

Mark Scheme Summer 2009

GCE O Level

GCE O Level Mathematics B (7361)

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Contents

1.	7361 Paper 01 Mark Scheme	5
2.	7361 Paper 02 Mark Scheme	12

Mathematics B 7361

Paper 1

1. $\frac{28}{11} \times \frac{2}{7}$ or $\frac{28}{11} \div \frac{7}{2}$ M1
8/11 A1 2
SC: answer only M1 A0
Total 2 marks
2. Any multiple of 2160 M1
2160 (accept $2^4 \times 3^3 \times 5$ o.e) A1 2
Total 2 marks
3. $y(x + 3) - 7(x + 3)$ or $x(y - 7) + 3(y - 7)$ (no slips) M1
 $(y - 7)(x + 3)$ (o.e but factorised) A1 2
NB: Ignore sign error if recovered by correct answer
Total 2 marks
4. 360/22.5 M1
16 A1 2
Total 2 marks
5. 24, 19 B1
10 B1 ft 2
Total 2 marks
6. Two // lines, 10 cm in length, 2 cm either side of AB M1
Two drawn semicircles, radius 2 cm, attached to these two added lines A1 2
Total 2 marks
7. 3.75×10^n (n can be any integer) M1
 3.75×10^{-14} A1 2
NB: "3.8" scores M0 A0
Total 2 marks

8. (a) 0 or zero or 0 lines or zero lines B1
- (b) 2 B1 2
- Total 2 marks
9. $\frac{x(5x-7)-2x(3x-2)}{4}$ or $\frac{x}{4}[(5x-7)-2(3x-2)]$ M1
- $\frac{5x^2-7x-6x^2+4x}{4}$ or $\frac{x}{4}[5x-7-6x+4]$ M1 dep
- (allow one error in sign only)
- $\frac{-x^2-3x}{4}$ (o.e. but simplified) A1 3
- NB: SC $\frac{5x^2}{4}-\frac{7x}{4}-\frac{6x^2}{4}+\frac{4x}{4}$ (or simplified) M2
- (allow one sign error only)
- Total 3 marks
10. 128° B1
- $\frac{352}{\text{c's}(128)} \times 360$ M1
- 990 A1 3
- Total 3 marks
11. 610 or (210 AND 400) or
 $(\frac{70}{15}$ AND $\frac{80}{15}$, possibly implied) B1
- c's(610)/15 or $\frac{70}{15} \times 3 + \frac{80}{15} \times 5$ M1
- £ 40.66, 40.67, 40.68 A1 3
- Total 3 marks
12. $-8 < 2x$ OR $3x < 9$ (ie x gathered on one side of inequality) M1
- $-4 < x < 3$ or $-8/2 < x < 9/3$ or $(-4 < x$ AND $x < 3)$ M1 dep 3
- $-3, -2, -1, 0, 1, 2$ A1
- Total 3 marks

13. (a)	$1/27$ (ignore working after correct seen)	B1	1
(b)	1	B1	1
(c)	27	B1	1
		Total 3 marks	
14.	$t^2 = 2s/g$	M1	
	$gt^2 = 2s$	M1 dep	
	$g = 2s/t^2$	A1	3
	SC: $\sqrt{g} = \frac{\sqrt{2s}}{t}$ (first) M1 then as per above scheme		
		Total 3 marks	
15.	$\begin{pmatrix} 4 \\ 5 \end{pmatrix}$ or $\begin{pmatrix} -2 \\ -12 \end{pmatrix}$ or $\begin{pmatrix} 2 \\ 12 \end{pmatrix}$	M1	
	$\begin{pmatrix} -1 \\ -6 \end{pmatrix}$	A1 (-1) A1(-6)	3
	NB (1): Note ordering of A marks, the first is for -1 and the second for -6		
	NB (2) (-1, -6) (ie a co-ord) scores A1 A0 in that order		
		Total 3 marks	
16. (a)	-1	B1	1
(b)	$x + y \leq 8$ (allow all three statements without '=' . Also allow o.e eg $y \leq 8 - x$ or $x \leq 8 - y$)	B1	
	$y \geq \frac{1}{2}x - 1$ (Ditto)	B1	
	$y \geq 8 - 4x$ (Ditto)	B1	3
	NB: The ordering of the award of the B marks is the order given above.		
		Total 4 marks	
17. (a)	$22/100 \times 2280$	M1	
	£ 501.60, £501.6	A1	2
(b)	$514.80/0.78$ (o.e.)	M1	
	£ 660	A1	2
		Total 4 marks	

