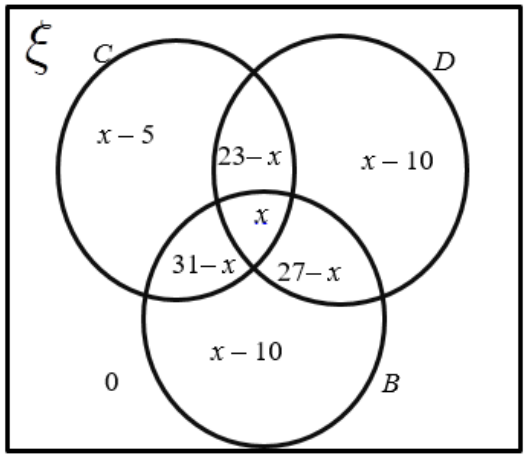
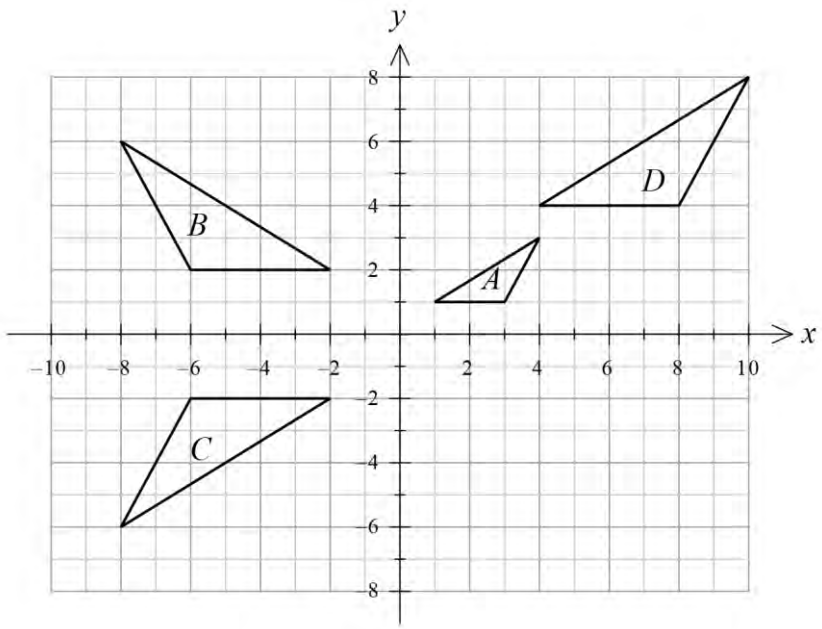
Question	Working	Answer	Mark	Notes
3 (a)	$3a + 5a = 4 - 6$ oe			M1
		$-\frac{1}{4}$	2	A1
(b)	$-3p > 12$ or $-12 > 3p$			M1
		$p < -4$	2	A1
(c)		$w \leqslant 5$	1	B1 allow use of $x \leqslant 5$
(d)		$x \geq -1$ or $x > -1$ and $y \geqslant 0$ or $y > 0$	1	B1 allow $-1 < x < n$ where $n \geq 2$ allow $0 < y < m$ where $m \geq 6$
	$y = -2x + ...$ or $y = ...x + 4$			M1
		$y \leq -2x + 4$ or $y < -2x + 4$ oe	2	A1
				Total 8 marks

Question	Working	Answer	Mark	Notes
4 (a)		x, $23 - x$, $31 - x$, $27 - x$ $x - 5$, $x - 10$, $x - 10$ 0	3	B1 B1 B1
(b)	$x + 56 = 75$			M1ft
		19	2	A1
(c)(i)	17		1	B1ft their "27" – " 10"
(ii)	44		1	B1ft $2x -$"5"+"31"–"20
(d)	$\frac{"19"-5}{49}$			M1 denominator of 49, numerator < 49
		$\frac{14}{49}$	2	A1ft oe (0.2857... allow 2dp truncated or rounded)
				Total 9 marks

Question	Working	Answer	Mark	Notes
5 (a)	Factorising into 2 brackets			M1 When multiplied out it must give at least 2 of the 3 terms correct
		$(x+6)(x-1)$	2	A1
(b)	$\frac{4(x+3)-5(2x-2)}{20}$ or $\frac{x+3}{5}-\frac{x-1}{2}$			M1
	$\frac{4x+12-10x+10}{20}$ or $\frac{2x+6-5x+5}{10}$			M1
		$\frac{-3x+11}{10}$	3	A1oe
				Total 5 marks

