01. 0580_m24_ms_22 Q: 6

	$\begin{pmatrix}-10\\3\end{pmatrix}$ final answer	**1**	

02. 0580_m24_ms_22 Q: 15

(a)(i)	reflection $x = -2$	**2**	**B1** for each
(a)(ii)	enlargement [sf] $\frac{1}{2}$ $(-3,-4)$	**3**	**B1** for each
(b)	Image at $(0,3)$, $(-4,3)$, $(-3,-1)$	**2**	**B1** for correct size and orientation, wrong centre

03. 0580_s24_ms_22 Q: 9

(a)	Enlargement [s f] 2 [centre] $(1,-1)$	**3**	**B1** for each
(b)	image at $(-1, 4)(-1, 5)(1, 4)$	**2**	**B1** for translation by $\begin{pmatrix}-4\\k\end{pmatrix}$ **or** $\begin{pmatrix}k\\3\end{pmatrix}$

04. 0580_s24_ms_22 Q: 24

(a)	$\frac{1}{2}\mathbf{b}-\frac{2}{3}\mathbf{a}$	**2**	**B**1 for answer $\frac{1}{2}\mathbf{b}+k\mathbf{a}$ or $j\mathbf{b}-\frac{2}{3}\mathbf{a}$ or correct unsimplified in terms of **a** and **b**
(b)	$\frac{5}{4}\mathbf{b}$	**3**	**M2** for $\overrightarrow{RS}=\frac{1}{4}\mathbf{b}$ oe or $\overrightarrow{MS}=\frac{3}{2}\left(\frac{1}{2}\mathbf{b}-\frac{2}{3}\boldsymbol{a}\right)$ oe or $\overrightarrow{NS}=\frac{1}{2}\left(\frac{1}{2}\mathbf{b}-\frac{2}{3}\boldsymbol{a}\right)$ oe or **M1** for a correct route in terms of vertices and/or **a** and/or **b** or **B**1 for answer $j\mathbf{b}$ where $j>1$ or $\overrightarrow{RS}=\frac{1}{2}\overrightarrow{MQ}$, $\overrightarrow{RS}=\frac{1}{4}\overrightarrow{OR}$, oe $\overrightarrow{NS}=\frac{1}{2}\overrightarrow{MN}$, $\overrightarrow{MS}=\frac{3}{2}\overrightarrow{MN}$ $\overrightarrow{NS}=\frac{1}{3}\overrightarrow{MS}$

05. 0580_s24_ms_23 Q: 19

(a)	Rotation 90° clockwise oe (0, –2)	**3**	**B1** for each
(b)	Triangle at (–5, –1), (–5, –7), (–7, –7)	**2**	**B1** for enlargement s.f. –2 in wrong position

06. 0580_s24_ms_23 Q: 26

	$\frac{4}{3}\mathbf{p} + \frac{2}{3}\mathbf{q}$ oe	**4**	**B3** for correct unsimplified answer or for $\overrightarrow{OR} = \mathbf{p} + \frac{1}{3}\mathbf{q} - \frac{1}{3}\mathbf{p}$ oe or **M2** for $\overrightarrow{PR} = \frac{1}{3}(-\mathbf{p} + \mathbf{q})$ oe or $\overrightarrow{QR} = \frac{2}{3}(-\mathbf{q} + \mathbf{p})$ oe or **M1** for $\overrightarrow{PQ} = -\mathbf{p} + \mathbf{q}$ oe or $\overrightarrow{QP} = -\mathbf{q} + \mathbf{p}$ oe or a correct route from O to S.

07. 0580_m23_ms_22 Q: 2

2(a)	$\begin{pmatrix}-3\\-2\end{pmatrix}$	**1**	
2(b)	$\begin{pmatrix}-2\\6\end{pmatrix}$	**1**	

08. 0580_s23_ms_21 Q: 11

Question	Answer	Marks	Partial Marks
(a)	Enlargement [sf] 2 (0, 7)	**3**	**B1** for each
(b)	Rotation (3, 1) 90° clockwise oe	**3**	**B1** for each

09. 0580_s23_ms_21 Q: 16

Question	Answer	Marks	Partial Marks
(a)	6.4[0] or 6.403...	**2**	**M1** for $(-4)^2 + 5^2$ oe
(b)	$2\mathbf{x} - \mathbf{y}$	**1**	

10. 0580_s23_ms_22 Q: 9

Question	Answer	Marks	Partial Marks
(a)	$\begin{pmatrix}24\\-9\end{pmatrix}$	1	
(b)	$\begin{pmatrix}-4\\32\end{pmatrix}$	1	
(c)	(9, –7)	1	
(d)	37	2	**M1** for $(-12)^2 + 35^2$ oe