18.	(a)	$0x26 + 1x20 + 2x24 + 3x15 + 4x3 + 5x2$ at least 5 terms correct	M1	
		$\Sigma fx / \Sigma f$ (all correct)	M1 dep	
		1.5	A1	3
	(b)	1 by itself (ignore any working)	B1	1
			Total 4 marks	
19.	(a)	7	B1	1
	(b)	$x - 10$ seen (brackets around $x - 10$ maybe needed for clarity)	M1	
		$x - 10 - 2x = x$	M1 dep	
		-5	A1	3
		NB: $x - 2(5)$ M1		
			Total 4 marks	
20.	(a)	Line $y = -x$ drawn and labelled (labelled as "(a)" acceptable) and at least the length of vector $\begin{pmatrix} 4 \\ -4 \end{pmatrix}$	B1	1
	(b)	Triangle drawn in correct position (label not needed)	B1	1
	(c)	$\begin{pmatrix} -3 \\ -2 \end{pmatrix}$ (o.e. the translation can be given in a literal form)	B1 (-3) ft B1 (-2) ft	2
		NB: Ordering of B marks, the first B mark is for -3 and the second for -2 SC: (-3, -2) B1 B0		
			Total 4 marks	
21.		17 or 28.1 (or better - but must be angle < 90)	B1	
		$[(\sin x =) 8/"17" \text{ or } (\cos x =) 15/"17"]$ OR $[\sin("28.1") \text{ or } \cos("28.1")]$	M1	
		$8/"17" + 15/"17" \text{ OR } \sin("28.1") + \cos("28.1")$	M1 dep	
		$23/17 \text{ or } 1\frac{6}{17}$	A1	4
			Total 4 marks	

22.	(a)	$1 - \frac{2}{3} \cdot \frac{2}{3}$ (o.e. eg 3 or 7 correct terms depending on method ie <i>complete</i> method required)	M1	
		$\frac{5}{9}$ or 0.556 (o.e)	A1	2
	(b)	$\frac{1}{6} \cdot \frac{1}{6} + \frac{1}{6} \cdot \frac{1}{6}$ OR $\frac{2}{6} \cdot \frac{2}{6} + \frac{2}{6} \cdot \frac{2}{6}$	M1	
		all four correct terms added	M1 dep	
		$\frac{5}{18}$, 0.278 (o.e eg $\frac{10}{36}$)	A1	3
Total 5 marks				
23.	(a)	$56 \times 5.2 \times 1000$	M1	
		291 200	A1	2
	(b)	$c's(291\ 200) \div 85$ or $c's(291\ 200) \div 60$	M1	
		$\frac{cs'(291\ 200)}{85 \times 60}$	M1 dep	
		57.1 m/s	A1	3
Total 5 marks				
24.	(a)	$x + y = 7000$ (o.e) NB: watch for "700"	B1	1
	(b)	$20x + 8y = 123\ 200$ (o.e) NB: Watch for "123 000"	B1	1
	(c)	$20x + 8(7000 - x) = 123\ 200$ (o.e, ie complete method to solve Sim Eqns , no errors, but allow ft on c's (a) and (b) which must be Sim Eqns in both x and y)	M1	
		$x = 5600, y = 1400$ (cao)	A1(5600) A1 (1400)	3
Total 5 marks				

25. (a) $t - 16/t = 0$ M1
 $t = +4$ A1 2
- (b) $(v =) 1 + 16/t^2$ (one term correct) M1
 Both terms correct A1
 $1.64, \frac{41}{25}$ A1 3

Total 5 marks

26. (a) $3 \cdot 3^3 + 8 \cdot 3^2 + 3 \cdot k - 60 = 0$ M1
 $k = -31$ A1 2
- (b) $3x^2 + 17x + \dots$ M1
 $3x^2 + 17x + 20$ A1
 $(3x + 5), (x + 4)$ A1 (3x + 5)
 NB: The ordering of the A marks is the first is for A1 (x + 4) 4
 (3x + 5) and the second for (x + 4)

