Apart from questions 10b, 11, 12, 21, 22 (where the mark scheme states otherwise) the correct answer, unless clearly obtained from an incorrect method, should be taken to imply a correct method.

Question	Working	Answer	Mark	Notes
1 (a)		$12 < d \leq 16$	1	B1
(b)	$2 \times 16 + 6 \times 18 + 10 \times 19 + 14 \times 27 + 18 \times 20$ $= 32 + 108 + 190 + 378 + 360$ (=1068)	10.68	4	M2 $f \times d$ for at least 4 products with correct mid- interval values and intention to add. If not M2 then award M1 for d used consistently for at least 4 products within interval (including end points) and intention to add or for at least 4 correct products with correct mid-interval values with no intention to add
	'1068' ÷ 100			M1 dep on at least M1 Allow division by their $\sum f$ provided addition or total under column seen A1 Accept 10, 10.7 and 11

Question	Working	Answer	Mark	Notes
2	$0.5 \times 6 \times 6 \times 5$ (= 90) $0.5 \times \pi \times 3^2 \times 5$ (=22.5π = 70.6858...) or $\pi \times 3^2 \times 5$ (=45π = 141.37166...) '90' – '70.6858.....'	19.3	4	M1 Correct method for volume of **A** M1 Correct method for volume of **B** or correct volume of cylinder M1 Correct method to find the difference in the volume A1 19 – 19.4
3 (a)		$6n + 4$	2	M1 for $6n + k$ (k may be 0 or absent) oe A1 oe eg $10 + (n – 1)6$ or $n \times 6 + 4$
(b)	...40, 46,... −2, 1, 6, 13, 22, 33 46 ... $6n + 4 = n^2 - 3$ oe	e.g. 22 or 46	2	M1 continuing sequence and writing at least 5 terms of 2nd sequence – allow one error or for a correct equation ft part (a) A1 or other number in both sequences eg −2

Question	Working	Answer	Mark	Notes
4	0.07 × 10 800 (= 756) oe 10 800 + '756'	11 556	3	M1 M1 M2 for 1.07 × 10 800 oe A1
5 (a)		*P* in correct region on overlay	2	M1 Correct bearing (±2°) or correct distance (±2 mm) A1 Fully correct position for P
(b) (i)		154	2	B1 150 – 158 ft from diagram
(ii)		332		B1 330 – 334 ft from diagram
6	360 ÷ 8 (= 45) or 180 – (360 ÷ 8) (= 135) or $\frac{6\times180}{8}$ (=135) oe e.g. $\frac{540-112-112-84}{2}$ (=116) or $\frac{540-308}{2}$ (= 116) or $\frac{232}{2}$ (= 116) e.g. '135' – '116' or 180 – '116' – '45'	19	4	M1 Correct method to find the interior or exterior angle of octagon M1 Correct method to find a missing angle from pentagon M1 Complete method A1

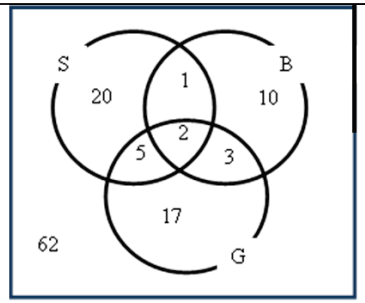
Question		Working	Answer	Mark	Notes	
7			47.5	4	M1	Forming a right-angled triangle with angle 125 – 90 marked or 55 marked
		$\tan'35' = \frac{x}{15}$ or $\tan'55' = \frac{15}{x}$ or $\frac{x}{\sin 35} = \frac{15}{\sin 55}$			M1	
		$x = 15 \times \tan$ '35' (= 10.5...) or $x = \frac{15}{\tan'55'}$ (= 10.5…) or $x = \frac{15}{\sin 55} \times \sin 35$ (= 10.5…)			M1	
		10.5 + 37			A1	awrt 47.5
8	(a)		$3k^3m$	2	B2	B1 for an answer in the form ak^xm^y with 2 correct from $a = 3, x = 3, y = 1$
	(b)	$7 + 1 < 4x \leq 17 + 1$ or $\frac{7}{4} < x - \frac{1}{4} \leq \frac{17}{4}$	$2 < x \leq 4.5$	3	M1	or one side of the inequality correct, e.g. 2 or 4.5
		$(7+1) \div 4 < x \leq (17+1) \div 4$ or $\frac{7}{4} + \frac{1}{4} < x \leq \frac{17}{4} + \frac{1}{4}$			M1	
					A1	Accept $x > 2$, $x \leq 4.5$

