Question	Working	Answer	Mark	AO		Notes
1	7800 ÷ 9.75 or 7800 ÷ 585 × 60			AO2	M2	M1 for 7800 ÷ 9.45 or 7800 ÷ 585 or 13.3....
		800	3		A1	
2	28÷ (6 − 4) (=14)			AO1	M1	or use of cancelled ratios (e.g. 3 : 6 : 4 = 0.75 : 1.5 : 1)
	'14' × 3 (=42)				M1 (dep)	28÷0.5(=56) or cancelled ratios, (e.g. 56×0.75) or M2 for $28 \div \frac{2}{3}$ oe
		42	3		A1	
3 **a**		$25 < d \leq 30$	1	AO3	B1	B1 identifies 25 → 30 class
b	(12 × 2.5) + (6 × 7.5) + (4 × 12.5) + (6 × 17.5) + (14 × 22.5) + (18 × 27.5) **or**			AO3	M2	M1 for frequency × consistent value within interval
	30 + 45 + 50 + 105 + 315 + 495 **or** 1040					NB. Products do not need to be added
	'1040' ÷ 60					Condone one error
					M1	
		$17\frac{1}{3}$	4		A1	accept 17.3(33…)
c				AO3	M1	for $\frac{a}{60}$ with $a < 60$ **or** $\frac{32}{b}$ with $b > 32$
		$\frac{32}{60}$ oe	2		A1	

Question	Working	Answer	Mark	AO		Notes
4	**Working with all 12 boxes** 12×15 (=180) **or** 12×12 (=144) $12 \times 12 \times \frac{3}{4} \times 1.6$ oe (=172.8) $12 \times 15 \times 1.15$ oe (=207) **or** 180×0.15 oe (=27) $\frac{'207' - '172.8'}{36}$ **or** $\frac{34.2}{36}$ **or** $\frac{'27' + ('180' - '172.8')}{36}$	0.95	5	AO1	M1 M1 M1 M1 A1 cao	for correct total cost or correct total number of melons (either may appear as part of another calculation) for revenue from all full price melons sold for total revenue or total profit dep on M3
	Alternative – working with one box $15 \div 12$ (=1.25) **or** $12 \times \frac{3}{4}$ (=9) $12 \times \frac{3}{4} \times 1.6$ oe (=14.4) 15×1.15 (=17.25) $\frac{'17.25' - '14.4'}{3}$ **or** $\frac{2.85}{3}$	0.95	5		M1 M1 M1 M1 A1 cao	for price of 1 melon **or** number of full price melons for revenue from all full price melons sold for total revenue from one box dep on M3

Question	Working	Answer	Mark	AO	Notes
5	Circular arc, centre B, to intersect both lines AB and BC Equal length arcs, from intersections on each line, meeting to give a point on the bisector	correct bisector	2	AO2	M1 A1 dep on M1 Full construction shown.
6 a		$9e^2f(2e + 5f^3)$	2	AO1	M1 Any correct partially factorised expression A1
b	$(x \pm 6)(x \pm 2)$ $(x - 6)(x + 2)$	6, −2	3	AO1	M1 or correct substitution into quadratic formula (condone one sign error) M1 or $\frac{4 \pm \sqrt{64}}{2}$ A1 dep. on at least M1
7	$\cos 35 = \frac{PR}{17.6}$ $17.6 \times \cos 35$	14.4	3	AO2	M1 M1 A1 14.4 ~ 14.42
8	22.50 ÷ 15 (=1.5) **or** 100 ÷ 15 (=6.6….) "1.5" × 100 (=150) **or** "6.6…" × 22.5(0)	150	3	AO1	M1 M1 dep } M2 for 22.5 ÷ 0.15 A1

Question		Working	Answer	Mark	AO	Notes	
9	**a**		140 000	1	AO1	B1	
	b		Mars	1	AO1	B1	
	c	$1.2 \times 10^5 - 5 \times 10^4$ **or** 120000 – 50000 **or** 70000 oe			AO1	M1	
			7×10^4	2		A1	
	d	$3.5 \times 10^3 : 1.4 \times 10^6$			AO1	M1	
			1 : 400	2		A1	
10		$\sqrt{9.5^2 - 7.6^2}$ **or** $\sqrt{90.25 - 57.76}$ **or** $\sqrt{32.49}$ **or** $\sqrt{32.5}$			AO2	M1	
		$(BC =)$ 5.7				A1	
		$\frac{1}{2} \times 7.6 \times$"5.7" **or** 21.6(6) **or** 21.7				M1	dep on first M1
							or e.g. $ACB = \sin^{-1}\left(\frac{7.6}{9.5}\right) (= 53.1...)$ **and** $\frac{1}{2} \times 9.5 \times$"5.7" $\times \sin$"53.1"
		$\frac{1}{2} \times \pi \times \left(\frac{\text{"5.7"}}{2}\right)^2$ **or** 12.7(587...) **or** 12.8				M1	dep on first M1
			34.4	5		A1	for answer rounding to 34.4 ($\pi \rightarrow$ 34.4187... 3.14 $\rightarrow$ 34.4123...)