Total 6 marks

27. (a) $\angle CDQ = 35^\circ$ or $\angle DCQ = 35^\circ$ B1
 $\angle DBC = 35^\circ$ B1 2
- (b) $\angle RBC = 29^\circ$ or $\angle RCB = 29^\circ$ B1
 $\angle BDC = 29^\circ$ B1 2
- (c) $\angle BCD = 116^\circ$ or $\angle BDP = 64^\circ$ or $\angle PBD = 64^\circ$ B1
 $\angle BAD = 64^\circ$ B1 2
- NB: (1) the ordering of the award of the B marks is as above
 (2) Award full marks if correct answer given in answer line
 (3) Allow angles in diagram to be awarded marks if earned

Total 6 marks

28. Penalise n.c ONCE only

- | | | | |
|-----|------------------------------------------------------------------------------------------------|--------|---|
| (a) | $AC = 7/\sin 36^\circ$ | M1 | 2 |
| | 11.9 cm | A1 | |
| (b) | $AD = c's(11.9) \times \cos 50^\circ$ | M1 | 2 |
| | 7.65, 7.66 cm | A1 | |
| (c) | any correct method for one triangle | M1 | |
| | completely correct method | M1 dep | 3 |
| | 68.5, 68.6, 68.7 cm ² | A1 | |
| | NB: Allow 9.62, 9.63, 9.64 seen (eg on diag or
calculated) for <i>AB</i> for M mark | | |
| | Allow 9.10, 9.11, 9.12, 9.13, 9.14 seen (eg on diag
or calculated) for <i>CD</i> for M mark | | |

Total 7 marks

PAPER TOTAL 100 MARKS

Mathematics B 7361

Paper 2

1. (a) $\begin{pmatrix} 2 & 1 \\ 0.6 & 0.8 \end{pmatrix}$ B2 (-1ee) 2

(b) (11, 5.8) B1, B1 2

Total 4 marks

2. (a) Table entries:
 19 B1
 24 plus correctly drawn bar $215 \leq m < 220$ B1 ft
 correctly drawn bar $190 \leq m < 205$ B1
 correctly drawn bar $220 \leq m < 230$ B1 4

(b) c's(42)/100 (oe) B1 ft 1

Total 5 marks

3. (a) $\frac{180}{2} \times 9$ M1
 810 gm A1 2

(b) $\frac{2}{11} \times 1320$ OR $\frac{9}{11} \times 1320$ M1
 240 gm , 1080 gm A1, A1 3

Total 5 marks

4. (a) $\angle BCA = 72^\circ$ M1
 (base angles) isos triangle A1
 $\angle FDC = 36^\circ$ M1 dep
 Alternate angles (between // lines) A1 4
- (b) Correctly stating the value of one of the following M1
 angles: $\angle BGD$, $\angle BGF$, $\angle FGC$, $\angle CFD$, $\angle AFG$
 A correct reason, in words, for a cyclic A1 2
 quadrilateral consistent with the candidate's
 found angle

Total 6 marks

5. (a) $\frac{x}{12}$ B1 1
- (b) $\frac{x + 81}{15}$ B1 1
- (c) $\frac{x + 81}{15} - \frac{x}{12} = 2$ B1 1
- (d) $12(x + 81) - 15x = 2 \cdot 15 \cdot 12$ (one error) (oe) M1
 $972 - 360 = 3x$ (oe) A1
 17 A1 3

Total 6 marks

6.	(a)	b	B1	
		g, e and i : two out of three correct	B1	
		: all three correct	B1	
		$a, f, h ; c, k ; d$	B1	4
	(b)	(i) $\{g, j\}$	B1	
		(ii) $\{a, b, d, e, f, h, i, j\}$	B1	
		(iii) $\{b, c, d, i, j, k\}$	B1	3
				Total 7 marks
7.	(a)	$10r$	B1	1
	(b)	$\frac{1}{2}\pi \times 2 \times 8r + \frac{1}{2}\pi \times 2 \times 4r + \frac{1}{2}\pi \times 2 \times 2 \times r + \frac{1}{2}\pi \times 2 \times c's(10r)$	M1	
		$24\pi r$	A1	2
	(c)	$\frac{1}{2}\pi(8r)^2 + \frac{1}{2}\pi(4r)^2 ; 40\pi^2$	M1, A1	
		$\frac{1}{2}\pi(c's(10r))^2 + \frac{1}{2}\pi(2r)^2 ; 52\pi^2$	M1, A1	
		$[c's(52) - c's(40)]/c's(40) \times 100 ; \text{conclusion}$	M1 dep, A1	
				6
				Total 9 marks

