

Question	Working	Answer	Mark	Notes
4 (a)(i)		$6\mathbf{b} - 6\mathbf{a}$	1	B1 oe
(ii)		$6\mathbf{b} - 3\mathbf{a}$	1	B1 oe
(iii)		$2\mathbf{b} - \mathbf{a}$	1	B1 oe
(b)	$\overrightarrow{ON} = \mu(5\mathbf{a} + 2\mathbf{b})$ or $\overrightarrow{ON} = 6\mathbf{b} + n\mathbf{a}$			M1
	$\overrightarrow{ON} = \mu(5\mathbf{a} + 2\mathbf{b})$ and $\overrightarrow{ON} = 6\mathbf{b} + n\mathbf{a}$			M1
	$n = 15$ oe.e.g. $3(5\mathbf{a} + 2\mathbf{b})$			M1
		$6\mathbf{b} + 15\mathbf{a}$	4	A1
(c)	for sides in ratio 1 : 2 oe			M1
	$2^2 \times 12$			M1
		48	3	A1

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5 (a)		Enlargement, scale factor 0.5, centre (−6, 0)	3	B1 Enlargement (not stretch) B1 scale factor 0.5 B1 centre of enlargement (−6, 0)
(b)	$\begin{pmatrix} -1 & 0 \\ -3 & -1 \end{pmatrix} \begin{pmatrix} -1 & -1 & -2 \\ 1 & 3 & 1 \end{pmatrix} = \begin{pmatrix} 1 & 1 & 2 \\ 2 & 0 & 5 \end{pmatrix}$	<i>C</i> correctly plotted	3	B2 for all points correctly calculated (may be in any order) B1 for 2 correctly calculated coordinates B1 for correctly plotting <i>C</i>
(c)	$\begin{pmatrix} 3 & -1 \\ -1 & 0 \end{pmatrix} \begin{pmatrix} 1 & 1 & 2 \\ 2 & 0 & 5 \end{pmatrix} = \begin{pmatrix} 1 & 3 & 1 \\ -1 & -1 & -2 \end{pmatrix}$	<i>D</i> correctly plotted	3	B2 for all points correctly calculated (ft (b)) B1 for 2 correctly calculated coordinates B1 for correctly plotting <i>D</i>
(d)		Reflection in $y = x$	2	NB: If not a single transformation then B0B0 B1 reflection B1 in $y = x$ (must be true for their triangle <i>B</i> and triangle <i>D</i>)

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6 (a)			3	B3 fully correct B2 for 6 or 7 correct entries B1 for 3, 4 or 5 correct entries Allow 4,3 and 11 instead of $11-x, x-4, 18-x$.
(b)	$11-x+x-4+18-x+3+4+2+3+5=35$	7	2	M1 Sum of all their 8 values = 35 or “their 3” + “their 4” A1
(c)(i)		19	2	B1ft
(ii)		10		B1 ft
(d)		$\frac{5}{14}, \frac{3}{9}, \frac{1}{5}$	2	B2 for all of $\frac{5}{14}, \frac{3}{9}, \frac{1}{5}$ B1 for 1 correct
(e)	$\frac{9}{14} \times \frac{6}{9} + \frac{5}{14} \times \frac{4}{5}$ oe	$\frac{5}{7}$	2	M1 Correct method using their prob from tree diagram DO Not ISW A1 oe allow 0.71 or better

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7 (a)		The angle between a <u>radius</u> and a <u>tangent</u> is <u>90°</u>	1	B1 Oe
(b)	e.g. $\tan 27^\circ = \frac{OC}{12}$ or $\tan 63^\circ = \frac{12}{OC}$ $OC = 12 \tan 27^\circ$ or $OC = \frac{12}{\tan 63^\circ}$ (=6.11..)			M1 for correct use of trig
	$0.5 \times 12 \times 12 \tan 27^\circ$ oe	36.7 cm ²	4	M1 correct equation for <i>OC</i> M1 A1 awrt 36.7 /36.8
(c)	$AOC = 126^\circ$ or <i>DOC</i> and <i>DOA</i> both marked or stated as 63°			M1 0.5×126
	for <u>angles</u> in a <u>triangle</u> total 180° , $EOC = AOE$ as $AO = CO$, $EA = EC$ and EO is a common side and <u>angle at centre</u> is twice angle at <u>circumference</u> . oe	63° Correct reasons for their method	4	A1 B2 (B1 for one correct reason)
(d)	$180 - "63"$ or $0.5 \times (360 - 2 \times "63")$	117°	2	M1 $180 - \text{their (c)}$ A1
(e)	<div> <div> $OCB = 90 - 59$ (31) </div> <div> $BAC = 59$ $OAC = (180 - 2 \times "63") \div 2$ (=27) </div> <div> $reflex AOC = 360 - 2 \times "63"$ (=234) $OCB = 90 - 59$ (=31) </div> </div> <div> $BAO = "63" - 31$ </div> <div> $BAO = 59 - "27"$ </div>	$360 - "63" - "234" - "31"$		M1 1 of the angles. May be on diagram M1
		32°	3	A1

