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Q	Answer	Mark	Comments
1	100	B1	

Q	Answer	Mark	Comments
2	60	B1	

Q	Answer	Mark	Comments
3	1, -2	B1	

Q	Answer	Mark	Comments
4	$a + 3$ or $3 + a$	B1	

Q	Answer	Mark	Comment
5	$(8^2 \times 8 =) 8^3$ or $(8^9 \div 8^5 =) 8^4$ or 512 or 4096 or $8^2 \times 8 \div 8^9 \times 8^5$	M1	
	$(8^3$ or 512) $\div$ ( $8^4$ or 4096) or $8^{(2+1-9+5)}$ or $8^8 \times 8^{-9}$ or $8^{-1}$ or $\frac{1}{8}$	M1dep	oe in the form $8^n \div 8^{(n+1)}$  oe where index sums to $-1$  oe in the form $8^n \times 8^{(-n-1)}$  oe fraction
	(0).125	A1	
	<b>Additional Guidance</b>		
	(0).125 and either $8^{-1}$ or $\frac{1}{8}$ on the answer line		M1M1A1
	(0).125 in working and $8^{-1}$ on the answer line		M1M1A0
	If a student attempts numerical and index working award the higher mark		

Q	Answer	Mark	Comment
6a	Valid description	B1	eg as downloads increase, so do CD sales downloads are about $\left[1\frac{1}{3}, 2\right]$ times as many as CDs CDs are about $\left[\frac{1}{2}, \frac{3}{4}\right]$ as many as downloads
	<b>Additional Guidance</b>		
	Ignore 'Positive correlation'		
	Condone references to causality eg an increase in downloads causes an increase in CDs sold		B1
	As one goes up the other goes up / Both go up at a similar rate		B1
	They both go up		B0
	Downloads are always more than CDs		B0
	They are in direct proportion		B0
	The relationship is linear		B0

Q	Answer	Mark	Comment
6b	<b>Alternative method 1 – reading from the graph</b>		
	$2.5(0) \times 9000$ or 22 500 or [5300, 5500]	M1	oe $2.5(0)$ may be 2 or 3 [5300, 5500] may be 5000
	$2.5(0) \times 9000 + 3 \times [5300, 5500]$ or $22\,500 + [15\,900, 16\,500]$	M1dep	oe $2.5(0)$ may be 2 or 3 [5300, 5500] may be 5000
	[38 400, 39 000]	A1ft	ft 2 or 3 for $2.5(0)$ and/or 5000 for [5300, 5500]
	<b>Alternative method 2 – using a multiplier</b>		
	$2.5(0) \times 9000$ or 22 500 or $9000 \times [0.5, 0.75]$	M1	oe $2.5(0)$ may be 2 or 3
	$2.5(0) \times 9000 + 3 \times 9000 \times [0.5, 0.75]$	M1dep	oe $2.5(0)$ may be 2 or 3
	[36 000, 42 750] with $9000 \times [0.5, 0.75]$ seen	A1ft	ft 2 or 3 for $2.5(0)$
	<b>Additional Guidance</b>		
	Check graph for working		
	Working may be in pence, units not required for up to M2 Final answer in pence must have units to award A1		

Q	Answer	Mark	Comment
7	Correct method to find 1%, 2%, 5%, 10%, 100% or 840% of the number	M1	
	Fully correct method	M1dep	
	600	A1	
	<b>Additional Guidance</b>		
	Up to M2 may be awarded for multiple attempts if no answer chosen		

