Topic 18 Vectors and transformations (Pre-TT) [32] MARKSCHEME

1.

Translation by $\begin{pmatrix}4\\-3\end{pmatrix}$	B1 B1	for translation $\begin{pmatrix}4\\-3\end{pmatrix}$

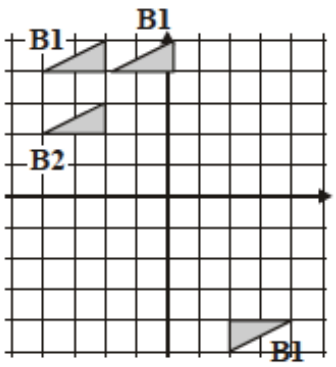
2.

(a) Reflection B1

Must be single transformation

$y = -1$ B1

(b) B2



B2 Fully correct
B1 if 90° clockwise about (0,-1)
B1 if 90° anti-clockwise about (-1,0)
B1 if 90° clock-wise about (0, 1)

(c) 3 B1

or 3:1 or 6:2

(6, 4) B1

Accept any clear indication eg 6-4 or marked on grid

[6]

3.

(a) **– p + q oe** B1

(b) **2p** B1

(c) SQ = SO+ OQ M1

or SR + RQ or SP + PQ

p + q A1

[4]

4.

$BC = \mathbf{t} - \mathbf{s}$ or $BM = {}^{3}/_{4}\,(\mathbf{t} - \mathbf{s})$ M1

or CB = s – t or CM= ¼ (s – t)

$AM = \mathbf{s} + {}^{3}/_{4}\,(\mathbf{t} - \mathbf{s})$ M1

or AM = t + ¼ (s – t)

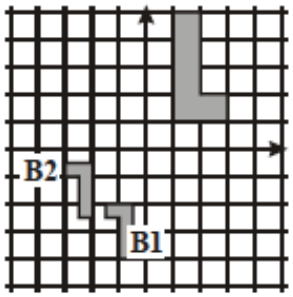
$AM = {}^{1}/_{4}\,\mathbf{s} + {}^{3}/_{4}\,\mathbf{t}$ or $\frac{1}{4}(\mathbf{s} + 3\mathbf{t})$ A1

[3]

5.

M1	states AB as $6\mathbf{b} - 3\mathbf{a}$
M1	for $AX = \frac{1}{3}AB$ or $\frac{1}{3}$"$(6\mathbf{b} - 3\mathbf{a})$" or ft to $2\mathbf{b} - \mathbf{a}$
M1	for $\overrightarrow{CY} = \overrightarrow{CB} + \overrightarrow{BY} = 6\mathbf{b} + 5\mathbf{a} - \mathbf{b}$ $(=5\mathbf{b} + 5\mathbf{a})$
M1	for $\overrightarrow{CX} = 3\mathbf{a} +$ "$2\mathbf{b} - \mathbf{a}$" or $\overrightarrow{CX} = 6\mathbf{b} - \frac{3}{5}$"$(6\mathbf{b} - 3\mathbf{a})$" $(= 2\mathbf{a} + 2\mathbf{b})$
C1	for $\frac{2}{5}\overrightarrow{CY} = \frac{2}{5}(5\mathbf{a} + 5\mathbf{b}) = 2(\mathbf{a} + \mathbf{b}) = \overrightarrow{CX}$

6.



B2 fully correct
B1 for any translation of correct answer.
Alternative scheme.
M1 for "rays' from at least 3 corners through (–1, 0) and attempt at drawing a reduced shape in 3rd quadrant.
A1 if correct shape

B2

[2]

7.

$\overrightarrow{ZY} = -2\mathbf{c} + 2\mathbf{a} + 2\mathbf{b}$ $\overrightarrow{SR} = \mathbf{c} + (-\mathbf{c} + \mathbf{a} + \mathbf{b})$ so $\overrightarrow{SR} = \mathbf{a} + \mathbf{b}$ $\overrightarrow{PQ} = \mathbf{a} + \mathbf{b}$ $\overrightarrow{SR} = \overrightarrow{PQ}$ so they are parallel	**5** 1 AO1.3a 2 AO2.2 2 AO2.4b	**M1** for $\overrightarrow{ZY} = -2\mathbf{c} + 2\mathbf{a} + 2\mathbf{b}$ **M1** for $\overrightarrow{SR} = \mathbf{c} + (-\mathbf{c} + \mathbf{a} + \mathbf{b})$ **M1** for $\overrightarrow{SR} = \mathbf{a} + \mathbf{b}$ **M1** for $\overrightarrow{PQ} = \mathbf{a} + \mathbf{b}$

8.

$\overrightarrow{OB} = \mathbf{b} + \mathbf{a}$ or $\overrightarrow{BO} = -\mathbf{a} - \mathbf{b}$	**B1**		Condone poor vector notation e.g. arrows omitted throughout
$\overrightarrow{OL} = \frac{2}{3}\mathbf{a} + \frac{2}{3}\mathbf{b}$ or $\overrightarrow{LO} = -\frac{2}{3}\mathbf{a} - \frac{2}{3}\mathbf{b}$ or $\overrightarrow{LB} = \frac{1}{3}\mathbf{a} + \frac{1}{3}\mathbf{b}$ or $\overrightarrow{BL} = -\frac{1}{3}\mathbf{a} - \frac{1}{3}\mathbf{b}$	**B3**	Implies previous **B1** **B1** for $\overrightarrow{CM} = -\frac{1}{2}\mathbf{b} + \mathbf{a}$ or $\overrightarrow{MC} = -\frac{1}{2}\mathbf{b} - \mathbf{a}$ **M1** for any correct route to find $\overrightarrow{OL}$, $\overrightarrow{LO}$, $\overrightarrow{LB}$ or $\overrightarrow{BL}$	
$\overrightarrow{OL} = 2\overrightarrow{LB}$ **oe**	**A1** 2 AO2.4b 2 AO3.1b 1 AO3.3	Dependent on **B1** and **B3** Allow use of BO, LO and BL also in conclusion	