11. 0580_s23_ms_22 Q: 10

Question	Answer	Marks	Partial Marks
(a)	Reflection $y = 2$	2	**B1** for each
(b)	Shape at (–2, –2), (–6, –5), (–6, –3), (–4, –2)	2	**B1** for correct size and orientation but wrong position or for rotation of 90° anticlockwise about (–1, 2) or for three correct vertices
(c)	Shape at (0, –2), (0, 2), (–2, 6), (–6, 6)	2	**B1** for correct size and orientation but wrong position or for three correct vertices

12. 0580_s23_ms_23 Q: 8

Question	Answer	Marks	Partial Marks
	Rotation (0,0) oe 90° clockwise oe	3	**B1** for each

13. 0580_s23_ms_23 Q: 12

Question	Answer	Marks	Partial Marks
	$\sqrt{1^2 + (-5)^2}$	**M2**	**M1** for $\begin{pmatrix} 1 \\ -5 \end{pmatrix}$ or $(5-4)^2 + (3-8)^2$ or $\sqrt{e^2 + f^2}$ from *their* $\overrightarrow{OB} = \begin{pmatrix} e \\ f \end{pmatrix}$ or *their* $B = (e, f)$ or only $\sqrt{1 + 25}$
	Correct working leading to 5.09[9..]	**A1**	**Dep.** on **M2** or **M1** for only $\sqrt{1 + 25}$

14. 0580_w23_ms_22 Q: 26

Question	Answer	Marks	Partial Marks
	$\mathbf{b} + \frac{4}{3}\mathbf{a}$	**3**	**B2** for correct unsimplified answer or $\overrightarrow{QX} = \frac{1}{3}\mathbf{a}$ seen or **B1** for a correct route for $\overrightarrow{OX}$ or answer $\mathbf{b} + k\mathbf{a}$ where $k > 1$ or $\overrightarrow{OK} = \mathbf{a} + \frac{3}{4}\mathbf{b}$ seen or $\overrightarrow{QX} = \frac{1}{3}\overrightarrow{OP}$ or $\overrightarrow{OX} = \frac{4}{3} \times \overrightarrow{OK}$

15. 0580_w23_ms_23 Q: 10

Question	Answer	Marks	Partial Marks
(a)	$\begin{pmatrix} 21 \\ -9 \end{pmatrix}$	**1**	
(b)	7.62 or 7.615 to 7.616	**2**	**M1** for $(7)^2 + (-3)^2$ oe If 0 scored **SC1** for 22.8 or 22.84 to 22.85

16. 0580_m22_ms_22 Q: 8

Question	Answer	Marks	Partial Marks
(a)(i)	triangle at (− 1, 1) (− 4, 2) (− 3, 5)	1	
(a)(ii)	triangle at (− 2, −3) (1, − 2) (0, 1)	2	**B1** for translation by $\begin{pmatrix}-3\\k\end{pmatrix}$ or by $\begin{pmatrix}k\\-4\end{pmatrix}$
(b)	enlargement [sf] $\frac{1}{2}$ [centre] (9, − 1)	3	**B1** for each

17. 0580_m22_ms_22 Q: 22

Question	Answer	Marks	Partial Marks
(a)	$\boldsymbol{a}-\frac{2}{5}\boldsymbol{b}$ oe simplified	2	**M1** for $-\boldsymbol{b}+\boldsymbol{a}+\frac{3}{5}\boldsymbol{b}$ or a correct route
(b)	$\frac{5}{2}\boldsymbol{a}$ oe	2	**B1** for $k\mathbf{a}$ where $k>1$ or $\frac{5}{2}\overrightarrow{OR}$

18. 0580_s22_ms_21 Q: 16

Question	Answer	Marks	Partial Marks
	Enlargement [sf] $-\frac{1}{2}$ [centre] (4, 4)	3	**B1** for each

19. 0580_s22_ms_21 Q: 26

Question	Answer	Marks	Partial Marks
	$\frac{5}{3}\mathbf{a} + \frac{1}{3}\mathbf{b}$ final answer	4	**M1** for $\overrightarrow{AK} = -\frac{1}{3}\mathbf{a} + \frac{1}{3}\mathbf{b}$ or $\overrightarrow{BK} = \frac{2}{3}\mathbf{a} - \frac{2}{3}\mathbf{b}$ **M1** for $\overrightarrow{AL}$ (or $\overrightarrow{OK}$) = **a** + *their* $\overrightarrow{AK}$ oe soi or $\overrightarrow{OK}$ (or $\overrightarrow{AL}$) = **b** + *their* $\overrightarrow{AK}$ oe soi or $\overrightarrow{BL}$ = **a** + *their* $\overrightarrow{AK}$ oe soi **M1** for a correct route e.g. $\overrightarrow{OL}$, **a** + $\overrightarrow{AL}$, **b** + $\overrightarrow{BL}$

