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Mark Scheme (Results)
January 2011

O Level

GCE O Level Mathematics B (7361/01)

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January 2011

Mathematics B 7361

Paper 1

1. (a) 0.0612 B1 1

(b) 0.061 B1 ft 1 **2**

Total 2 marks

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2. $S \subset R$ B1

$R \cap H = \varnothing$ B1 **2**

Total 2 marks

---

3. $y(3x + 1) = 1$ (o.e) M1

$\frac{1-x}{3x}$ or $\frac{1}{3x} - \frac{1}{3}$ or $\frac{1}{3}\left(\frac{1}{x} - 1\right)$ A1 **2**

Total 2 marks

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4. (a) $\begin{pmatrix} 1 \\ 4 \end{pmatrix}$ B1 1

(b) $\begin{pmatrix} -1 \\ 1 \end{pmatrix}$ B1 1 **2**

Total 2 marks

---

5. **any** multiple of 60 B1

60 B1 **2**

SC: $2 \times 2 \times 3 \times 5$ only earns B1, B0

Total 2 marks

---

6. (a) 1 B1 1

(b) 1 B1 1 **2**

Total 2 marks

---

7. seeing 13 or 3.5 -2 OR seeing 7 or 3.3 - 2 B1

6 or -6 B1 **2**

Total 2 marks

---

8. (a) $(B \cup C) \cap A$ or $(A \cap B) \cup (A \cap C)$ or

$(A \cap B) \cup (A \cap C) \cup (A \cap B \cap C)$ B1 1

(b) $(A \cap B \cap C)'$

or $A' \cup B' \cup C'$

or $(A \cap B)' \cup (B \cap C)' \cup (A \cap C)'$

or any **pair** of bracketed terms from above joined with $\cup$ B1 1

Total 2 marks

---

9. (a) 0.0125 or 1.25×10^{n}

or any equivalent **correct** decimal form (i.e. 0.125×10^{-1})

M1

1.25×10^{-2} A1 2

SC: 1.3×10^{-2} M1, A0

(b) 1.25(%) B1 ft 1 **3**

Total 3 marks

---

10. $5n - 3n < -24 - 1$ (o.e) (allow one sign slip) M1

$n < -12.5$ (o.e.) A1

-13 A1 3 **3**

Total 3 marks

---

11. $\frac{3x + (x-4) + (3-x) + 4x + (5x-7)}{5} = 8$ (o.e) M1

$12x - 8 = 5 \times 8$ (allow 1 slip) M1 DEP

4 A1 3 **3**

Total 3 marks

---

12. (a) $\begin{pmatrix} -2 & 4 \\ 8 & 6 \end{pmatrix}$ B1 1

(b) $\begin{pmatrix} 9 & 4 \\ 8 & 17 \end{pmatrix}$

1 row or column correct B1

all correct B1 2 **3**

Total 3 marks

---

13. (a) $\frac{x}{20}$ B1 1

(b) $2 \times "\frac{x}{20}" = \frac{x+10}{30}$ (o.e) M1

5 A1 2 **3**

Total 3 marks

---

14. **(**Hypotenuse = $)\sqrt{a^2+b^2}$ seen B1

$\sin\theta = \frac{a}{"\sqrt{a^2+b^2}"}$ M1

$\sin\theta = \frac{a}{\sqrt{a^2+b^2}}$ A1 3 **3**

Total 3 marks

---

15. $3\mathbf{a} - \mathbf{b} = \begin{pmatrix} 12 \\ -5 \end{pmatrix}$ seeing 12 or 3 x 3 – (-3) B1

