GCSE MATHEMATICS · HIGHER

Targeting Grade 9

Paper 5 · Mark scheme · Non-calculator · 40 marks

M method mark **P** process mark **A** accuracy mark (depends on the M or P marks before it)
B independent mark **C** communication mark **ft** follow through **oe** or equivalent

Q	Working	Answer	Mark	Notes
1	$2^a = 2^{3b} \Rightarrow a = 3b$ $3^{2a} \times 3^b = 3^8 \Rightarrow 2a + b = 8$ $6b + b = 8$	 $a = \frac{24}{7},\ b = \frac{8}{7}$	M1 M1 M1 A1	 Solves simultaneously oe

Q	Working	Answer	Mark	Notes
2	$x = 0.45\dot{}:\ 100x - 10x = 45.5\dot{} - 4.5\dot{} = 41 \Rightarrow \frac{41}{90}$ $y = 0.4\dot{5}\dot{}:$ $100y - y = 45 \Rightarrow \frac{45}{99} = \frac{5}{11}$ $\frac{41}{90} + \frac{5}{11} = \frac{451 + 450}{990}$	 $\frac{901}{990}$	M1 M1 M1 A1	 Common denominator

Q	Working	Answer	Mark	Notes
3	$OA = OB$ (radii) OM is common; angle $OMA =$ angle $OMB = 90°$ Triangles OMA and OMB are congruent (RHS)		M1 M1 M1 C1	 So $AM = MB$ and M is the midpoint: complete proof with reasons

Q	Working	Answer	Mark	Notes
4(a)	$28 + 22 - x + 2x - 6 = 50$	6	M1 A1	Or a correct Venn diagram in terms of x
4(b)	6 of the 22 Spanish students also study French $\frac{6}{22} \times \frac{5}{21}$	$\frac{5}{77}$	P1 P1 A1	 oe, e.g. $\frac{30}{462}$

Q	Working	Answer	Mark	Notes
5(a)	$h(x) = 3 - \frac{2}{x+1}$ $y = 3 - \frac{2}{x+1} \Rightarrow \frac{2}{x+1} = 3 - y$ $x + 1 = \frac{2}{3-y} \Rightarrow x = \frac{2-(3-y)}{3-y}$	$\frac{x-1}{3-x}$	M1 M1 M1 A1	 Rearranging (in either variable) oe
5(b)		3	B1	ft their (a)

Q	Working	Answer	Mark	Notes
6(a)	$a+b=7$ and $\frac{1}{2}a+b=5$		M1	Uses COS $0^\circ=1$ and COS $60^\circ=\frac{1}{2}$
		$a=4,\ b=3$	A1	
6(b)	$4\,\text{COS}\,x^\circ+3=1\Rightarrow\text{COS}\,x^\circ=-\frac{1}{2}$		M1	ft their a and b
	One solution	120	A1	
	Uses symmetry of the cosine graph	240	A1	

Q	Working	Answer	Mark	Notes
7	$\overrightarrow{OC}=\mathbf{b}-\mathbf{a},\ \overrightarrow{OD}=-\mathbf{a}$		P1	
	$\overrightarrow{OP}=\overrightarrow{OC}+\frac{1}{3}\overrightarrow{CD}=$ $\mathbf{b}-\mathbf{a}+\frac{1}{3}(-\mathbf{b})=-\mathbf{a}+\frac{2}{3}\mathbf{b}$		P1	
	$\overrightarrow{AP}=-2\mathbf{a}+\frac{2}{3}\mathbf{b}$		P1	
	$\overrightarrow{OY}=\mathbf{a}+s\left(-2\mathbf{a}+\frac{2}{3}\mathbf{b}\right)=t\mathbf{b}$		P1	
	$1-2s=0\Rightarrow s=\frac{1}{2},\ t=\frac{1}{3}$		P1	
		$1:2$	A1	

Q	Working	Answer	Mark	Notes
8(a)	Turning point at $x = 3$ so $y = (x-3)^2 + k,\ p = -6$ $25 - 30 + q = 7$ $q = 12$ $k = 9 - 18 + 12$	 $p = -6,\ q = 12,\ k = 3$	M1 M1 A1 A1	
8(b)	$x^2 - 6x + 12 = 2x$ $x^2 - 8x + 12 = 0 \Rightarrow (x-2)(x-6) = 0$	 $(2,\ 4)$ and $(6,\ 12)$	M1 M1 A1	ft their p and q
		Total	**40**	