Question	Working	Answer	Mark	Notes
				
6 (a)		Triangle *A*	1	B1
(b)	$\begin{pmatrix} -2 & 0 \\ 0 & 2 \end{pmatrix}\begin{pmatrix} 1 & 3 & 4 \\ 1 & 1 & 3 \end{pmatrix}$			M1
	$\begin{pmatrix} -2 & -6 & -8 \\ 2 & 2 & 6 \end{pmatrix}$			A1
		Triangle *B*	3	A1
(c)		Triangle *C*	1	B1

Question	Working	Answer	Mark	Notes
(d)	$\mathbf{N}=\begin{pmatrix}1 & 0\\ 0 & -1\end{pmatrix}\begin{pmatrix}-2 & 0\\ 0 & 2\end{pmatrix}=\begin{pmatrix}-2 & 0\\ 0 & -2\end{pmatrix}$ Or $A\to C$ is an enlargement with centre O and scale factor -2 so that $\begin{pmatrix}1\\0\end{pmatrix}\mapsto\begin{pmatrix}-2\\0\end{pmatrix}$ and $\begin{pmatrix}0\\1\end{pmatrix}\mapsto\begin{pmatrix}0\\-2\end{pmatrix}$			M1 Allow M1 for $\begin{pmatrix}0 & -2\\ -2 & 0\end{pmatrix}$
		$\begin{pmatrix}-2 & 0\\ 0 & -2\end{pmatrix}$	2	A1
(e)	Rotation 180º about any point			M1
		Triangle D	2	A1
(f)		Enlargement	1	B1
		SF $\frac{1}{2}$	1	B1
		centre (–2, –2)	1	B1
				Total 12 marks

Question	Working	Answer	Mark	Notes
7 (a)		$5 < t \leq 8$	1	B1
(b)	$2.5\times10+6.5\times8+9\times5+12.5\times3+22.5\times2$ $(=204.5)$			M2 for at least 4 correct products added OR (M1 for use of a value within interval (incl. end points) for at least 4 products, which must be added).
	$\frac{"204.5"}{28}$			M1(dep) on at least M1
		awrt 7.3	4	A1
(c)		Bar drawn height 30 little squares	1	B1
(d)		$\frac{5}{35}$ oe	1	B1 (0.14(28571...) or 14(.28571)%)
				Total 7 marks

Question	Working	Answer	Mark	Notes
8	5010, 4990, 10100, 9900, 33.5, 34.5, 68.5, 67.5			M1 at least 1 from each row.
	Colin $\frac{10100}{67.5}$ or $\frac{10.1}{67.5}$			A1
	Jenny $\frac{4990}{34.5}$ or $\frac{4.99}{34.5}$			A1
	$\frac{\left(\frac{10100}{67.5}-\frac{4990}{34.5}\right)\times 60}{1000}$			M1
		0.2995 (km/h)	5	A1
				Total 5 marks

Question	Working		Answer	Mark	Notes
9 (a)	$8y^2 - ... = 400$ **or** $...-2x^2 = 400$ **or** $2y(4y - x) + ... = 400$ **or** $... + x(2y - x) = 400$				M1
	$4y^2 - x^2 = 200$				A1cso
	$10y + 2x + 5 = 2y$ therefore $2y = 2x + 5$			3	B1cso
(b)	$(2x+5)^2 - x^2 = 200$	$4y^2 - \left(\frac{2y-5}{2}\right) = 200$			M1
	$3x^2 + 20x - 175 = 0$	$12y^2 + 20y - 825 = 0$			M1 Rearranging correctly to get a 3 term quadratic
	$(3x+35)(x-5)=0$ $\frac{-20 \pm \sqrt{20^2 - 4\times3\times-175}}{2\times3}$ $3[(x+\frac{20}{6})^2 - (\frac{20}{6})^2] - 175$	$(2y-15)(6y+55)=0$ $\frac{-20 \pm \sqrt{20^2 - 4\times12\times-825}}{2\times12}$ $12[(y+\frac{20}{24})^2 - (\frac{20}{24})^2] - 825$			M1 dep on M1 for solving their quadratic equation using any correct method - if factorising, allow brackets which expanded give 2 out of 3 terms correct (if using formula or completing the square allow one sign error and some simplification – allow as far as eg $\frac{-20 \pm \sqrt{400+2100}}{6}$ or eg $3\left(x+\frac{20}{6}\right)^2 - \frac{625}{3}$)

	$x = 5$	$y = 7.5$			A1 one correct result for x or for y (ignore negative value for this mark)
	$y = \frac{2 \times "5" + 5}{2}$	$x = \frac{2 \times "7.5" - 5}{2}$			M1
			$x = 5$ and $y = 7.5$	5	A1 dep on M2 (positive values only)
					Total 8 marks