Question	Working	Answer	Mark	Notes		
9	6000 × 0.015 (= 90) **or** 6000 × 1.015 (= 6090) (6000 + '90') × 0.015 (= 91.35) ('6090' + '91.35') × 0.015 (= 92.72) ('6090' + '91.35' + '92.72') × 0.015 (= 94.11..)	368.18	3	M1 M1 A1	or for $\frac{4\times1.5}{100}\times 6000$ (=360) or 6360 for complete method (4 years) for total value or sight of 6368….. accept 368 – 368.20	M2 for 6000×1.015^4

Question		Working	Answer	Mark	Notes	
10	(a)		$4x^4y^3$	2	B2	B1 for 2 correct terms of 3 in a product
	(b)	e.g. $2(8-2x)-3(2x-3)=4\times 6$ or	0.1	3	M1	For method to deal with fractions
		$\frac{2(8-2x)}{6}-\frac{3(2x-3)}{6}=4$ or				eg. finds a common denominator (6 or a multiple of 6)
		$\frac{16-4x}{6}-\frac{6x-9}{6}=4$ or				or
		$\frac{2(8-2x)-3(2x-3)}{6}=4$ or				multiplies by common multiple in a correct equation.
		$\frac{-10x+25}{6}=4$ oe				Condone one error in expansion
		e.g. $16-4x-6x+9=24$ or $-10x+25=24$ oe			M1	For method to expand brackets and multiplies by common denominator in a correct equation.
						Condone one error in expansion
					A1	oe dep on M1
	(c)	$m^2=\frac{1}{3}ef$	$f=\frac{3m^2}{e}$	2	M1	for squaring the m
					A1	oe must have $f=$

Question	Working	Answer	Mark	Notes
11	e.g. $y = 2 - \frac{1}{2}x$ or $y = 2 - \frac{x}{2}$ or $y = \frac{4-x}{2}$ or gradient of $L_1 = -0.5$ oe	Yes, with correct gradients shown to make −1 when multiplied	3	M1
	e.g. $\frac{9--7}{7--1}$ (=2) or $\frac{-7-9}{-1-7}$ (=2)			M1
				A1 $2 \times -0.5 = -1$ and yes
Alternative scheme for 11				
	e.g. $y = 2 - \frac{1}{2}x$ or $y = 2 - \frac{x}{2}$ or $y = \frac{4-x}{2}$ or gradient of $L_1 = -0.5$ oe	Yes, with correct equation shown to be valid by using the given points	3	M1
	$-7 = 2(-1) + c$ or $9 = 2(7) + c$ ($c = -5$)			M1 dep on M1 for substituting $(-1, -7)$ or $(7, 9)$ into $y = 2x + c$ to find value of c
				A1 Uses the other point in $y = 2x - 5$ to show it is valid and yes

Question	Working	Answer	Mark	Notes
12	0, 4, 6, 9, 17, 21, 32, 42, 51, 69, 102	45	3	M1 for identifying 6 or 51 from ordered list **or** attempt to find 3rd and 9th seen (from an ordered list) M1 for identifying 6 **and** 51 A1 for 45
13	1 + 0.65 + 1.22 (=2.87) or 100 + 65 + 122 (=287) 861 ÷ 2.87 or (861 ÷ 287) × 100 oe	300	3	M1 oe Note: 861÷3=287 is M0 M1 A1
14 (a)(i)		a^2	1	B1
(ii)		ab^4	1	B1
(iii)		$\frac{1}{3}b$	1	B1oe
(b)	177 147 ÷ 2187 (= 81) or $a = 81$ 2187 ÷ 81 (= 27) or $b = 27$	$x = 4, y = 3$	3	M1 or $x + y = 7$, M1 $2x + y = 11$ A1 $x = 4$ **and** $y = 3$

Question		Working	Answer	Mark	Notes	
15	(a)	**$0.3^3 \times 0.7$**	0.0756	3	M1	oe
		$4 \times 0.3^3 \times 0.7$			M1	oe
					A1	$\frac{189}{2500}$ or 0.075 or 0.076
	(b)	**$1 - 0.7^4$ oe**	0.7599	2	M1	Fully correct method
					A1	0.759 – 0.7560
16	(a)			3	M1	for 2 in the middle **and** one from 1 or 3 or 5 in the correct place in the Venn diagram
					M1	for any 4 correct entries
					A1	for a fully correct answer including 62 outside the circles inside the rectangle
	(b)		$\frac{3}{28}$	1	B1ft	

Question		Working	Answer	Mark	Notes	
17	(a)	4.75×0.255	1.21	2	M1	for 4.75 or 0.255 seen
					A1	1.21125
	(b)	$2.735 \div 0.035$	78	2	M1	2.735 or 0.035 seen
					A1	78.142857...
18	(a)	(0, 1), (90, 0), (180, −1), (270, 0), (360, 1)	Curve through given coordinates	2	M1	for a translation of the curve parallel to the x axis or for a curve going through 3 correct points
					A1	fully correct
	(b)		(180, 4)	2	M1	1 coordinate correct or a sketch of $\sin\left(\frac{x}{2}\right)^0$
					A1	for (180, 4)