Q	Answer	Mark	Comments
8	<b>Alternative method 1: using algebra</b>		
	$\frac{1}{2} \times k \times 12$ or $6k$ or $2 \times k + 3 \times m$ or $2k + 3m$	M1	oe correct expression for either area eg $2(k - 3) + 3(m + 2)$ or $k(m + 2) - m(k - 3)$
	$\frac{1}{2} \times k \times 12 = 2 \times k + 3 \times m$ or $4k = 3m$	M1dep	oe equation
	3 : 4	A1	oe ratio
	<b>Alternative method 2: substituting a value for <math>k</math></b>		
	Substitutes a value for $k$ and gives correct method or value for area of triangle or correct area in $m$ for L-shape	M1	eg $k = 5$ and area of triangle is 30 or $k = 5$ and area of L-shape is $10 + 3m$
	Correct equation connecting the two areas or correct value of $m$ for their $k$	M1dep	eg $k = 5$ and $30 = 10 + 3m$ or $k = 6$ and $m = 8$
	3 : 4	A1	oe ratio

Q	Answer	Mark	Comment
9	$(x =) [2.25, 2.75]$ and $(x =) [9.25, 9.75]$	B2	B1 $(x =) [2.25, 2.75]$ or $(x =) [9.25, 9.75]$ or one or both values identified but not given in correct notation eg $(2.5, 0)$ and/or $(9.5, 0)$ or $2.5 < x < 9.5$ or 2.5 and/or 9.5 written on the graph or in working
	<b>Additional Guidance</b>		
	$x =$ can be $x \approx$		
	$[2.25, 2.75]$ and/or $[9.25, 9.75]$ with one extra value		B1
	$[2.25, 2.75]$ and/or $[9.25, 9.75]$ with more than one extra value		B0
	Answer from use of formula or completing the square		B0

Q	Answer	Mark	Comment
10	$(\pi \times) \left( \frac{\sqrt{17}}{2} \right)^2$	M1	oe condone missing brackets
	$\frac{17}{4}(\pi)$ or $4\frac{1}{4}(\pi)$ or $4.25(\pi)$	A1	oe fraction, mixed number or decimal
	$(\pi \times) 5^2$ or $(\pi \times) 25$ or $\frac{60}{360}$ used	M1	oe
	$\frac{25}{6}(\pi)$ or $4\frac{1}{6}(\pi)$ or $4.1(6\dots)(\pi)$ or $4.17(\pi)$	A1	oe fraction, mixed number or decimal
	A with values in comparable form or A by $\frac{1}{12}(\pi)$ or A by $0.08(3\dots)(\pi)$	A1	eg values $\frac{51}{12}(\pi)$ and $\frac{50}{12}(\pi)$ $4\frac{1}{4}(\pi)$ and $4\frac{1}{6}(\pi)$ $4.2(5)(\pi)$ and $4.1(6\dots)(\pi)$ $4.2(5)(\pi)$ and $4.17(\pi)$ accept 'circle' for A  allow comparison of fraction or decimal parts only if integer parts shown as equal
	<b>Additional Guidance</b>		
	For the final mark, presence or absence of $\pi$ must be the same for both values		
	Accept consistent use of a numerical value of $\pi$ throughout. The value can be 3 or 3.1 or 3.14 or 3.142 or better		



Q	Answer	Mark	Comment
11	$(x + 6)(x - 4)$	B2	either order B1 $(x + a)(x + b)$ where $ab = -24$ or $a + b = 2$
	<b>Additional Guidance</b>		
	Condone a multiplication sign between the brackets		
	Condone missing final bracket		
	Ignore an attempt to solve $(x + 6)(x - 4) = 0$		

Q	Answer	Mark	Comment
12(a)	2000	B1	

Q	Answer	Mark	Comment
12(b)	0.5 or $\frac{2 \times 10^3}{5 \times 10^{-1}}$ or $\frac{\text{their 2000}}{5 \times 10^{-1}}$ or $0.4 \times 10^{3 - (-1)}$ or $0.4 \times 10^4$	M1	oe  their 2000 from part (a)
	4000 or $4 \times 10^3$	A1ft	ft $2 \times$ their 2000 in part (a)

Q	Answer	Mark	Comments
13	$10x + 5d$ or $10x = cx$ or $5d = 30$	M1	
	$10x = cx$ and $5d = 30$ or $c = 10$ or $d = 6$	M1dep	
	$c = 10$ $d = 6$	A1	