Question	Working	Answer	Mark	Notes
10 (a)	$3\times\left(\frac{1}{3}\right)^3-7\times\left(\frac{1}{3}\right)^2+5\times\frac{1}{3}-1$			M1
		= 0, $(3x-1)$is a factor	2	A1
(b)	x^2-2x+1			M1
	$(x-1)(x-1)$			M1
		$x=\frac{1}{3}$ or 1	3	A1
(c)	$\frac{dy}{dx}=9x^2-14x+5$			M1
	$(x-1)(9x-5)=0$			M1
		1, $\frac{5}{9}$		A1
	Substituting x values into $y=3x^3-7x^2+5x-1$			M1
		(1, 0) $\left(\frac{5}{9},\frac{32}{243}\right)$	5	A1
(d) (i)		5	1	B1ft (ft $\frac{dy}{dx}$)
(ii)	$y=$ "5"$x-1$			M1
		$y=5x-1$	2	A1oe
				Total 13 marks

Question	Working	Answer	Mark	Notes
11 (a)	SF $\frac{1}{5}$			B1 use or statement of the correct SF
	$\frac{1}{3}(\pi)\times 30^2\times 100-\frac{1}{3}(\pi)\times "6"^2\times 20$ oe			M1
		29760	3	A1
(b)		40800π	1	B1
(c)	$\frac{2}{3}\pi\times 30^3+...$			M1
	g = height of small cone $\frac{2}{3}\pi\times 30^3+$ $\frac{1}{3}\pi\times 30^2\times 108-\frac{1}{3}\pi\times\left(\frac{30}{108}g\right)^2\times g="40800\pi"$ or $0.02\ 572g^3=9\ 600$			M1 Condone $30k^2$ A1 Correct equation
	$g=72$			A1
	$h=30+(108-72)$			M1
		awrt 66	6	A1
Alternate method				
	$V_{\text{hemisphere}}=\frac{2}{3}\pi\times 30^3\ [=18000\pi]$			M1
	$V_{\text{frustrum}}=40800\pi-18000\pi[=22800\pi]$			

	$V_{\text{whole cone}} = \frac{1}{3}\pi \times 30^2 \times 108 \left[= 32400\pi\right]$			
	$V_{\text{top cone}}$ $32400\pi - 22800\pi \left[= 9600\pi\right]$			M1
	$V_{\text{top cone}} : V_{\text{whole cone}} = 9600\pi : 32400\pi$			A1
	$= 8 : 27$			
	$H_{\text{top cone}} : H_{\text{whole cone}} = 2 : 3$			A1
	$\frac{138-h}{108} = \frac{2}{3}$			M1
		awrt 66		A1
				Total 10 marks

Question	Working	Answer	Mark	Notes
12 (a)	$\frac{1}{2}\mathbf{b} \pm \frac{1}{5}\mathbf{a}$			M1
		$-\frac{1}{5}\mathbf{a}+\frac{1}{2}\mathbf{b}$	2	A1
(b)	$\overrightarrow{FC}=\frac{4}{5}\mathbf{a}+2\overrightarrow{AB}$			M1 or $\overrightarrow{EC}=-\frac{1}{2}\mathbf{b}+\mathbf{a}+2\overrightarrow{AB}$
	$\overrightarrow{FC}=$ "$\frac{4}{5}$" $\mathbf{a}+2(\mathbf{b}-\mathbf{a})$			M1 or $\overrightarrow{EC}=-\frac{1}{2}\mathbf{b}+\mathbf{a}+2(\mathbf{b}-\mathbf{a})$
	$\overrightarrow{FC}=2\mathbf{b}-\frac{6}{5}\mathbf{a}$			A1 or $\overrightarrow{EC}=\frac{3}{2}\mathbf{b}-\mathbf{a}$
	$2\mathbf{b}-\frac{6}{5}\mathbf{a}$ is not a multiple of $\frac{1}{2}\mathbf{b}-\frac{1}{5}\mathbf{a}$ therefore F, E and C are not collinear.		4	A1 $\frac{5}{3}\mathbf{b}-\mathbf{a}$ is not a multiple of $\frac{1}{2}\mathbf{b}-\frac{1}{5}\mathbf{a}$ therefore F, E and C are not collinear.
(c)	$\overrightarrow{OG}=\mathbf{a}+m(\mathbf{b}-\mathbf{a})$			M1
	$\overrightarrow{OG}=\frac{1}{5}\mathbf{a}+n\left("-\frac{1}{5}\mathbf{a}+\frac{1}{2}\mathbf{b}"\right)$			M1
	$\left(\frac{1}{5}-\frac{1}{5}n\right)=1-m$ or $m=\frac{1}{2}n$			M1
	$n=\frac{8}{3}$ or $m=\frac{4}{3}$			A1