

# Mark Scheme (Results) January 2009

GCE O Level

## O Level Mathematics B (7361) Paper 2

# Mathematics B 7361

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## Paper 2

1. 3.6  
 $\frac{3.6^3 - 3.0^3}{3.0^3} \times 100$   
 72.8%
- B1  
 o.e M1  
 A1  
**3**  
**Total 3 marks**
2. (a) 3 cm = 1.2 × 1000 × 100 cm  
 1: 40 000
- (b) 1.6 = Area ×  $\left(\frac{40000}{1000 \times 100}\right)^2$   
 10 cm<sup>2</sup>
- o.e M1  
 A1 2  
 o.e M1  
 A1 2  
**4**  
**Total 4 marks**
3. (a) 12t - 3 (1 term correct namely 12t) M1  
 "12t - 3" = 21 M1 DEP  
 2 secs A1 3
- (b) " $\frac{dv}{dt}$ " = 12 (differentiating) M1  
 c.c A1 2
- 5**  
**Total 5 marks**
4.  $\frac{x(x-3)+12x}{2(x-3)} = 1$  (combining fractions) M1  
 $x^2 + 9x = 2x - 6$  (elim. denominator) M1 DEP
- NB:** A total of 1 slip is allowed for *both* of the above 2 Ms
- $x^2 + 7x + 6 = 0$  A1  
 $(x + 1)(x + 6) = 0$  (solving trinomial quadratic) M1 INDEP  
 -1 A1  
 -6 A1
- 6**  
**Total 6 marks**

5.	(a)	$\frac{12}{25}, 0.48, 48\%$	B1	1
	(b)	$\frac{6}{25}, 0.24, 24\%$	B1	1
	(c)	$\frac{1}{25}, 0.04, 4\%$	B1	1
	(d)	$\frac{3}{25}$	B1	
		$\frac{3}{25} \times \frac{2}{24}$	M1	
		$\frac{1}{100}, \frac{6}{600}, 0.01, 1\%$	A1	3
	(e)	$\frac{2}{25}$	B1	
		$\frac{2}{25} \times \frac{1}{24}$	M1	
		$\frac{1}{300}, \frac{2}{600}, 0.0033, 0.33\% \text{ or better}$	A1	3
				<b>9</b>
				<b>Total 9 marks</b>

6.	(a)(i)	4	B1	
	(ii)	$[3(4^x - 1) = 9]$	B1 ft	2
	(b)	$y + 3 = 3x$ (1 slip but isolating x)	o.e	M1
		$f^{-1}: x \mapsto \frac{x+3}{3}$ cao	A1	2
	(c)	$hfg(x) = \left[ \frac{3}{x}(1-x) \right]^2$ o.e (1 slip)	M1	
		$\frac{1}{x} - 1 = \pm 2$ o.e OR $1 + x^2 - 2x = 4x^2$ o.e (eliminating denominator and multiplying out brackets)		
			M1 DEP	
		$x_{\pm} = \frac{1}{\pm 2 - 1}$ OR $(3x - 1)(x + 1) = 0$		
		(solving quadratic)	M1 DEP	
		$x = \frac{1}{3}, \frac{9}{27}, 0.333 \text{ or better}$	A1	
		-1	A1	
				<b>5</b>
				<b>9</b>

S.C:  $\frac{1}{x} - 1 = 2$  scores M1 M0 A0 A0

**Total 9 marks**

7. (a)  $\frac{(2 \times 8 - 4) \times 90}{8}$  M1  
 $135^\circ$  A1 2
- (b)  $\angle EFD = \frac{180 - "135"}{2}$  M1  
 $22.5^\circ$  A1 2
- (c)  $\angle DHE = 67.5^\circ$  OR  $\angle FXD = 90^\circ$  B1  
 $\angle XDF = 45^\circ$  B1 2
- (d)  $\angle CBY = 67.5^\circ$  (symmetry of *FBCDE* and *FGHAB*) B1  
 $\angle BCY = 45^\circ$  ( $\angle$ s of quad. and symmetry) B1  
 $\angle BYC = 67.5^\circ$  ( $\angle$ s of  $\Delta$ ) B1  
c.c (eg 2 angles equal  $\therefore \Delta BYC \therefore \Delta BYC$  is isosceles) B1 4  
**10**

[S.C.: No reasons, and  $\angle CBY = 67.5^\circ$  and  $\angle BYC = 67.5^\circ$  B1  
 $\angle CBY = 67.5^\circ$  and  $\angle BYC = 67.5^\circ$  and 1 reason for 67.5 angle B1  
 $\angle CBY = 67.5^\circ$  and  $\angle BYC = 67.5^\circ$  and 2 reasons for 67.5 angle  
c. c. B1  
B1

**Total 10 marks**

8.	(a) (i)	$\mathbf{a - b}$		B1	
	(ii)	$\frac{2}{3} (\mathbf{a - b})$		B1 ft	
	(iii)	$\frac{1}{2} \mathbf{b}$		B1	
	(iv)	$“\frac{1}{2} \mathbf{b}” + “\frac{2}{3} (\mathbf{a - b})”$		M1	
		$\frac{2}{3} \mathbf{a} - \frac{1}{6} \mathbf{b}$	o.e	A1	5
	(b)	$\overrightarrow{MP} = “2\mathbf{a}” - \frac{1}{2} \mathbf{b}”$ or $\overrightarrow{NP} = \frac{4}{3} \mathbf{a} - \frac{1}{3} \mathbf{b}$		M1	
		$\overrightarrow{MP} = 3 \overrightarrow{MN} = \frac{3}{2} \overrightarrow{NP}$ or $\overrightarrow{NP} = 2 \overrightarrow{MN}$		M1 DEP	
		correct conclusion		A1	3
		[NB: Dividing vectors leading to $\overrightarrow{MP} = 3 \overrightarrow{MN} = \frac{3}{2} \overrightarrow{NP}$ or $\overrightarrow{NP} = 2 \overrightarrow{MN}$			
		scores M1 (for $\overrightarrow{MP}$ or $\overrightarrow{NP}$ ) M1 A0 ]			
	(f)	$\overrightarrow{NP} = \frac{2}{3} “(2\mathbf{a} - \frac{1}{2} \mathbf{b})” = 2 \overrightarrow{MN}$		M1	
		1 : 2		A1	2
		[NB: Dividing vectors leading to 1 : 2 scores M1 A0 ]			
					10
					<b>Total 10 marks</b>

