



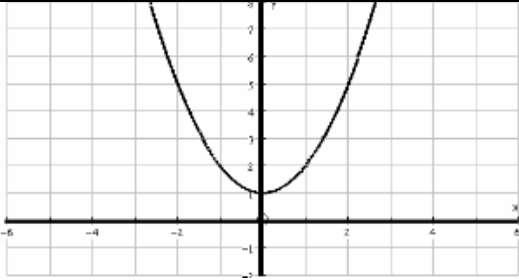
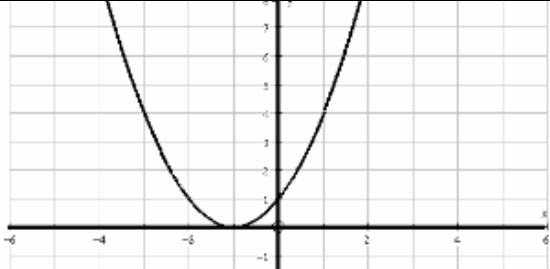
Mathematics in Education and Industry

MEI STRUCTURED MATHEMATICS

INTRODUCTION TO ADVANCED MATHEMATICS, C1

Practice Paper C1-A

MARK SHEME

Qu	Answer	Mark	Comment
Section A			
1	$\frac{y - y_1}{y_2 - y_1} = \frac{x - x_1}{x_2 - x_1} \Rightarrow \frac{y - 3}{9 - 3} = \frac{x - 1}{4 - 1}$ $\Rightarrow \frac{1}{6}(y - 3) = \frac{1}{3}(x - 1) \Rightarrow y = 2x + 1$	M1 A1 2	Any method will do
2	$x^2 - 5x + 6 \leq 0 \Rightarrow (x - 3)(x - 2) \leq 0$ $\Rightarrow 2 \leq x \leq 3$	M1 A1 A1 3	
3	$(\sqrt{3} - \sqrt{2})^2 = 3 - 2\sqrt{3}\sqrt{2} + 2 = 5 - 2\sqrt{6}$	M1 A1 A1 A1 4	Expand Middle term <i>a</i> <i>b</i>
4	(i) 	M1 A1 2	Vertical translation Correct graph
	(ii) 	M1 A1 2	Horizontal translation Correct graph
5	$\frac{1}{v} - \frac{1}{u} = \frac{1}{f} \Rightarrow \frac{1}{u} = \frac{1}{v} - \frac{1}{f} = \frac{f - v}{vf}$ $\Rightarrow u = \frac{vf}{f - v}$	M1 M1 A1 M1 4	isolating <i>v</i> Dealing with fractions correct expression taking reciprocals
6	$x^2 + y^2 - 2x - 8 = 0$ $\Rightarrow (x - 1)^2 + y^2 = 8 + 1 = 9$ <p>i.e. Centre is (1, 0), radius = 3</p>	M1 A1 B1 B1 4	
7	$f(2) = 8 - 4 - 8 + 4 = 0 \Rightarrow (x - 2) \text{ is a factor.}$ $f(x) = x^3 - x^2 - 4x + 4$ $= (x - 2)(x^2 + x - 2)$ $= (x - 2)(x + 2)(x - 1)$ $\Rightarrow f(x) = 0 \Rightarrow x = 1, 2, -2$	B1 M1 A1 A1 B1 5	