20. 0580_s22_ms_22 Q: 10

Question	Answer	Marks	Partial Marks
(a)(i)	$\begin{pmatrix}3\\4\end{pmatrix}$	1	
(a)(ii)	$\begin{pmatrix}12\\48\end{pmatrix}$	1	
(b)	5	2	**M1** for $(their3)^2 + (their4)^2$ or better

21. 0580_s22_ms_22 Q: 22

Question	Answer	Marks	Partial Marks
	4 : 3 oe	2	**M1** for $\overrightarrow{AD} = -\frac{4}{7}x + \frac{4}{7}y$ oe or $\overrightarrow{DB} = -\frac{3}{7}x + \frac{3}{7}y$ oe

22. 0580_w22_ms_21 Q: 14

Question	Answer	Marks	Partial Marks
	Rotation (5, 3) 90° clockwise oe	3	**B1** for each

23. 0580_s21_ms_21 Q: 5

Question	Answer	Marks	Partial Marks
(a)	$\begin{pmatrix}14\\-6\end{pmatrix}$	1	
(b)	$\begin{pmatrix}-12\\21\end{pmatrix}$	1	

24. 0580_s21_ms_21 Q: 10

Question	Answer	Marks	Partial Marks
(a)(i)	Rotation 90° anticlockwise oe (0, − 1)	3	**B1** for each
(a)(ii)	enlargement [s.f.] $\frac{1}{3}$ (6, 6)	3	**B1** for each
(b)	triangle at (− 4, 7) (− 4, 1) (− 1, 1)	2	**B1** for translation by $\begin{pmatrix}k\\10\end{pmatrix}$ or $\begin{pmatrix}2\\k\end{pmatrix}$

25. 0580_s21_ms_21 Q: 18

Question	Answer	Marks	Partial Marks
	$\frac{5}{9}\mathbf{a} + \frac{4}{9}\mathbf{b}$	2	**M1** for $\frac{4}{9}$ (**b** – **a**) or $\frac{5}{9}$ (**a** – **b**) or a correct route

26. 0580_s21_ms_23 Q: 10

Question	Answer	Marks	Partial Marks
(a)	Translation $\begin{pmatrix}-1\\-8\end{pmatrix}$	**2**	**B1** for each
(b)	Image at (–1, –1), (–4, –1), (–1, –2)	**2**	**B1** for image correct scale factor and orientation but wrong position or for enlargement scale factor $\frac{1}{2}$ centre (0, 0)

27. 0580_s21_ms_23 Q: 14

Question	Answer	Marks	Partial Marks
	[±] 21	**3**	**M2** for $29^2 - 20^2$ oe or better or **M1** for $20^2 + k^2 = 29^2$ oe

28. 0580_w21_ms_23 Q: 26

Question	Answer	Marks	Partial Marks
	$\frac{3}{5}\mathbf{r} + \frac{2}{5}\mathbf{t}$ or $\frac{1}{5}(3\mathbf{r} + 2\mathbf{t})$	**3**	**M2** for $\mathbf{r} + \frac{2}{5}(-\mathbf{r} + \mathbf{t})$ oe or $\mathbf{t} + \frac{3}{5}(\mathbf{r} - \mathbf{t})$ oe or **M1** for $\overrightarrow{RT} = -\mathbf{r} + \mathbf{t}$ oe or $\overrightarrow{TR} = \mathbf{r} - \mathbf{t}$ **M1** for $\overrightarrow{OR} + \overrightarrow{RX}$ or $\overrightarrow{OT} + \overrightarrow{TX}$ any other correct route.

29. 0580_m20_ms_22 Q: 3

3	$\begin{pmatrix}-4\\3\end{pmatrix}$	**1**	

30. 0580_m20_ms_22 Q: 21

Question	Answer	Marks	Partial Marks
	X, Y and Z are collinear oe	1	Allow in a straight line
	X is the midpoint of ZY oe	1	Allow e.g. $ZY = 2XY$, $ZX = XY$ oe

31. 0580_s20_ms_21 Q: 17

	Answer	Marks	Partial Marks
(a)(i)	$\begin{pmatrix}15\\21\end{pmatrix}$	1	
(a)(ii)	26	2	**M1** for $10^2 + (-24)^2$ or better
(b)	$\mathbf{p} + \frac{3}{4}\mathbf{q}$	2	**M1** for a correct route or for $\overrightarrow{AE} = \frac{3}{4}\mathbf{q}$

32. 0580_s20_ms_22 Q: 18

	Answer	Marks	Partial Marks
	Enlargement [scale factor] $-\frac{1}{2}$ [centre] (3, 4)	3	**B1** for each