Question	Working	Answer	Mark	Notes
19	$\frac{BD}{\sin 97} = \frac{9.3}{\sin 58}$ $BD = \frac{9.3}{\sin 58} \times \sin 97$ (= 10.8846..) 0.5 × '10.88.' × 11.2 × sin47 (= 44.57.....) 0.5 × '10.88..' × 9.3 × sin25 (=21.39.....) or 0.5 × '4.63458 …' × 9.3 × sin97 (=21.39.....)	66.0	5	M1 M1 M1 Complete method to find area *BCD* M1 Complete method to find area *ABD* A1 Allow 65.9 – 66.1
20 (a)	$3(x^2 - 4x) + 7$ or $3\left(x^2 - 4x + \frac{7}{3}\right)$ $3((x-2)^2 - 4) + 7$ or $3\left((x-2)^2 - 4 + \frac{7}{3}\right)$ or $3(x-2)^2 - 12 + 7$	$3(x-2)^2 - 5$	3	M1 or expanding $a(x^2+2bx+b^2)+c$ M1 $-12 = 2ab$ or $7 = ab^2 + c$ A1 or $a = 3$, $b = -2$, $c = -5$
(b)		$x = 2$	1	B1 ft from (a)

Question	Working	Answer	Mark	Notes	
21	$(10x - 3)(x + 1) = 6x$	$(-0.05, -0.3)$	6	M1	for a correct equation to find points A and B
	$10x^2 + x - 3\ (= 0)$			M1	for rearranging equation in the form $ax^2 + bx + c\ (= 0)$
	$(5x + 3)(2x - 1)\ (= 0)$ or			M1	dep on M1for solving the quadratic equation using factorisation or using the formula or by completing the square
	$x = \dfrac{-1 \pm \sqrt{1^2 - (4 \times 10 \times -3)}}{2 \times 10}$ or				
	$10(x + 0.05)^2 - 0.025 - 3 = 0$				
	$x = -0.6$ and $x = 0.5$ $(y = -3.6$ and $y = 3)$			A1	Both x values correct dep on M2
	$\dfrac{'-0.6' + '0.5'}{2}$ or $\dfrac{'-3.6' + '3'}{2}$ oe			M1	dep on M1
				A1	

Question	Working	Answer	Mark	Notes		
22	$\pi\times(5r)^2\times\frac{45}{360}$ or $\pi\times(3r)^2\times\frac{45}{360}$ $\pi\times r^2\times\frac{45}{360}$ or $\pi\times(0.6r)^2\times\frac{45}{360}$ $\pi\times(5r)^2\times\frac{45}{360}-\pi\times(3r)^2\times\frac{45}{360}=\frac{81}{2}\pi$ or $\pi\times r^2\times\frac{45}{360}-\pi\times(0.6r)^2\times\frac{45}{360}=\frac{81}{2}\pi$ $r^2 = (40.5 \times 8) \div (1 - 0.36)$ or $r^2 = 506.25$ oe $(r = 22.5)$ $r^2 = (40.5 \times 8) \div (25 - 9)$ or $r^2 = 80.25$ oe $(r = 4.5)$ $(AB =)\ 2\times\pi\times'13.5'\times\frac{45}{360}\left(=\frac{27}{8}\pi\right)$ or $(PQ =) 2\times\pi\times'22.5'\times\frac{45}{360}\left(=\frac{45}{8}\pi\right)$ oe Perimeter $=\frac{'27}{8}\pi'+\frac{'45}{8}\pi'+'9'+'9'$	$9\pi+18$	6	M1 M1 M1 M1 M1 A1	oe oe or 1 share = 4.5 or $r = 22.5$ or $OA = 13.5$ or $AP = 9$ dep on M3 or $2\times\pi\times('13.5'+'22.5')\times\frac{45}{360}(=9\pi)$ dep on M4 oe	M2 for $0.64\pi r^2\times\frac{45}{360}=\frac{81}{2}\pi$ or $16\pi r^2\times\frac{45}{360}=\frac{81}{2}\pi$

Question	Working	Answer	Mark	Notes	
23	$a + 9d = 66$ oe $\frac{20}{2}(2a + 19d) = 1290$ oe $a = 93$ or $d = -3$	81	4	M1 M1 A1 A1	A correct formula involving 10^{th} term Correct formula for sum of first 20 terms A correct value for a or d dep on M2