9. NB: Penalise omission of labelling or incorrect labelling ONCE only

- (a)  $\triangle ABC$  drawn and labelled B1 1
- (b) (i)  $\begin{pmatrix} -1 & -2 & -4 \\ -2 & -4 & -3 \end{pmatrix}$  o.e B2 (-1 eeo)
- (ii)  $\triangle A_1B_1C_1$  drawn and labelled B2 (-1 eeo) ft  
4
- (c)  $(\triangle A_2B_2C_2 = \begin{pmatrix} 3 & 4 & 6 \\ -2 & -4 & -3 \end{pmatrix})$   
 $\triangle A_2B_2C_2$  drawn and labelled B2 (-1 eeo) ft  
2
- (d) (i) Reflection in the line  $y = x$  B1
- (ii)  $\begin{pmatrix} -2 & -4 & -3 \\ 3 & 4 & 6 \end{pmatrix}$  o.e B2 (-1 eeo)
- (iii)  $\triangle A_3B_3C_3$  drawn and labelled B2 (-1 eeo) 5
- (e)  $\mathbf{n} = \begin{pmatrix} 0 \\ 2 \end{pmatrix}$  B2 (-1 eeo) 2

14  
Total 14 marks

10. NB: Penalise not corrected answers ONCE only

(a)	$FG = 6$	B1	
	$\frac{\sqrt{20^2 + 6^2}}{20.9}$	M1	
		A1	3

OR	$AF = 7.81$	B1	
	$(EB = 21.5)$		
	$EG = \sqrt{(21.5^2 - 5^2)}$	M1	
	20.9	A1	

(b)	$\frac{1}{2} \times 20.9 \times 10$	M1	
	104.4, 104.5, 104.6	A1	2

OR	$(\angle EBG = 76.55^\circ)$		
	$\frac{1}{2} \times 10 \times 21.5 \times \sin 76.55^\circ$	M1	
	104.4, 104.5, 104.6	A1	

(c)	$\frac{\sqrt{5^2 + 20.9^2}}{21.5}$	M1	
		A1	2

OR	$FB = 7.81$		
	$EB = \sqrt{(20^2 + 7.81^2)}$	M1	
	21.5	A1	

(d)	$"104.4" = \frac{1}{2} \times EB \times EB \times \sin \angle AEB$	M1	
	$\sin \angle AEB = \frac{"104.4"}{\frac{1}{2} \times 461}$	M1 DEP	
	$27^\circ$	A1	3

OR	$\sin \angle EGB = \frac{5}{21.5}$	o.e	M1
	$\angle AEB = 2 \times 13.48^\circ$		M1 DEP
	$27^\circ$		A1

OR	$12^2 = 21.5^2 + 21.5^2 - 2 \times 21.5 \times 21.5 \times \cos \angle BEC$	M1	
	$\therefore \cos \angle BEC = \frac{21.5^2 + 21.5^2 - 12^2}{2 \times 21.5 \times 21.5}$	M1 DEP	

27°

A1

(e)  $EN = \sqrt{EB^2 - 6^2}$   
(N is the mid-pt of BC, say)

M1

$$\Delta EBC = \frac{1}{2} \times EN \times 12$$

M1 DEP

Total surface area

$$= 2 \times (\Delta EBC) + 2 \times 104.4 + 10 \times 12$$

M1 DEP

$$576.2 \rightarrow 576.6$$

A1 4 14

OR

$$\angle BEC = 2 \times 16.2$$

M1

$$\Delta EBC = \frac{1}{2} \times 21.5^2 \times \sin 32.4$$

M1 DEP

Total surface area

$$= 2 \times (\Delta EBC) + 2 \times 104.4 + 10 \times 12$$

M1 DEP

**Total 14 marks**



11. (a) 1.88, 2.13, -3.13 B1, B1, B1 3

**NB: Ordering of the award of the B marks**

(b) -1 mark for  
 straight line segments  
 each point missed  
 each missed segment  
 each point not plotted  
 each point incorrectly plotted  
 tramlines in 2 segments  
 very poor curve B3 3

**NB: Ordering of the award of the B marks** - award all 3 B marks and then deduct, beginning with the 3<sup>rd</sup> one for any errors.

(c) -1.66 B1 ft  
 -0.21 B1 ft  
 2.87 B1 ft  
 $-0.21 < x < 2.87$  B1 ft  
 4

**NB: 'ft' on candidates' curve**

(d) Rewrite  $2x^3 - 2x^2 - 11x - 1 = 0$  as  
 $x^3 - x^2 - 5x = \frac{1}{2} + \frac{1}{2}x$  (ie attempting to isolate  $x^3 - x^2 - 5x$ )  
 M1  
 correctly A1  
 Draw  $y = \frac{1}{2}(1 + x)$  ie straight line going  
 through  $(-1, 0)$  and  $(0, \frac{1}{2})$  A1  
 $-1.84, -0.09, 2.93$  A1 ft  
 $-0.09$  A1 ft  
 $2.93$  A1ft  
 6

**16**  
**Total 16 marks**