{b}$	[1] Vector representing M to P
	$\overrightarrow{MP} = 3\boldsymbol{a} + \boldsymbol{b} = \overrightarrow{NK}$	[1] Showing M to P is the same as N to K
5(a)	$-a + b$	[1] Vector representing B to C
5(b)	$-2a$	[1] Vector representing D to E
5(c)	$-2a + b$	[1] Vector representing D to E
5(d)	$a + b$	[1] Vector representing D to E
6	$\overrightarrow{DA} = 4\boldsymbol{b}$	[1] Magnitude of 4
	$\overrightarrow{BE} = 2\boldsymbol{a}$	[1] Vector representing B to E
	$\therefore \overrightarrow{AE} = 5\boldsymbol{a}$	[1] Vector representing A to E
	$\overrightarrow{DE} = 4\boldsymbol{b} + 5\boldsymbol{a}$	[1] Vector representing D to E

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7(a)	$-a+b$	[1] Vector representing B to C
7(b)	$\overrightarrow{(AC)} = \overrightarrow{(CE)} = b$	[1] Vector representing C to E
	$\overrightarrow{(DE)} = \frac{1}{4}\overrightarrow{(CE)} = \frac{1}{4}\ b$	[1] Vector representing D to E
	$\overrightarrow{(CD)} = \overrightarrow{(CE)} - \overrightarrow{(DE)} = b - \frac{1}{4}\ b = \frac{3}{4}\ b$	[1] Vector representing C to D
	$\overrightarrow{(DB)} = \overrightarrow{(DC)} + \overrightarrow{(CB)} = -\frac{3}{4}\ b - b + a = -\frac{7}{4}\ b + a$	[1] Vector representing D to B
8	$\overrightarrow{BC} = -2\boldsymbol{a} + \boldsymbol{3b}$	[1] Vector representing B to C
	$\overrightarrow{BD} = -\frac{\boldsymbol{a}}{2} + \frac{3}{4}\boldsymbol{b}$	[1] Vector representing B to D
	$\overrightarrow{AD} = 2\boldsymbol{a} - \frac{\boldsymbol{a}}{2} + \frac{3}{4}\boldsymbol{b} = \frac{3}{2}\boldsymbol{a} + \frac{3}{4}\boldsymbol{b}$	[1] Vector representing A to D
	$\overrightarrow{AE} = \frac{1}{2}(\frac{3}{2}\boldsymbol{a} + \frac{3}{4}\boldsymbol{b})$	[1] Vector representing A to E
	$= \frac{3}{4}\boldsymbol{a} + \frac{3}{8}\boldsymbol{b} = \frac{3}{4}(\boldsymbol{a} + \frac{\boldsymbol{b}}{2})$	[1] Simplification not required
9(a)	$2a - 3b$	[1] $\overrightarrow{DC} = \overrightarrow{DA} + \overrightarrow{AC}$
9(b)	$AD:BE:CF\ =\ 3:2:2$ $AD:BE:CF\ =\ 3b:2b:2b$ $CF = 2b$	[1] Ratio finds $\overrightarrow{FC}$
	$\overrightarrow{(FD)} = \overrightarrow{(FC)} + \overrightarrow{(CB)} + \overrightarrow{(BA)} + \overrightarrow{(AD)}$ $= -2b - a - a + 3b$ $= -2a + b$	[1] Final answer
9(c)	$\overrightarrow{(DE)} = -3b + a + 2b$ $= a - b$	[1] Vector representing D to E
	$\overrightarrow{(EX)} = x\overrightarrow{(DE)}$ Need 1 lot of $\overrightarrow{(EX)}$ to reach CF, and gives: $\overrightarrow{(CX)} = \overrightarrow{(XF)} = b$	[1] Comparison
	$CX:XF = 1:1$	[1] Correct Ratio

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10	$\overrightarrow{(AD)}:\overrightarrow{(DY)}:\overrightarrow{(YC)} = 1:1:1$ $\overrightarrow{(AD)} = \overrightarrow{(DY)} = \overrightarrow{(YC)} = a$ $\overrightarrow{(BC)} = \overrightarrow{(BD)} + \overrightarrow{(DY)} + \overrightarrow{(YC)}$ $= -(3b - a) + a + a$ $= a - 3b + a + a$ $= 3a - 3b$ $= 3(a - b)$	[1] Find vector B to C
	$\overrightarrow{(AB)} = \overrightarrow{(AD)} + \overrightarrow{(DB)}$ $= a + 3b - a$ $= 3b$ $\overrightarrow{(AX)}:\overrightarrow{(XB)} = 2:1$ $\overrightarrow{(AX)} = 2b$	[1] Find vector A to X
	$\overrightarrow{(XY)} = \overrightarrow{(XA)} + \overrightarrow{(AD)} + \overrightarrow{(DY)} = -2b + a + a$ $= 2a - 2b$ $= 2(a - b)$ BC is a multiply of XY, so they are going in the same direction	[1] Find vector X to Y

END