

Mark Scheme (Results) January 2010

GCE O Level

Mathematics Syllabus B (7361/02)
Paper 2

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Mathematics B 7361

Paper 2

1. (a) $\emptyset, \{1\}, \{2\}, \{3\}, \{1, 2\}, \{1, 3\},$
 $\{2, 3\}, \{1, 2, 3\}$ B3 (-1 eeo) 3

NB: Accept $\{\}$ for \emptyset

- (b) $D \subset C$ B1 1 4
-

2. (a) Area $\triangle OBA = \frac{1}{2} \times 7.5 \times 9$ M1
 $33.8, 33.75 \text{ cm}^2$ A1 2

Alternative (a)

$$\triangle OBA = \triangle AFB + \triangle OFB = \frac{1}{2} \times 4.5 \times 6 + \frac{1}{2} \times 4.5 \times 9$$

- (where $AF = 6$) M1
 $33.8, 33.75 \text{ cm}^2$ A1 2

- (b) Area $\triangle OBE = \frac{1}{2} \times 9 \times 9$ M1

$$\text{Area } \triangle ABE = 2 \times "33.75" - "\frac{1}{2} \times 9 \times 9"$$

- $27, 27.1 \text{ cm}^2$ A1 3 5

Alternative (b)

$$AF = \sqrt{(7.5)^2 - (4.5)^2}$$

$$\text{Area} = \frac{1}{2} \times 9 \times "6"$$

OR

$$\text{Area} = 2 \times \triangle ABF = 2 \times \frac{1}{2} \times 4.5 \times 6$$

- $= 27, 27.1 \text{ cm}^2$ A1 3 5

Alternative (b)

Correct method for an angle of $\triangle ABE$

M1

Correct subs into $\frac{1}{2} ab \sin C$ M1 (DEP)

- $27, 27.1 \text{ cm}^2$ A1 3 5
-

3. (a)	$\angle CBE = 64^\circ$ (isos Δ)	B1		
	$\angle BCE = 180 - 2 \times 64 (= 52)$ (isos Δ or \angle s of Δ)			
		M1		
	$\angle BCD = 112^\circ$ (equil Δ)	A1	3	

NB: (1) 2 different valid reasons secures full marks plus correct angle.
(2) **SC:** no reasons + correct angle scores B1 only
(3) 1 valid reason + correct angle scores B1, M1, A0.

(b)	$\angle BAC = \frac{180 - 116}{2}$ (\angle s on line or isos Δ or ext $\angle = \Sigma$ of opp. int. \angle s)			
	32°	M1		
		A1	2	5

NB: SC: no reasons = correct angle score M1 A0

4. (a)	$\frac{4}{3} \times \pi \times 9^3$	M1		
	$3054 \text{ cm}^3, 3055 \text{ cm}^3$	A1	2	
(b)	Vol of each cyl. = $\frac{"3054"}{20}$ (=152.7)			
		M1		
	$\frac{"3054"}{20} = \pi r^2 \times 15$ (o.e)	M1(DEP)		
	$r = \sqrt{\frac{3054}{20} \times \frac{1}{15\pi}}$	M1(DEP)		
	1.8 cm	A1	4	
(c)	$1.8 \times 10^{-2} \text{ m}$	B1 ft	1	7

5. (a)	$3t^2 - 4t + 1$	M1 (2 terms correct)		
	cao	A1	2	
(b)	$6t - 4$	M1 ft (1 term correct)		
	cao	A1	2	
(c)	" $3t^2 - 4t + 1$ " = " $6t - 4$ "	M1		
	$3t^2 - 10t + 5 = 0$	A1		
	$t = \frac{10 \pm \sqrt{10^2 - 4 \times 3 \times 5}}{2 \times 3}$	M1 (INDEP, solving any quadratic)		
	0.6	A1		
	2.7	A1		
	(or better eg 0.61 sec, 2.72 sec)		5	9

6. (a)	$\frac{1}{8}$	$\frac{3}{4}$	in less than 2 hrs			
		$\frac{1}{4}$	takes 2 hrs or more			
		$\frac{3}{5}$	takes 2 hrs or more	B4 (-1 eeo)	4	
(b)	$\frac{1}{8} \times \frac{3}{5}$			M1 ft		
	$\frac{3}{40}$	(o.e)		A1	2	
(c)	$\frac{7}{8} \times \frac{3}{4}$	or	$\frac{1}{8} \times \frac{2}{5}$	M1 ft		
	$\frac{7}{8} \times \frac{3}{4}$	+	$\frac{1}{8} \times \frac{2}{5}$	M1 (DEP)		
	$\frac{113}{160}$, 0.706, 70.6%		A1	3	9

7. (a)	$\frac{1}{11}$			B1	1	
(b)	$y(2x-1) = 1$	(o.e)		M1		
	$g^{-1}: x \mapsto \frac{1+x}{2x}$			A1	2	
(c)	$\left(\frac{1}{2x-1}\right)^2 + 2 = 3$			M1		
	$1 = (2x-1)^2$	(eliminating denominator)		M1 (DEP)		

NB: Allow 1 slip in the first 2 M marks

$4x^2 - 4x = 0$	(o.e)	A1		
$x(x-1) = 0$	(solving (o.e) but must be quadratic having a linear term)			
		M1 (INDEP)		

OR

$2x-1 = \pm 1$	A1			
$2x=2$ AND $2x=0$ (o.e)	M1 (INDEP)			