33. 0580_s20_ms_23 Q: 21

	Answer	Marks	Partial Marks
(a)(i)	$\mathbf{a} - \mathbf{b}$ or $-\mathbf{b} + \mathbf{a}$	2	**B1** for a correct route or identifying $\overrightarrow{OT}$
(a)(ii)	$\frac{1}{2}\mathbf{a} - \mathbf{b}$ or $-\mathbf{b} + \frac{1}{2}\mathbf{a}$	1	
(b)	$\overrightarrow{PT} = \mathbf{a} - 2\mathbf{b}$ oe	M1	
	$\overrightarrow{PT} = 2\overrightarrow{RV}$ oe	A1	Dep on correct vector RV Accept in words

34. 0580_w20_ms_21 Q: 9

Question	Answer	Marks	Partial Marks
(a)	40×4	1	
(b)	$\sqrt{2^2+(-3)^2}$	1	

35. 0580_w20_ms_21 Q: 23

Question	Answer	Marks	Partial Marks
(a)	$\frac{5}{6}\,\mathbf{m} - \frac{1}{3}\,\mathbf{n}$	3	**B2** for correct unsimplified answer in terms of **m** and **n** e.g. $\frac{1}{3}\,(\mathbf{m}-\mathbf{n}) + \frac{1}{2}\,\mathbf{m}$ or **M1** for a correct route or for $\overrightarrow{FC} = \mathbf{m} - \mathbf{n}$ or $\overrightarrow{CF} = \mathbf{n} - \mathbf{m}$ or better e.g. $\overrightarrow{AC} = \frac{1}{3}\,(\mathbf{m}-\mathbf{n})$
(b)	$\overrightarrow{GH} = 3\overrightarrow{JK}$ oe or $\overrightarrow{GH}$ has a greater magnitude $\overrightarrow{GH}$ and $\overrightarrow{JK}$ are parallel	2	**B1** for each

36. 0580_w20_ms_22 Q: 22

Question	Answer	Marks	Partial Marks
(a)	$-\mathbf{a} + \mathbf{b}$	1	

Question	Answer	Marks	Partial Marks
(b)	$2\mathbf{a} - \frac{1}{2}\mathbf{b}$	3	**B2** for answer $2\mathbf{a} + p\mathbf{b}$ or $q\mathbf{a} - \frac{1}{2}\mathbf{b}$ $q \neq \frac{1}{2}$ or correct unsimplified answer in terms of **a** and **b** or **M1** for $\overrightarrow{AC} = \frac{3}{2}\mathbf{a}$ or $\overrightarrow{OC} = \frac{5}{2}\mathbf{a}$ or correct route If 0 scored **SC1** for answer $\mathbf{a} + \frac{1}{2}\,\mathbf{b}$

37. 0580_m19_ms_22 Q: 8

	Answer	Mark	Partial Marks
	$\mathbf{x} + 7\mathbf{y}$	2	**M1** for a correct route

38. 0580_s19_ms_21 Q: 25

	Answer	Mark	Partial Marks
(a)	$\frac{1}{3}\mathbf{p} - \frac{1}{2}\mathbf{q}$ oe simplified	2	**M1** for a correct unsimplified answer or a correct route
(b)	$\frac{5}{6}\mathbf{p} + \frac{3}{4}\mathbf{q}$ oe simplified	2	**M1** for a correct unsimplified answer or a correct route

39. 0580_s19_ms_22 Q: 23

	Answer	Mark	Partial Marks
(a)	$\frac{5}{3}\mathbf{p} - 2\mathbf{q}$ oe simplified	2	**M1** for correct unsimplified answer or $c\mathbf{p} - 2\mathbf{q}$ or $\frac{5}{3}\mathbf{p} + c\mathbf{q}$ $c \neq 0$ or for a correct route
(b)	$\frac{5}{6}$	2	**B2FT** for $\frac{\textit{their } c}{2}$ if *their* **(a)** is $c\mathbf{p} - 2\mathbf{q}$ oe **M1** for $\overrightarrow{MX} = \frac{5}{6}\mathbf{p} - \mathbf{q}$ or $\overrightarrow{MX} = \frac{1}{2}$ *their* **(a)** or $\overrightarrow{BX} = \frac{1}{2}\overrightarrow{AN}$ or $\mathbf{q} + \frac{1}{2}$ *their* **(a)** or $\mathbf{q} + \overrightarrow{MX} - k\mathbf{p} = 0$ oe

40. 0580_s19_ms_22 Q: 25

	Answer	Mark	Partial Marks
(a)	Rotation 90° clockwise oe (1, 0)	3	**B1** for each
(b)	Enlargement − 2 (0, 2)	3	**B1** for each