Q	Answer	Mark	Comments
14	$7x = 2x + 20$ or $\frac{x-20}{x} = \frac{2}{7}$ or $\frac{x+20}{x} = \frac{7}{2}$ or $20 \div (7 - 2)$ or $20 \div 5$ or 4	M1	oe any letter
	$7 \times 20 \div (7 - 2)$ or 28 or $2 \times 20 \div (7 - 2)$ or 8 or $(7 + 2) \times 20 \div (7 - 2)$	M1dep	oe hours for History  hours for French  total hours
	36	A1	

Q	Answer	Mark	Comments
15(a)	16	B1	

Q	Answer	Mark	Comments
15(b)	<b>Average</b>		
	Indicates that the statement is correct and uses the median to support their decision	B2	eg Yes, as median is lower (in 2019) B1 median is lower in 2019 with no or incorrect decision or median (for 2019) is 22.5
	<b>Consistency</b>		
	Indicates that the statement is correct and uses the IQR to support their decision or states that both quartiles were 1 minute greater in 2020	B2	eg IQRs are equal, so same consistency B1 IQR is the same with no or incorrect decision or IQR (for 2019) is 6 or IQR (for 2020) is 6
	<b>Additional Guidance</b>		
	<b>Average</b>		
	For B2 or B1, ignore reference to the LQ or UQ		
	Condone 22.30 for the median		
	For B2 or B1, if using 'average' for 'median' the value(s) must be given		
	Incorrect value for the 2019 median can score B1 if lower than 24 eg It's correct, the 2019 median was 23.5		B1
	Reference to IQR		B1max
	Median is 22.5, so true		B2
	Correct, the median is 1.5 lower in 2019 / Yes, it was 1.5 seconds faster		B2
	<b>Consistency</b>		
	Allow calculation seen to imply IQR eg (2019) $26 - 20 = 6$		
	Ignore reference to the range in 2019		
	Reference to median		B1max
	$26 - 20 = 27 - 21$ so this is true		B2
	6 not accompanied by a calculation or reference to IQR		B0
	6 stated to be the range		B0

Q	Answer	Mark	Comments
16(a)	$2x + x + 15 + 8 = 80$ or $3x + 23 = 80$ or $80 - 15 - 8$ or 57 or $\frac{x+8}{80}$ or $\frac{x+8}{3x+23}$	M1	oe  implied by $\frac{57}{80}$
	$(x =) \frac{80-15-8}{3}$ or $\frac{57}{3}$ or 19 or 27	M1dep	oe implied by $\frac{19}{80}$
	$\frac{27}{80}$ or 0.3375 or 33.75%	A1	oe fraction, decimal or percentage
	<b>Additional Guidance</b>		
	Ignore incorrect conversion after correct answer seen		

Q	Answer	Mark	Comments
16(b)	$\frac{8}{23}$ or 0.3478... or 34.78...% or 0.348 or 34.8%	B1	oe fraction, decimal or percentage
	<b>Additional Guidance</b>		
	Ignore incorrect conversion after correct answer seen		

Q	Answer	Mark	Comments
17	$2 \leq x \leq 5$ or $6 \leq 3x \leq 15$ or $x = 5$ or $3x = 15$	M1	may be in two parts implied by ( $y =$ ) 27 or ( $x =$ ) 2, 3, 4, 5 or ( $3x =$ ) 6, 9, 12, 15
	$y - 3 \times 5 < 12$ or $y < 12 + 3 \times 5$ or $y < 27$ or $y - 3 \times 5 \leq 11$ or $y \leq 11 + 3 \times 5$ or $y \leq 26$	M1dep	oe may be seen in a double-sided inequality eg condone $18 < y < 27$ using $\leq$ or $=$
	26	A1	SC1 17
	<b>Additional Guidance</b>		
	SC1 is for the use of 2 instead of 5		
	All inequalities may be reversed, eg $2 \leq x \leq 5$ may be $5 \geq x \geq 2$		