8		$y = 2x - 3$ cuts $y = x^2 - 4x + 5$ when $2x - 3 = x^2 - 4x + 5$ $\Rightarrow x^2 - 6x + 8 = 0$ $\Rightarrow (x - 4)(x - 2) = 0 \Rightarrow x = 2, 4$ $\Rightarrow (2, 1)$ and $(4, 5)$	M1 A1 M1 A1 A1 5	
9	(i)	$\frac{2^6}{8^{\frac{1}{2}} \times 2^{-\frac{1}{2}}} = \frac{2^6}{2^{7.5} \times 2^{-0.5}} = 2^{6-7.5+0.5} = 2^{-1} = \frac{1}{2}$	M1 B1 B1 3	Powers of 2 Correct signs
	(ii)	$x^{\frac{1}{3}} = 8 \Rightarrow x^{\frac{1}{3}} = \frac{1}{8} \Rightarrow x = \left(\frac{1}{8}\right)^3 = \frac{1}{512}$	M1 A1 2	
Section B				
10	(i)	Midpoint = $\left(\frac{1+3}{2}, \frac{1+5}{2}\right) = (2, 3)$ Grad of AC $y = \frac{5-1}{3-1} = 2 \Rightarrow$ Grad of perp = $-\frac{1}{2}$ $\Rightarrow y - 3 = -\frac{1}{2}(x - 2) \Rightarrow -2y + 6 = x - 2 \Rightarrow x + 2y = 8$	B1 M1 A1 M1 A1 5	
	(ii)	$-2 + 10 = 8$, so B lies on the line. B to $(2, 3) = \begin{pmatrix} 4 \\ -2 \end{pmatrix} \Rightarrow (2, 3)$ to $D = \begin{pmatrix} 4 \\ -2 \end{pmatrix} \Rightarrow D$ is $(6, 1)$	B1 M1 A1 A1 4	
	(iii)	$MA = \sqrt{(2-1)^2 + (3-1)^2} = \sqrt{5}$ $MB = \sqrt{(2--2)^2 + (3-5)^2} = \sqrt{20}$ Area = $2.MA.MB = 2\sqrt{5}.\sqrt{20} = 20$	M1 A1 A1 3	Use to find area Both

11	(i)	$(x - p)(x - q) = x^2 - (p + q)x + pq$	B1 1	
	(ii)	$p + q = 4, pq = 2^2 - 3 = 1$ $\Rightarrow x^2 - (p + q)x + pq = x^2 - 4x + 1$ i.e. $x^2 - 4x + 1 = 0$	B1 B1 M1 A1 4	
	(iii)	$x = \frac{-5 \pm \sqrt{25 + 28}}{2} = \frac{-5 - \sqrt{53}}{2}$ and $\frac{-5 + \sqrt{53}}{2}$	M1 A1 A1 3	
	(iv)	$f(1) = 1 + 2 - 3 = 0$ $f(x) = (x - 1)(x^2 + x + 3) = 0$ For $x^2 + x + 3 = 0$, " $b^2 - 4ac$ " = $1 - 12 < 0$ so no roots	B1 M1 A1 3	
	(v)	$3 - \sqrt{5}$	B1 1	
12	(i)	$(1 + 2x)^6 = 1 + 6 \cdot 2x + 15(2x)^2 + 20(2x)^3$ $+ 15(2x)^4 + 6(2x)^5 + (2x)^6$ $= 1 + 12x + 60x^2 + 160x^3 + 240x^4 + 192x^5 + 64x^6$	B1 B1 B1 3	Coeffs Powers Ans
	(ii)	$(1 + 2x)^6 = 1 + 12x + 60x^2 + 160x^3$ $+ 240x^4 + 192x^5 + 64x^6$ $(1 - 2x)^6 = 1 - 12x + 60x^2 - 160x^3$ $+ 240x^4 - 192x^5 + 64x^6$ $\Rightarrow (1 + 2x)^6 + (1 - 2x)^6 = 2 + 120x^2 + 480x^4 + 128x^6$	B1 B1 B1 3	Signs Terms Ans
	(iii)	$x = 0.01 \Rightarrow (1 + 2x)^6 + (1 - 2x)^6 = 1.02^6 + 0.98^6$ $= 2 + 120(0.01)^2$ $= 2 + 0.012 = 2.012$ 3rd term = 0.0000048 \Rightarrow 4 decimal places (i.e. 2.01200)	M1 A1 A1 B1 B1 B1 6	3 rd term Accept 5 decimal places