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8	$2(3 + 2y)^2 + y^2 = 6 \text{ or } 2x^2 + \left(\frac{x-3}{2}\right)^2 = 6$ <p>e.g. $2(9 + 12y + 4y^2) + y^2 = 6$ or</p> $2x^2 + \frac{x^2 - 6x + 9}{4} = 6$ <p>e.g. $9y^2 + 24y + 12 (= 0)$ or $9x^2 - 6x - 15 (=0)$</p> <p>$(3y + 2)(y + 2) (=0)$ $(3x - 5)(x + 1) (=0)$</p>	$x = \frac{5}{3}, y = -\frac{2}{3}$ $x = -1, y = -2$	6	<p>M1 for correct substitution for x or y</p> <p>M1 for correct expansion in correct equation</p> <p>M1 for correct 3 term quadratic dep on M1(one of the 2 above)</p> <p>M1 Solving 3 term quadratic .For correct factorising or correct use of formula or completing the square.</p> <p>A1 for correct x or y values</p> <p>A1 for all 4 values correctly paired</p>

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9	<p>eg $(3 \times 5 + 2 \times 15 + 3.6 \times 10 + 0.6 \times 20 + 1.7 \times 10)$ or $(6 \times 5 + 4 \times 15 + 7.2 \times 10 + 1.2 \times 20 + 3.4 \times 10)$ or $(30 \times 5 + 20 \times 15 + 36 \times 10 + 6 \times 20 + 17 \times 10)$</p> <p>$(3 \times 5 + 2 \times 15 + 3.6 \times 10 + 0.6 \times 20 + 1.7 \times 10) [= 110]$ or $(6 \times 5 + 4 \times 15 + 7.2 \times 10 + 1.2 \times 20 + 3.4 \times 10) [= 220]$ or $(30 \times 5 + 20 \times 15 + 36 \times 10 + 6 \times 20 + 17 \times 10) [= 1100]$</p> <p>freq of 30 – 50 bar = $20 \times 2.4 [= 48]$ or freq of 50 – 60 bar = $10 \times 6.8 [= 68]$ or freq of 45 – 50 = $5 \times 2.4 [= 12]$</p> <p>$\frac{"80"}{440} \times \frac{"80"-1}{439}$</p>	0.0327	5	<p>M1 for use of area of bar, showing at least 2 products or for statement such as 44 blocks of 25 squares or 11 blocks of 100 squares. Allow 44 squares. Implied by following Method mark</p> <p>M1 for complete method to find total area of bars or for $>45 = \frac{8}{44}$ or $\frac{2}{11}$ or for FD scale of 1cm = FD of 2 , 0.4 [per small square] oe</p> <p>M1 for correct method to find frequency of 30-50 or 50-60 bar or 45 – 50 or for $\frac{8}{44} \times 440$ or $\frac{2}{11} \times 440$ oe</p> <p>M1 oe</p> <p>A1 0.032718989..., $\frac{158}{4829}$ awrt 0.0327</p>

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10 (a)	$8x^2 + 8xy = 240$	$8x^2 + 8xy = 240$ $x^2 + xy = 30$ $x^2 + xy - 30 = 0$	2	M1 A1 cso Completely correct rearrangement
(b)	(volume =) $4x^2y$ $y = \frac{30 - x^2}{x}$ (volume =) $4x^2 \times (\frac{30 - x^2}{x}) = 120x - 4x^3$ $\frac{dy}{dx} = 120 - 12x^2 = 0$			M1 Correct volume M1 Finding y in terms of x allow 1 sign error M1 Subst y into Volume
		$\sqrt{10}$	5	M1 Multiplying out and Differentiating one term correct A1 Must be exact

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11 (a)		$\frac{25}{3}$	1	B1 oe
(b)		50	1	B1
(c)	$\frac{x}{3x-25} = 7$ and $7(3x-25) = x$ e.g. $21x - x = 175$	8.75	3	M1 for $h = 7$ and for getting rid of denominator M1 collecting terms in x on one side and number terms the other in correct equation A1 oe
(d)	$g(4) = 11$	1.375	2	M1 $hg(x) = \frac{2x+3}{3(2x+3)-25}$ A1 oe
(e)	$y(3x-25) = x$ or $x(3y-25) = y$ $3xy - x = 25y$ or $3xy - y = 25x$ oe	$h^{-1}: x \mapsto \frac{25x}{3x-1}$	3	M1 for $y =$ or $x =$ and first stage of rearrangement. M1 for collecting terms in x or y (as appropriate) on the same side. A1 $\frac{25x}{3x-1}$
(f)	$[fg(x) =] (2x+3)^2 + 3(2x+3) - 4$ $4x^2 + 18x + 14 (= 0)$ oe $2(2x+7)(x+1) (= 0)$	-3.5, -1	4	M1 $fg(x)$ correct or $x^2 + 3x - 4 = 0$ oe M1 Allow for $g(x) = 1$ or $g(x) = -4$ M1 a correct method to solve their quad or for $2x+3 = 1$ and $2x+3 = -4$ A1 both answers