41. 0580_s19_ms_23 Q: 22

	Answer	Mark	Partial Marks
(a)	$-\mathbf{s}+\mathbf{t}$	**1**	
(b)	$-\frac{4}{5}\mathbf{s}-\frac{1}{5}\mathbf{t}$ oe simplified	**3**	**M2** for correct unsimplified e.g. $-\mathbf{t}+\frac{4}{5}(-\mathbf{s}+\mathbf{t})$ or $-\mathbf{s}-\frac{1}{5}(-\mathbf{s}+\mathbf{t})$ or **M1** for a correct route e.g. $\overrightarrow{CB}+\overrightarrow{BN}$ or $[\overrightarrow{BN}=]\ \frac{4}{5}(-\mathbf{s}+\mathbf{t})$ or $[\overrightarrow{DN}=]\ -\frac{1}{5}(-\mathbf{s}+\mathbf{t})$

42. 0580_w19_ms_21 Q: 21

	Answer	Mark	Partial Marks
(a)	Translation $\begin{pmatrix}-1\\-5\end{pmatrix}$	**2**	**B1** for each
(b)	Correct reflection at (6, 2), (6, 6), (7, 6), (7, 3)	**2**	**B1** for three correct vertices

43. 0580_w19_ms_21 Q: 25

	Answer	Mark	Partial Marks
(a)	$-\frac{1}{3}\mathbf{q}+\frac{1}{2}\mathbf{p}$ oe	**2**	**M1** for correct unsimplified answer or correct route
(b)	$\frac{1}{2}\mathbf{p}+\frac{1}{2}\mathbf{q}$ oe	**2**	**M1** for correct unsimplified answer or correct route

44. 0580_m18_ms_22 Q: 7

	Answer	Mark	Partial Marks
	$2\mathbf{q}+\mathbf{p}$	**2**	**B1** for $CF = 2(\mathbf{q}+\mathbf{p})$ or $BA = \mathbf{q}+\mathbf{p}$ or $DE = \mathbf{q}+\mathbf{p}$ or $DA = 2\mathbf{q}$ or for correct route

45. 0580_m18_ms_22 Q: 20

	Answer	Mark	Partial Marks
(a)	Rotation [centre] origin oe 90°[anti-clockwise] oe	**3**	**B1** for each
(b)	Enlargement [centre] (0, 3) [sf] – 2	**3**	**B1** for each

46. 0580_s18_ms_22 Q: 22

	Answer	Mark	Partial Marks
(a)	$6\mathbf{a} - 2\mathbf{b}$ or $2(3\mathbf{a} - \mathbf{b})$	**2**	**M1** for $4\mathbf{a} + \mathbf{b} - (-2\mathbf{a} + 3\mathbf{b})$ or better
(b)	$5\mathbf{a} - \mathbf{b}$	**2**	**M1** for a correct route e.g. $\overrightarrow{OD} + \overrightarrow{DE}$, $4\mathbf{a} + \mathbf{b} + \mathbf{a} - 2\mathbf{b}$, $\overrightarrow{OE}$

47. 0580_s18_ms_23 Q: 14

	Answer	Mark	Partial Marks
	$\frac{2}{3}\mathbf{p} + \frac{1}{3}\mathbf{q}$	**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

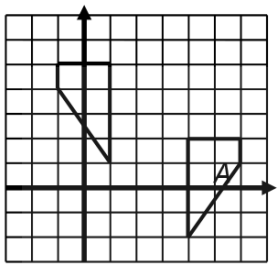
48. 0580_s18_ms_23 Q: 26

	Answer	Mark	Partial Marks
(a)	Enlargement [scale factor] 2 [centre] (7, 0)	**3**	**B1** for each
(b)	Image at (6, 4), (7, 4), (6, 8)	**3**	**B2** for rotation through 90° clockwise but about other point or **B1** for rotation through 90° anticlockwise about any point or for triangle at (6, 4), (7, 4), (6, k)

49. 0580_w18_ms_23 Q: 26

	Answer	Mark	Partial Marks
(a)	$\mathbf{c} + \frac{2}{3}\mathbf{a}$	**2**	**M1** for correct unsimplified form or correct route e.g. $\overrightarrow{OC} + \overrightarrow{CP}$
(b)(i)	$\frac{2}{5}\mathbf{a} + \frac{3}{5}\mathbf{c}$	**2**	**M1** for correct unsimplified form or correct route e.g. $\overrightarrow{OC} + \overrightarrow{CX}$
(b)(ii)	3 : 2 oe	**2**	**B1** for $\overrightarrow{OX} = \frac{3}{5}\overrightarrow{OP}$ oe or $\overrightarrow{XP} = \frac{2}{5}\mathbf{c} + \frac{4}{15}\mathbf{a}$