Seeing -5 or 3x1 - 8 B1

$\sqrt{"(9+3)"^2 + "(3-8)"^2}$ **(o.e.)** M1

13 A1 2 **4**

Total 4 marks

---

16. (a) $\frac{1}{1000} \times 25$ M1

0.025 (km/s) A1 2

(b) 3600 x "0.025" M1

90 (km/h) A1 2 **4**

Total 4 marks

---

17. $20 = \frac{k}{4^2}$ OR $20 = \frac{1}{k.4^2}$ (o.e) M1

k = 320 OR $k = \frac{1}{320}$ A1

$t = \sqrt{\frac{20 \times 4^2}{40}}$ (o.e.) M1 DEP

t = 2.83 (ignore sign) A1

Total 4 marks

---

18. $5 \times 2 = 3 \times x$ (o.e) M1

(AC =) 3+"10/3"+4 M1 DEP

4 x "AC" = AB^2 M1

6.43 A1 4 **4**

Total 4 marks

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19. (a) 96 000 cm^3 B1 1

(b) Rate of flow = $(\pi 5^2) \times 4$ (cm^3/sec) M1

$\therefore$ time = $\frac{("96000"/2)}{(\pi 5^2) \times 4}$ (secs) M1 dep

153 (secs) A1 3 **4**

Total 4 marks

---

20. $y^2 = \frac{2}{x} - 5$ M1

$xy^2 = 2 - 5x$ or $y^2 + 5 = \frac{2}{x}$ M1 DEP

$x(y^2 + 5) = 2$ M1 DEP

$\frac{2}{y^2 + 5}$ A1 4 **4**

Total 4 marks

---

21. $12 = x^2 + x$ M1

$x^2 + x - 12\ (= 0)$ A1

$(x - 3)(x + 4) = 0$ (solving a trinomial quadratic) M1

3, -4 A1 4 **4**

Total 4 marks

---

22. $1.27 \times £1250$ M1

€1587.5 A1

"€1587.5" - €1200 (=€387.5) M1 DEP

$\frac{"387.5"}{1.14}$ M1 DEP

£339.91 A1 **5**

Total 5 marks

---

23. (a) $(5x + 16)^2 = (3x - 6)^2 + (4x + 20)^2$ (o.e.) M1

$36x = 180$ (o.e.) (allow one error in one coefficient) M1 DEP

$x = 5$ (cm) A1 3

(b) Δ area = $\frac{1}{2} \times (3 \times "5" - 6) \times (4 \times "5" + 20)$ M1

180 (cm^2) A1 2 **5**

Total 5 marks

---

24. (a) either $\angle ECB = 50$ or $\angle EDC = 20$ (stated)

or $\angle DBC = 100$ (stated) B1

$\angle BCD = 20$ (can be marked on diagram) B1

one valid geometrical reason B1 3

(b) $\angle DAC = 30$ (stated) B1

one valid geometrical reason OR correct angle calculation seen leading to $\angle DAC = 30$
PLUS conclusion B1 DEP 2 **5**

Total 5 marks

---

25. (a)(i) 50 B1

(ii) 40 B1

(iii) 130 B1 3

(b) $\frac{"50"}{360} \times 180$ M1

25 A1 2 **5**

Total 5 marks

---

26. (a) seeing 4 or 4^3 (o.e) B1

$ht = 5 \times 4$ M1

20 (cm) A1 3

(b) $\frac{480}{SA} = \frac{4^2}{1^2}$ (o.e) M1

30 (cm^2) A1 2 **5**

Total 5 marks

27.	(a) line having bearing 042 from P	B1		
	line having bearing 090 (drawn from previous line)	B1		
	lines correct lengths	B1	3	
	(b) line having bearing 080 from P	B1		
	line having bearing 110 from A	B1	2	
	(c) 121 $\rightarrow$ 124 km (accept answer in range)	B1	1	**6**
				Total 6 marks
28.	(a) 3 or -2x	M1		
	$3 - 2x$	A1	2	
	(b) $3 - 2 \times 1.5$ OR "$3 - 2x$" = 0 (o.e.)	M1		
	= 0 x = 1.5 (o.e)	A1	2	
	(c) $8 + 3 \times 1.5 - 1.5^2$	M1		
	10.25	A1	2	
	(d) 8.25	B1 ft	1	**7**
				Total 7 marks
				TOTAL 100 MARKS

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January 2011

Mathematics B, Mark Scheme

Paper2

1. $\angle AOD = 30^o$ B1

$\therefore \angle OCD$ OR $\angle ODC = 15^o$ B1

$\angle CDE = 75^o$ B1 **3**

NB: Award Bs for angles seen on diagram

Total 3 marks

---

2. (a) 20-*x*, *x*, 16-*x*, 7 shown on Venn diagram B3 (-1eeoo) 3

(b) "(20-*x*)" + *x* + "(16-*x*)" + 7 = 35 (no slips) M1

x=8 A1 2 **5**

Total 5 marks

---

3. $l = \sqrt{6^2 + 2.5^2}$ (= 6.5) M1

$\pi \times 2.5 \times "6.5" + 2\pi \times 2.5 \times 9 + \pi \times 2.5^2$

(Sum of 2 correct areas) M1

(Sum of 3 correct areas) M1 DEP

212 cm^3 A1 **4**

Total 4 marks

---

4. (a) 1.5 x 20000 /100 M1

300 m A1 2

(b) 1.2 x 100 000/20000 cm M1

6 cm A1 2

(c) 60 000 x $(100)^2$ x $(1/20000)^2$

presence of one of $(100)^2$ or $(1/20\ 000)^2$

in above formula M1

both M1 DEP

1.5 cm^2 A1 3 **7**

Total 7 marks

---

5. $\mathbf{B.C} = \begin{pmatrix} 2 & 13 \\ 2y & y+3x \end{pmatrix}$ B2 (-1 eeoo)