Q	Answer	Mark	Comments
18(a)	<b>Rotation about (1, 0)</b>		
	$90^\circ$ anticlockwise or $270^\circ$ clockwise	B1	oe description of rotation condone $90^\circ$ counter-clockwise eg quarter turn anticlockwise
	<b>Translation</b>		
	$\begin{pmatrix} -2 \\ -6 \end{pmatrix}$	B1	oe description of translation eg 2 left and 6 down condone missing brackets SC1 B0B0 and point $(-1, 4)$ identified
	<b>Additional Guidance</b>		
	Condone missing degrees sign		
	$(-2, -6)$		B0
	Compound transformation		B0 for that part

Q	Answer	Mark	Comments
18(b)	(4, 4) and (7, 7) or (1, 1) and (6, 6)	B1	condone (5, 5) and (10, 10) either order

19	<b>Alternative method 1</b>		
	$(0.\dot{4}) = \frac{4}{9}$ or $10x - x = 4$ or $9x = 4$	M1	oe eg $100x - x = 44$ or $99x = 44$ or $100x - 10x = 40$ or $90x = 40$ any letter
	$\frac{7}{9} \div 10$ or $\frac{7}{90}$ or $10y - y = 0.7$ or $9y = 0.7$	M1	oe eg $100y - y = 7.7$ or $99y = 7.7$ or $100y - 10y = 7$ or $90y = 7$ any letter
	$\frac{47}{90}$	A1	oe single fraction
	<b>Alternative method 2</b>		
	$0.5\dot{2}$	M1	oe
	$10x - x = 4.7$ or $9x = 4.7$	M1dep	oe eg $100x - x = 51.7$ or $99x = 51.7$ or $100x - 10x = 47$ or $90x = 47$ any letter
	$\frac{47}{90}$	A1	oe single fraction
	<b>Additional Guidance</b>		
	For M marks, allow fractions with decimal numerator or denominator eg in alt 1, $\frac{0.7}{9}$ scores M1 and in alt 2, $\frac{4.7}{9}$ scores M2		

Q	Answer	Mark	Comments
20	$(x =) 60$ or $(3x =) 180$ or $(y =) 45$ or $(2y =) 90$	M1	implied by $\sin 60$ or $\tan 45$ must be selected and not just in a table
	$3 \times 60 - 2 \times 45$ or $180 - 90$ or $(w =) 90$ or $\cos 90$	M1dep	
	0 with M2 awarded	A1	
	<b>Additional Guidance</b>		
	0 with no working		M0M0A0
	Condone degrees sign on answer with correct working		M1M1A1

Q	Answer	Mark	Comments
21	$2(4x)^2 + 9$	M1	oe
	$32x^2 + 9$	M1dep	dep on 2nd M1 may be implied by 4th mark
	$8x + 9$	M1	may be implied by 4th mark
	$32x^2 - 8x = 0$ or $32x^2 = 8x$	M1	oe equation with brackets expanded rearranges their $f^{-1}(x)$ = their $gh(x)$ to correctly collect terms
	0 and $\frac{1}{4}$	A1	oe eg 0 and $\frac{8}{32}$
	<b>Additional Guidance</b>		
	With no terms to collect in their equation the 4th mark cannot be awarded		
	$8x + 9 = 8x^2 + 36$ $0 = 8x^2 - 8x + 27$		M0M0M1 M1A0
	$8x - 9 = 8x^2 + 36$ $0 = 8x^2 - 8x + 45$		M0M0M0 M1A0
	$8x + 9 = 2(4x)^2 + 9$ $8x + 9 = 16x^2 + 9$ $8x = 16x^2$		M1M0M1  M1A0
	$8x + 9 = 4x(2x^2 + 9)$ $0 = 8x^3 + 28x - 9$		M0M0M1 M1A0