50. 0580_m17_ms_22 Q: 11

	Answer	Mark	Partial Marks
		**3**	**B2** for correct translation of A seen or **B1** for translation of A by $\begin{pmatrix}-1\\k\end{pmatrix}$ or $\begin{pmatrix}k\\3\end{pmatrix}$ seen and **B1** for correct reflection of their translation in $x = 2$ seen If 0 scored **SC2** for correct TM(A) or **SC1** for reflection in $x = 2$ seen or a correct translation of $\begin{pmatrix}-1\\3\end{pmatrix}$ seen

51. 0580_m17_ms_22 Q: 14

	Answer	Mark	Partial Marks
(a)	Point at (3, 5)	**1**	
(b)	$\begin{pmatrix}1\\-3\end{pmatrix}$	**1FT**	**FT** their $\overrightarrow{AC}$
(c)	$\begin{pmatrix}0\\4\end{pmatrix}$ or $\begin{pmatrix}0\\-4\end{pmatrix}$	**2**	**M1** for a vector of magnitude 4 or of form $\begin{pmatrix}0\\\pm k\end{pmatrix}$

52. 0580_m17_ms_22 Q: 19

	Answer	Mark	Partial Marks
(a)	11.4 or 11.40 to 11.41	**2**	**M1** for $\frac{1}{2}\times 2.8\times 8.3\times \sin 79$ oe
(b)	231 or 230.8 to 231.1	**2FT**	**FT** *their* **(a)** $\times 4.5^2$ **M1** for 4.5^2 or 20.25 seen

53. 0580_s17_ms_21 Q: 18

	Answer	Mark	Partial Marks
(a)	$2\mathbf{a} + \mathbf{b}$	**1**	
(b)	D	**1**	
(c)	$\overrightarrow{CF}$ and $\overrightarrow{BG}$	**2**	**B1** for each

54. 0580_s17_ms_23 Q: 9

	Answer	Mark	Partial Marks
(a)(i)	$\begin{pmatrix} 30 \\ -20 \end{pmatrix}$	**1**	
(a)(ii)	$\begin{pmatrix} -6 \\ 4 \end{pmatrix}$	**1**	
(b)	−4	**1**	

55. 0580_s17_ms_23 Q: 17

	Answer	Mark	Partial Marks
	$\frac{2}{7}\mathbf{p} + \frac{5}{7}\mathbf{q}$	**3**	**M1** for $PZ = \frac{5}{7}(\mathbf{q} - \mathbf{p})$ oe or $QZ = \frac{2}{7}(\mathbf{p} - \mathbf{q})$ oe **M1** for correct route from O to Z or identifying OZ

56. 0580_w17_ms_21 Q: 14

	Answer	Mark	Partial Marks
(a)	(9, −4)	**1**	
(b)	−5	**2**	**M1** for $t^2 + 12^2 = 13^2$ oe or **SC1** for answer 5 or ± 5

57. 0580_w17_ms_21 Q: 16

	Answer	Mark	Partial Marks
	Enlargement	**1**	
	$\frac{1}{3}$	**1**	
	(2, 1)	**1**	

58. 0580_w17_ms_22 Q: 21

	Answer	Mark	Partial Marks
	$\frac{1}{3}\mathbf{a} + \frac{2}{3}\mathbf{b}$ oe simplified	**3**	**B2** for correct unsimplified vector for $\overrightarrow{OK}$ in terms of **a** and **b** or **M1** for a correct route for $\overrightarrow{OK}$ or $\overrightarrow{AB} = -\mathbf{a} + \mathbf{b}$ or $\overrightarrow{BA} = -\mathbf{b} + \mathbf{a}$ or recognition of $\overrightarrow{OK}$ as a position vector

59. 0580_s16_ms_22 Q: 24

	Answer	Mark	Partial Marks
(a)	$\mathbf{a} + \mathbf{b} - \mathbf{c}$	**1**	
(b)	$\frac{1}{2}\mathbf{a} + \frac{1}{2}\mathbf{b} + \frac{1}{2}\mathbf{c}$	**2**	**M1** for $\mathbf{c}$ + ½ (*their* (a)) or for a correct route e.g. $\overrightarrow{OC} + \frac{1}{2}\overrightarrow{CB}$, $\overrightarrow{OQ}$
(c)	$\frac{1}{2}\mathbf{c} - \frac{1}{2}\mathbf{a} - \frac{1}{6}\mathbf{b}$	**2**	**M1** for $\frac{1}{3}\mathbf{b} - \frac{1}{2}$ (*their* (a)) or other correct route e.g. $-\frac{2}{3}\mathbf{b} - \mathbf{a}$ + *their* (b), $\overrightarrow{PO} + \overrightarrow{OQ}$

60. 0580_s16_ms_23 Q: 9

	Answer	Mark	Partial Marks
	$\frac{1}{4}\mathbf{a} - \frac{1}{4}\mathbf{b} - \frac{1}{4}\mathbf{c}$ oe	**2**	**B1** for $\overrightarrow{GK} = \mathbf{a} - \mathbf{b} - \mathbf{c}$ oe soi or $\overrightarrow{GL} = \frac{1}{4}(\overrightarrow{GK})$ or for any correct route