0	A1			
1	A1	6	9	

8. (a) $\mathbf{a} - \mathbf{c}$	B1	1	
(b) $\overrightarrow{AP} = \frac{1}{m} \overrightarrow{CA}$	M1		
$\frac{1}{m} (\mathbf{a} - \mathbf{c})$	A1	2	
(c) “ $\mathbf{a} - \mathbf{c}$ ” + $k\mathbf{c}$	M1		
$\mathbf{a} + \mathbf{c}(k - 1)$	A1	2	
(d) $\mathbf{a} + \frac{1}{m} (\mathbf{a} - \mathbf{c})$	M1		
$\mathbf{a}(1 + \frac{1}{m}) - \frac{1}{m} \mathbf{c}$	A1	2	
(e) $3 \times (\mathbf{a} + \mathbf{c}(k - 1)) = 2 \times (\mathbf{a}(1 + \frac{1}{m}) - \frac{1}{m} \mathbf{c})$			
(must be 3 x “vector” = 2 x “vector”)	M1		
$3 = 2 + \frac{2}{m}$ and $3k - 3 = -\frac{2}{m}$ M1 (equating coefs of \mathbf{a} and \mathbf{c} , 1 slip)			
$m = 2$	A1		
$k = \frac{2}{3}, \frac{4}{6}, 0.667$	A1	4	11

9. (a) $\triangle ABC$ drawn and labelled	B1	1		
(b) (i) $\begin{pmatrix} -1 & -1 & -3 \\ 2 & 3 & 2 \end{pmatrix}$	B2 (-1eeoo)	2		
(ii) $\triangle A_1B_1C_1$ drawn and labelled	B1 ft	1		
(c) (i) scale factor $\frac{1}{2}$ about origin	B1			
(ii) in y-axis	B1	3		
(d) $\triangle A_2B_2C_2$ drawn and labelled	B1 ft	1		
(e) $\begin{pmatrix} -1 & 0 \\ 0 & -1 \end{pmatrix}$	B1	1		
(f) $\begin{pmatrix} -1/2 & 0 \\ 0 & 1/2 \end{pmatrix} \begin{pmatrix} -1 & 0 \\ 0 & -1 \end{pmatrix}$ or				
$\begin{pmatrix} -1 & 0 \\ 0 & -1 \end{pmatrix} \begin{pmatrix} -1/2 & 0 \\ 0 & 1/2 \end{pmatrix}$	M1			
$\begin{pmatrix} -1 & 0 \\ 0 & -1 \end{pmatrix} \begin{pmatrix} -1/2 & 0 \\ 0 & 1/2 \end{pmatrix}$	A1			
$\begin{pmatrix} 1/2 & 0 \\ 0 & -1/2 \end{pmatrix}$	A1	3	12	

NB: The second A mark in (f) is dependent on the first A mark

10. (a)	1.33, -1.58, 0.71, 3.57	B3 (-1 eeo)	3	
NB: Penalise ncc ONCE only				
(b)	curve	B3	3	
	-1 mark for incorrect/ non-uniform scale straight line segments each point missed each missed segment each point not plotted each point incorrectly plotted tramlines very poor curve			
(c)	$y = x - 2$ drawn 1.3 4.7	M1 A1 ft A1 ft	3	
(d)	$\frac{x^2}{3} + \frac{6}{x^2} - 5 = x - 5$ $y = x - 5$ drawn c.c	M1 M1 A1	3	
(e)	2.1	B1 ft	1	13
<hr/>				
11. (a)	$\frac{3}{\sin 30}$ 6 m	M1 A1	2	
(b)	$\sqrt{2^2 + 6^2}$ 6.32 m	M1 A1	2	
(c)	$DG = \frac{3}{\tan 30}$ (=5.196) (o.e)	M1		
	$\cos^{-1}\left(\frac{5.196}{6.32}\right)$	M1 (DEP)		
	Alternative (c)			
	$AG = \sqrt{2^2 + 3^2}$ (=3.606)	M1		
	$\sin^{-1}\left(\frac{3.606}{6.32}\right)$	M1 (DEP)		
	34.7°, 34.8°	A1	3	

(d) $AG = "6.32" \times \sin "34.8" (=3.606)$

OR

$$DG = \frac{3}{\tan 30} (= 5.196) \quad \text{M1}$$

$$ABHG = 2 \times "3.606" \quad \text{M1 (DEP)}$$

(where H is st $CH = DG$)

$$\Delta ADG = \frac{1}{2} \times "3.606" \times "5.196" \quad \text{M1 (DEP)}$$

$$ABCD = ABHG + 2 \times \Delta ADG$$

$$= 7.211 + 2 \times 9.368 \quad \text{M1 (DEP)}$$

OR

$$CD = 2 + 2 \times "DG" (= 12.392) \quad \text{M1 (DEP)}$$

$$0.5 \times "AG" \times 2, \quad 0.5 \times "AG" \times "CD"$$

$$\text{(one of)} \quad \text{M1 (DEP)}$$

$$ABCD = 0.5 \times "AG" \times (2 + "CD") \quad \text{M1 (DEP)}$$

$$25.9 \text{ m}^2, 26.0 \text{ m}^2 \quad \text{A1} \quad 5$$

(e) $EFCD = 2 \times 3 + 2 \times (\frac{1}{2} \times 3 \times "5.196")$

OR

$$EFCD = \frac{1}{2} \times 3 \times (2 + "CD") (=21.59)$$

M1

$$\Delta ADE = \Delta BFC = \frac{1}{2} \times 2 \times "6" \quad \text{M1}$$

$$\text{Total S.A.} = ABCD + EFCD + ABFE + 2 \times \Delta ADE$$

$$= "25.9" + "21.59" + 4 + 2 \times "6" \quad \text{M1 (DEP)}$$

$$63.5 \text{ m}^2, 63.6 \text{ m}^2 \quad \text{A1} \quad 4 \quad 16$$

(TOTAL 100 MARKS)

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