Q	Answer	Mark	Comments
22	<b>Alternative method 1</b>		
	$\frac{180}{9+3}$ or 15 or $3 \times \frac{180}{9+3}$ or 45 or $9 \times \frac{180}{9+3}$ or 135	M1	oe eg $180 \times \frac{1}{3+1}$ or $180 \div 4$  size of angle $c$  size of angle $a$
	$5 \times \frac{180}{9+3}$ or or $5 \times 15$ or 75 or $7 \times \frac{180}{9+3}$ or $(3+5+9) \times \frac{180}{9+3}$ or 255	M1dep	oe size of angle $b$
	105	A1	
	<b>Alternative method 2</b>		
	$a : b : c : d = 9 : 5 : 3 : 7$ or $b : d = 5 : 7$	M1	oe implied by $d = 7$
	$\frac{7}{9+5+3+7} \times 360$ or $\frac{7}{24} \times 360$ or $\frac{7}{5+7} \times 180$ or $\frac{7}{12} \times 180$ or $7 \times 15$	M1dep	oe allow numerator to be 5
	105	A1	

Q	Answer	Mark	Comments
23	<b>Alternative method 1</b>		
	$\frac{7\sqrt{3}}{\sqrt{20}} \times \frac{\sqrt{20}}{\sqrt{20}}$	M1	oe eg $\frac{7\sqrt{3}}{\sqrt{2}\sqrt{10}} \times \frac{\sqrt{2}\sqrt{10}}{\sqrt{2}\sqrt{10}}$
	$\frac{7\sqrt{60}}{20}$	M1dep	oe single rationalised fraction
	$\frac{7\sqrt{15}}{10}$ or $\frac{14\sqrt{15}}{20}$	A1	oe in the form $\frac{x\sqrt{15}}{y}$ where $x$ and $y$ are integers
	<b>Alternative method 2</b>		
	$\frac{7\sqrt{3}}{2\sqrt{5}}$	M1	
	$\frac{7\sqrt{3}}{2\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}}$	M1dep	oe rationalisation eg $\frac{7\sqrt{3}}{2\sqrt{5}} \times \frac{2\sqrt{5}}{2\sqrt{5}}$
	$\frac{7\sqrt{15}}{10}$ or $\frac{14\sqrt{15}}{20}$	A1	oe in the form $\frac{x\sqrt{15}}{y}$ where $x$ and $y$ are integers

**Mark scheme and Additional Guidance continue on the next page**

Q	Answer	Mark	Comments
23 cont	<b>Alternative method 3</b>		
	$\frac{7}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}}$ or $\frac{7\sqrt{2}}{2}$ or $\frac{\sqrt{3}}{\sqrt{10}} \times \frac{\sqrt{10}}{\sqrt{10}}$ or $\frac{\sqrt{30}}{10}$	M1	oe
	$\frac{7\sqrt{2}}{2} \times \frac{\sqrt{30}}{10}$ or $\frac{7\sqrt{60}}{20}$	M1dep	oe rationalised
	$\frac{7\sqrt{15}}{10}$ or $\frac{14\sqrt{15}}{20}$	A1	oe in the form $\frac{x\sqrt{15}}{y}$ where $x$ and $y$ are integers
	<b>Alternative method 4</b>		
	$\frac{7}{\sqrt{2}} \times \frac{\sqrt{3}}{\sqrt{10}} \times \frac{\sqrt{5}}{\sqrt{5}}$	M1	oe
	$\frac{7\sqrt{5}}{\sqrt{10}} \times \frac{\sqrt{3}}{\sqrt{10}}$ or $\frac{7}{\sqrt{2}} \times \frac{\sqrt{15}}{\sqrt{50}}$ or $\frac{7\sqrt{15}}{\sqrt{100}}$	M1dep	oe one term or product of two terms with numerator $7\sqrt{15}$
	$\frac{7\sqrt{15}}{10}$ or $\frac{14\sqrt{15}}{20}$	A1	oe in the form $\frac{x\sqrt{15}}{y}$ where $x$ and $y$ are integers