61. 0580_w16_ms_22 Q: 16

	Answer	Mark	Partial Marks
(a)	$\begin{pmatrix}-7\\3\end{pmatrix}$	**2**	**M1** for $\overrightarrow{CB}=\begin{pmatrix}-2\\-3\end{pmatrix}$ or for correct route allow e.g. $BA-BC$, $CB+BA$
(b)	7.81 or 7.810….	**2**	**M1** for $\sqrt{(-5)^2+6^2}$

62. 0580_m15_ms_22 Q: 17

	Answer	Mark	Partial Marks
(a)	**b – a**	**2**	**M1** if unsimplified or correct route in terms of P,Q,R,S
(b)	$\frac{5}{8}\mathbf{x}+\frac{3}{8}\mathbf{y}$	**2**	**M1** for a correct route e.g. $OX+XM$ or for $\frac{3}{8}\overrightarrow{XY}$ or $\frac{5}{8}\overrightarrow{YX}$

63. 0580_P15_ms_20 Q: 13

	Answer	Mark	Partial Marks
	(a) $\frac{1}{2}\mathbf{a}+\frac{1}{2}\mathbf{b}$ oe	**2**	**M1** unsimplified or any correct route e.g $\mathbf{a}+\frac{1}{2}$ **(b – a)** or **OA + AC**
	(b) $-1\frac{1}{2}\mathbf{a}+1\frac{1}{2}\mathbf{b}$ oe	**2**	**M1** unsimplified or any correct route e.g. $\mathbf{CD}=1\frac{1}{2}\mathbf{AB}$ or $\mathbf{b}-\mathbf{a}+\frac{1}{2}$ **(b – a)**

64. 0580_s15_ms_21 Q: 14

	Answer	Mark	Partial Marks
(a)	$\mathbf{a} + 2\mathbf{b} - \mathbf{a}$ or $\mathbf{a} - (\mathbf{a} - 2\mathbf{b})$ oe	**1**	
(b)	Parallelogram	**1**	
	PM **equal** and parallel to *QR*	**1**	**SC1** for answer trapezium with reason *PM* parallel to *QR*
	or		
	PM or *PS* parallel to *QR* **and** *MR* found = **a** so 2 pairs of parallel sides		

65. 0580_s15_ms_23 Q: 19

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

66. 0580_w15_ms_21 Q: 3

	Answer	Mark	Partial Marks
	Triangle (3, –2), (4, –2), (4, –1)	**2**	**B1** for movement 2 right or 3 down

67. 0580_w15_ms_22 Q: 4

	Answer	Mark	Partial Marks
	5.83 or 5.830 to 5.831	2	**M1** for $\sqrt{(-3)^2+5^2}$

68. 0580_w15_ms_23 Q: 23

	Answer	Mark	Partial Marks
(a)	$\frac{1}{3}(-\mathbf{a}+\mathbf{b})$ oe	2	**M1** for any correct route eg $AO+OB+\frac{2}{3}BA$ or **B1** for $\overrightarrow{AB} = -\mathbf{a}+\mathbf{b}$ oe
(b)	$\frac{2}{3}\mathbf{a}+\frac{1}{3}\mathbf{b}$ oe simplified	2FT	**FT** *their* **(a)** + **a** simplified only if in terms of **a** and **b**. **M1** for identifying $\overrightarrow{OC}$ as position vector or correct route in any form or for correct unsimplified answer

69. 0580_s14_ms_22 Q: 14

	Answer	Mark	Partial marks
(a)	**p** + **r**	1	
(b)	$\frac{3}{2}$ **p** + $\frac{1}{2}$ **r**	2	**M1** for correct route from *O* to *M* or **M1** for **p** + ½*their*(a)

70. 0580_w14_ms_22 Q: 19

	Answer	Mark	Partial marks
(a) (i)	**c** – **a**	1	
(ii)	$-\frac{1}{3}$ **a** + $\frac{1}{3}$ **c**	3	**M2** for $-\mathbf{a}+\frac{1}{3}(\mathbf{c}+2\mathbf{a})$ **oe** e.g. $-\mathbf{a}+\mathbf{c}+2\mathbf{a}-\frac{2}{3}(\mathbf{c}+2\mathbf{a})$ Or **M1** for a correct route from *A* to *X*
(b)	$\overrightarrow{AC}$ is a multiple of $\overrightarrow{AX}$	1	oe
	and		
	they share a common point [A]	1	oe