8.	(a)	(i)	3	(ii)	18	(iii)	11	B1, B1, B1	3
	(b)		12					B1	1
	(c)		$\frac{6}{\frac{1}{3}x + 2}$;	$\frac{18}{x + 6}$			M1, A1	2
	(d)		$x = -6$					B1 ft	1
	(e)		Removing the denominator (one error)					M1	
			$3x^2 + 5x - 12 (= 0)$ (oe)					A1	
			Attempt at factorisation					M1	
			$x = 4/3, x = -3$					A1, A1	5

Total 12 marks

9.	(a)	$-2\mathbf{b} + \mathbf{a} + 2\mathbf{a} + \mathbf{b}$ (o.e.)	M1	
		$3\mathbf{a} - \mathbf{b}$	A1	2
		\rightarrow		
	(b)	$BC = -2\mathbf{a} - \mathbf{b} + 8\mathbf{a} - \mathbf{b}$	M1	
		\rightarrow		
		or $AC = 8\mathbf{a} - \mathbf{b} - (2\mathbf{b} - \mathbf{a})$		
		$6\mathbf{a} - 2\mathbf{b}$ or $9\mathbf{a} - 3\mathbf{b}$		
		plus conclusion	A1	2
		\rightarrow		
	(c)	$XY = -\frac{1}{6}(8\mathbf{a} - \mathbf{b}) + 2\mathbf{b} - \mathbf{a} + \frac{1}{2}c's(AB)$	M1	
		\rightarrow		
		$\frac{(-8 - 6 + 9)}{6}\mathbf{a} + \frac{(1 + 12 - 3)}{6}\mathbf{b}$		
		(one coefficient correct (unsimplified))	A1	
		$-\frac{5}{6}\mathbf{a} + \frac{5}{3}\mathbf{b}$	A1	3
	(d)	$\mu(2\mathbf{a} + \mathbf{b})$	B1	1
		\rightarrow		
	(e)	$\frac{1}{6}(8\mathbf{a} - \mathbf{b}) + \lambda(c's(XY))$	B1	1
	(f)	$2\mu = \frac{8}{6} - \frac{5}{6}\lambda$ (oe) ; $\mu = -\frac{1}{6} + \frac{5}{3}\lambda$ (oe)	M1, M1	
		$\mu = \frac{1}{2}$, $\lambda = \frac{2}{5}$	A1, A1	4
	(g)	Z is the midpoint of OB .	B1 ft	1
			Total	14 marks

10. (a)	$h = 20 - 2r$	B1	1
(b)	$V = \pi r^2 h - \frac{2}{3} \pi r^3$ (oe)	B1	1
(c)	substituting c's expression for h into c's(b)	M1	
	correct conclusion	A1	2
(d)	$(V' =) 40\pi r - 8\pi r^2$	M1, A1	
	$V' = 0$	M1 dep	
	$r = 5$	A1	4
(e)	184, 524, 452	B1, B1, B1	3
(f)	graph penalties straight line segments (penalised once only) each point missed (\pm one small square) each missed segment each point incorrectly plotted (\pm one small square) tramlines very poor curve	B3	3
(g)	Line drawn at $V = 400$ (This can be implied from the result(s) given)	M1	
	3.4 & 6.3 (allow ± 0.1)	A1	2
			Total 16 marks

11. (a)	$(OT^2) = 17^2 - 8^2$	M1	
	15 cm	A1	2
(b)	c's(a) - $\sqrt{10^2 - 8^2}$	M1	
	9 cm	A1	2
(c)	$\cos \angle PAT = 8/10$ (o.e. trig. statement)	M1	
	$\cos \angle TAO = 8/17$ (o.e. trig. statement)	M1	
	25.0°/25.1°	A1	3
(d)	$PD/10 = \sin(\text{c's } 25.0^\circ)$	M1	
	4.23 cm/4.24 cm	A1	2
(e)	$(BD =) \sqrt{(c's(6^2) - c's(4.23^2))}$	M1	
	$(BC =) 2 \times c's(4.26)$	M1 dep	
	8.49 cm → 8.52 cm	A1	3
(f)	Using a correct trig method to find either <i>AD</i> or <i>OD</i>	M1	
	<i>AD</i> in the range 9.03 → 9.09 or <i>OD</i> in the range 7.92 → 7.95	A1	
	Either $AD - c's(BD)$ or $17 - c's(OD) - c's(BD)$	M1	
	4.78 → 4.84 cm	A1	4

Total 16 marks

PAPER TOTAL 100 MARKS

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