Question	Working	Answer	Mark	AO		Notes
11	e.g. $(x^2 + 5x – 3x – 15)(x + 3)$ **or** $(x^2 + 2x – 15)(x + 3)$ **or** $(x – 5)(x^2 + 3x – 3x – 9)$ **or** $(x – 5)(x^2 – 9)$			AO1	M1	expansion of any two of the three brackets – at least 3 correct terms
	E.g. $x^3 + 3x^2 + 2x^2 + 6x – 15x – 45$ **or** $x^3 + 5x^2 – 9x – 45$				M1	(dep) ft for at least 3 correct terms in second expansion
		$x^3 + 5x^2 – 9x – 45$	3		A1	
12 **a**	14 16 17 18 20 21 22 23 23 24 24 (14 16 17 18 20 <u>21</u> 22 23 23 24 24) (14 16 <u>17</u> 18 20) and (22 23 <u>23</u> 24 24) 23 - 17			AO3	M1	arrange in order **or** One of 21(median), 17(LQ), 23(UQ) identified
					M1	Identify any **two** of 21, 17 and 23
		6	3		A1 cao	
b		Carmelo **and** reason using IQR	1	AO3	B1	ft from (a) Carmelo - he has a lower IQR oe (IQR must be part of the statement)

Question	Working	Answer	Mark	AO		Notes
13 **a**	$m = \frac{5-2}{-3-1}$ **or** $-\frac{3}{4}$ oe			AO1	M1	for gradient
	eg. $2 = -\frac{3}{4} \times 1 + c$ **or**				M1	for method to find c
	$y - 2 = -\frac{3}{4}(x-1)$					
	$y = -\frac{3}{4}x + \frac{11}{4}$				M1	found values of m and c substituted in $y = mx + c$
		$3x + 4y = 11$	4		A1	
b	$y = \frac{1-2x}{6}$ **or** $m = -\frac{1}{3}$ oe			AO1	M1	
		shown	2		A1	for conclusion from correct gradients
14	26÷20 (=1.3) **or**			AO3	M1	Any one frequency density (without contradiction) or,
	3.6×10 or 3.3×10 or 1×30 **or**					e.g. $1\text{cm}^2 = 5$ **or**
	36 or 33 or 30 **or** $\frac{26}{130}\left(=\frac{1}{5}\right)$					clear association of area with frequency
	26 + 3.6×10 + 3.3×10 + 1×30 **or**				M1	Any fully correct complete method;
	26 + 36 + 33 + 30 **or** $625 \times \frac{1}{5}$ **or**					condone one error in bar width or bar height
	$(130+180+165+150) \times \frac{1}{5}$					
		125	3		A1	

Question		Working	Answer	Mark	AO		Notes
15	**a**	$(3x + 2)(2x + 1) = 100$			AO1, AO2	M1	or $(2x \times 3x) + 2(2x + 1) + 3x = 100$ oe or $(2x \times 3x) + (2 \times 2x\ (\times 1)) + 1) + 3x + 1 + 1 = 100$ oe other partitions are acceptable but partitioning must go on to form a correct equation.
			$6x^2 + 7x - 98 = 0$ *	2		A1	Accept $6x^2 + 7x + 2 = 100$ if M1 awarded * Answer given
	b	$(3x + 14)(2x - 7)\ (= 0)$			AO1	M2	or $(x =)\dfrac{-7 \pm \sqrt{49 + 2352}}{12}$ or $(x =)\dfrac{-7 \pm \sqrt{2401}}{12}$ If not M2 then M1 for $(3x \pm 14)(2x \pm 7)$ or $(x =)\dfrac{-7 \pm \sqrt{7^2 - 4 \times 6 \times -98}}{2 \times 6}$
		$x = 3.5$				A1	Dependent on at least M1 Ignore negative root
		(Area =) $6 \times$ '3.5'^{2} or $(3 \times$ '3.5'$) \times (2 \times$ '3.5'$)$				M1 ft	Dependent on at least M1 and x > 0
			73.5	5		A1	