Q	Answer	Mark	Comments
24	$\frac{1}{2}$	B1	oe

Q	Answer	Mark	Comments
25	$r^2 = \frac{8}{9}$ or $\sqrt{\frac{8}{9}}$ or $\frac{2\sqrt{2}}{\sqrt{9}}$ or $\frac{\sqrt{8}}{3}$ or $\frac{2\sqrt{2}}{3}$ or $\left(\sqrt{\frac{8}{9}}\right)^3$ or $\frac{8\sqrt{8}}{27}$	M1	oe eg $\left(\frac{8}{9}\right)^{\frac{1}{2}}$ allow $\pm\sqrt{\frac{8}{9}}$ etc
	$\frac{16\sqrt{2}}{27}$	A1	oe in the form $\frac{c\sqrt{2}}{d}$ where $c$ and $d$ are integers

Q	Answer	Mark	Comments
26(a)	$\sqrt[4]{5\frac{1}{16}}$ or $\left(5\frac{1}{16}\right)^{\frac{1}{4}}$ or $\frac{81^{\frac{1}{4}}}{16^{\frac{1}{4}}}$ or $\left(81^{\frac{1}{4}} = \right) 3$ or $\left(16^{\frac{1}{4}} = \right) 2$	M1	oe eg $\sqrt[4]{\frac{81}{16}}$ condone missing brackets
	$\frac{3}{2}$ or $1\frac{1}{2}$ or 1.5	A1	

Q	Answer	Mark	Comments
26(b)	$\left(7^{2m}\right)^{2.5}$ or $49^{2.5m}$ or $\left(7^2\right)^{2.5m}$	M1	oe with base changed to 7 and/or brackets removed
	$7^{5m}$	A1	

Q	Answer	Mark	Comments
27	$-4 < x < 4$ or $4 > x > -4$	B1	condone the inequality in two parts eg $x > -4$ and $x < 4$

Q	Answer	Mark	Comments
28	$(\overrightarrow{XR}) = \frac{3}{2}(2\mathbf{a} + 4\mathbf{b})$ or $3\mathbf{a} + 6\mathbf{b}$ or $(\overrightarrow{QR}) = \frac{5}{2}(2\mathbf{a} + 4\mathbf{b})$ or $5\mathbf{a} + 10\mathbf{b}$	M1	oe may be on diagram
	$(\overrightarrow{PS}) = -5\mathbf{a} + 2\mathbf{a} + 4\mathbf{b}$ $+ \frac{3}{2}(2\mathbf{a} + 4\mathbf{b}) + \mathbf{a} - 8\mathbf{b}$ or $(\overrightarrow{PS}) = -5\mathbf{a} + \frac{5}{2}(2\mathbf{a} + 4\mathbf{b}) + \mathbf{a} - 8\mathbf{b}$ or $(\overrightarrow{PS}) = \mathbf{a} + 2\mathbf{b}$	M1dep	oe may be on diagram
	$(\overrightarrow{PS}) = \mathbf{a} + 2\mathbf{b}$ and indication why $PS$ is parallel to $QR$	A1	eg $2(\mathbf{a} + 2\mathbf{b}) = 2\mathbf{a} + 4\mathbf{b}$ or $5\mathbf{a} + 10\mathbf{b} = 5(\mathbf{a} + 2\mathbf{b})$ or $\mathbf{a} + 2\mathbf{b}$ and $\overrightarrow{QR}$ is a multiple of $\overrightarrow{PS}$
	<b>Additional Guidance</b>		
	Some or all vectors may be reversed and the final mark can be from using a negative constant eg $\overrightarrow{RX} = -3\mathbf{a} - 6\mathbf{b}$ $\overrightarrow{PS} = \mathbf{a} + 2\mathbf{b}$ $-3(\mathbf{a} + 2\mathbf{b}) = -3\mathbf{a} - 6\mathbf{b}$		M1 M1 A1

Q	Answer	Mark	Comments
29(a)	$y = \cos x$ passes through $(180^\circ, -1)$	B1	

Q	Answer	Mark	Comments
29(b)	None of the graphs pass through $(270^\circ, 1)$	B1	