71. 0580_w14_ms_23 Q: 14

	Answer	Mark	Partial marks
(a)	$\frac{1}{2}\mathbf{b}-\frac{1}{2}\mathbf{a}$ oe	**2**	**M1** for $\frac{1}{2}(\overrightarrow{AO}+\overrightarrow{OB})$ oe or correct unsimplified route e.g. $\overrightarrow{AO}+\overrightarrow{OB}+\overrightarrow{BP}$ or $-\mathbf{a}+\mathbf{b}+\frac{1}{2}\overrightarrow{BA}=-\mathbf{a}+\mathbf{b}+\frac{1}{2}(\mathbf{a}-\mathbf{b})$
(b)	$\frac{1}{4}\mathbf{a}+\frac{3}{4}\mathbf{b}$ oe	**2**	**M1** for $\overrightarrow{OA}+\overrightarrow{AQ}$ oe or correct unsimplified route

72. 0580_s13_ms_21 Q: 20

		Answer	Mark	Partial marks
(a)	**(i)**	$\mathbf{p}+\frac{1}{2}\mathbf{r}$	**1**	
	(ii)	$2\mathbf{p}+\mathbf{r}$	**1ft**	2 × *their* (i)
(b)		Midpoint of *R*Q	**1**	

73. 0580_s13_ms_23 Q: 19

		Answer	Mark	Partial marks
(a)		hexagon	**1**	
(b)	**(i)**	$-\mathbf{b}+\mathbf{c}$	**1**	
	(ii)	$\mathbf{b}-\frac{1}{2}\mathbf{c}$	**2**	**B1** for **OB** + **BA** or any correct route
	(iii)	$-\mathbf{b}+\mathbf{c}$	**1FT**	= *their* (b)(i)

74. 0580_w13_ms_21 Q: 16

	Answer	Mark	Partial marks
	(a) $\begin{pmatrix}9\\6\end{pmatrix}$	**1**	
	(b) 10.8 or 10.81 to 10.82	**2FT**	**M1** for $\sqrt{(\textit{their}\ 9)^2+(\textit{their}\ 6)^2}$ **A1** for 10.8 or FT correctly evaluated
	(c) (17, 13)	**1FT**	FT *their* 9 and 6. (8 + *their* 9, 7 + *their* 6) correctly evaluated

75. 0580_w13_ms_22 Q: 19

	Answer	Mark	Partial marks
	(a) $-2\mathbf{a} - 2\mathbf{c}$ oe	**2**	**M1** for $\mathbf{BO} = -\mathbf{a} - \mathbf{c}$ or for any correct route or correct unsimplified expression
	(b) $2\mathbf{a} + \mathbf{c}$	**2**	**M1** for any correct route or correct unsimplified expression
	(c) $-\mathbf{a} - \mathbf{c}$ 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

76. 0580_s12_ms_21 Q: 19

	Answer	Mark	Partial marks
(a)	$-\mathbf{p} + \mathbf{t}$	**1**	
(b)	$\mathbf{p} + 2\mathbf{t}$	**2**	**M1** for a correct route from P to R or unsimplified answer
(c)	$2(\mathbf{p} + \mathbf{t})$ or $2\mathbf{p} + 2\mathbf{t}$	**2ft**	**M1** for **OR** or a correct route or ft $\mathbf{p}$ + their (b) unsimplified provided their (b) is a vector

77. 0580_s12_ms_23 Q: 18

	Answer	Mark	Partial marks
(a)	$\mathbf{p} - \frac{1}{3}\mathbf{q}$ oe	**2**	**M1** $\overrightarrow{QR} + \overrightarrow{RX}$ oe or $-\mathbf{q} + \mathbf{p} + (\frac{2}{3})\mathbf{q}$ oe
(b)	$\frac{1}{2}\mathbf{p} + \frac{5}{6}\mathbf{q}$ oe	**2 ft**	ft $\mathbf{q} + \frac{1}{2}$ their (a) but must be vectors or **M1** for $\overrightarrow{OQ} + \overrightarrow{QM}$ oe

78. 0580_w12_ms_21 Q: 21

	Answer	Mark	Partial marks
	(a) triangle at (1, 1), (1, –1), (2, –1)	**2**	**SC1** triangle at (–1, –1),(–1, 1), (–2, 1)
	(b) triangle at (–1, –1)(1, –1), (1, –2)	**2ft**	correct or reflection of their triangle in $y = -x$
	(c) reflection in the x axis	**2**	**B1** reflection **B1** x axis or $y = 0$

79. 0580_w12_ms_23 Q: 20

	Answer	Mark	Partial marks
	(a) $\frac{1}{3}(\mathbf{c} - \mathbf{d})$ oe	**2**	**M1** for **DC** = **c** – **d** oe or correct route Their **(a)** + **d** simplified
	(b) $\frac{1}{3}\mathbf{c} + \frac{2}{3}\mathbf{d}$ oe	**2ft**	**M1** for any correct route from O to E stated