Question	Working	Answer	Mark	AO		Notes
16	$180 - 77 - 39$ **or** $\angle BAD = 77°$ **and** $\angle ABD = 39°$ **or** $\angle BA''X'' = 64°$ where X is on PA produced **or** a fully correct method to find angle ADB	64	5	AO2	M2 B1 B1 A1	also accept $103 - 39$ M1 for $\angle BAD = 77°$ **or** $\angle ABD = 39°$ (angles may be stated or marked on diagram) Opposite angles in a cyclic quadrilateral add up to 180° Alternate segment theorem oe cao
17	41.5 **or** 42.5 **or** 24.5 **or** 23.5 **or** 14.5 **or** 13.5 $(y =)\dfrac{2 \times 41.5}{24.5 - 13.5}$	7.5	3	AO1	B1 M1 A1	 A1 accept $\frac{83}{11}$ or 7.55 or $7.5\dot{4}$ (depending on M1) NB. Answer **must** come from correct working

Question	Working	Answer	Mark	AO		Notes
18	$(x-1)\times\dfrac{(3x+2)}{(x^2-1)}$			AO1	M1	correct method for divsion
	$(x+1)(x-1)$				M1	correct factorisation of x^2-1
	eg $\dfrac{3(x+1)-(3x+2)}{(x+1)}$				M1	correct single fraction
		$\dfrac{1}{x+1}$	4		A1	
19	$130=\pi\times4.5\times l$			AO2	M1	
	$l=\dfrac{130}{4.5\pi}$ or $l=9.1956$				M1	For exact expression or answer which rounds to 9.2
	sin (AVO) = 4.5/"9.20" (= 0.489..)				M1	For a correct expression for sin AVO or cos AVB cos (AVB) = ("9.2"^{2} + "9.2"^{2} – 9^2)/(2 × "9.2" × "9.2") (=0.521...)
		58.6	4		A1	awrt 58.6
20 ai		(0, 5)	1	AO1	B1	
aii		(3, 10)	1		B1	
aiii		(1, 5)	1		B1	
b		translation $\begin{pmatrix}0\\-4\end{pmatrix}$	1	AO1	B1	

Question	Working	Answer	Mark	AO		Notes
21	$\left(\frac{dy}{dx}\right) = 2\times 8x - 2x^{-2}$			AO1	M2	(M1 for one term differentiated correctly)
	$2\times 8x - 2x^{-2} = 0$				M1	dep on M1
	$x^3 = \frac{1}{8}$ or $x = 0.5$ oe				M1	
		(0.5, 6)	5		A1	
22	$\overrightarrow{AE} = \overrightarrow{AD} + \overrightarrow{DE}$ oe			AO2	M1	may be fully or partially in terms of **a** and/or **b**
	eg. $\overrightarrow{DE} = \frac{1}{3}\overrightarrow{DB}$ **or** $\overrightarrow{BE} = \frac{2}{3}\overrightarrow{BD}$				M1	correct use of ratio
	$\overrightarrow{AE} = 2\mathbf{b} + 4\mathbf{a}$				A1	
	$\overrightarrow{BC} = \overrightarrow{BA} + \overrightarrow{AD} + \overrightarrow{DC}$ (=3**b** + 6**a**)				M1	may be fully or partially in terms of **a** and/or **b**
		eg. $\overrightarrow{AE} = 2(\mathbf{b} + 2\mathbf{a})$ **and** $\overrightarrow{BC} = 3(\mathbf{b} + 2\mathbf{a})$	5		A1	**NB** Correct expressions for $\overrightarrow{BC}$ and $\overrightarrow{AE}$ must be given

Question	Working	Answer	Mark	AO	Notes		
23	$a + 3d = 17$ **or** $a + 9d = 35$ **or** $35 - 17 = 6d$			AO1	M1		M1 for $17 = 4p + q$ **and** $35 = 10p + q$
	$d = 3$				A1		$p = 3$ and $q = 5$
	$a = 8$				A1	ft from $d = 3$	$u_1 = 8$ and $u_{50} = 155$
	$\frac{50}{2}(2\times'8'+(50-1)\times'3')$ oe				M1		$\frac{1}{2}\times 50(8+155)$
		4075	5		A1		