$\left(\mathbf{A} + \mathbf{B.C} = \begin{pmatrix} 5 & 15 \\ 2y+x & 2y+3x \end{pmatrix} \right)$

$2y + x = 4$ B1
$2y + 3x = 6$ B1

Elimin. x or y from 2 linear "SEs" in x and y M1
Subst x or y M1 (DEP)
NB: allow 1 sign slip only for both Ms

$x = 1,\ y = 3/2$ A1, A1 **8**

Total 8 marks

---

6. (a) 1/3 , 120/360, 0.333, 33.3% B1 1

(b) 1/3 + 1/4 or $\frac{120+90}{360}$ M1
210/360, 7/12 , 0.583, 58.3% A1 2

(c) $\frac{1}{6} \times \frac{1}{4}$ or 60/360 x 90/360 M1
1/24 , 0.0417, 4.17% A1 2

(d) 1/3 x ¼, ¼ x 1/3, 1/6 x ¼, ¼ x 1/6 (2 off) B1
all B1
1/3 x ¼ + ¼ x 1/3 + 1/6 x ¼ + ¼ x 1/6 M1
¼ , 0.25 , 25% A1 4 **9**

Total 9 marks

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7 (a)(i) $\overrightarrow{PA} = \frac{4}{5}\mathbf{a}$ B1

(a)(ii) $\overrightarrow{AB} = \mathbf{b} - \mathbf{a}$ B1 2

(b)(i) $\overrightarrow{AQ} = \frac{4}{9}$ "$(\mathbf{b} - \mathbf{a})$" B1 ft

(b)(ii) $\overrightarrow{PQ}$ = "$\frac{4}{5}\mathbf{a}$" + "$\frac{4}{9}$ $(\mathbf{b} - \mathbf{a})$" M1

OR $\overrightarrow{PQ} = -\frac{1}{5}\mathbf{a} + \mathbf{b} - \frac{5}{9}(\mathbf{b} - \mathbf{a})$ (no errors) M1

$\therefore \overrightarrow{PQ} = \frac{16}{45}\mathbf{a} + \frac{4}{9}\mathbf{b}$ A1

(b)(iii) $\overrightarrow{QC} = \mathbf{b}$ - "$\frac{4}{9}$ $(\mathbf{b} - \mathbf{a})$" M1

OR $\overrightarrow{QC} = \frac{5}{9}(\mathbf{b} - \mathbf{a}) + \mathbf{a}$ **(**no errors) M1

OR $\overrightarrow{QC}$ = **-"**$\frac{16}{45}\mathbf{a} + \frac{4}{9}\mathbf{b}$**"** - $\frac{1}{5}\mathbf{a} + \mathbf{b} + \mathbf{a}$ M1

$\therefore \overrightarrow{QC} = \frac{4}{9}\mathbf{a} + \frac{5}{9}\mathbf{b}$ A1 5

(c) $\overrightarrow{PC} =$ "$\frac{4}{5}\mathbf{a}$" + $\mathbf{b}$

and attempting (but NOT using vector division) to show that $\overrightarrow{PQ} = n\overrightarrow{PC}$ and $\overrightarrow{QC} = m\overrightarrow{PC}$

M1

Either $\overrightarrow{PQ} = \frac{4}{9}\left(\frac{4}{5}\mathbf{a} + \mathbf{b}\right) = \frac{4}{9}\overrightarrow{PC}$

OR $\overrightarrow{QC} = \frac{5}{9}\left(\frac{4}{5}\mathbf{a} + \mathbf{b}\right) = \frac{5}{9}\overrightarrow{PC}$ A2

[OR Attempting (but NOT using vector division) to show that

$\overrightarrow{PQ} = \frac{4}{5}$"$\overrightarrow{QC}$" or $\overrightarrow{QC} = \frac{5}{4}$"$\overrightarrow{PQ}$" M1

$\overrightarrow{PQ} = \frac{4}{5}\left(\frac{4}{9}\mathbf{a} + \frac{5}{9}\mathbf{b}\right)$ OR $\overrightarrow{QC} = \frac{5}{4}\left(\frac{16}{45}\mathbf{a} + \frac{4}{9}\mathbf{b}\right)$ A2]

c.c A1 4 **11**

Total 11 marks

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8. **Penalise labelling ONCE only**

(a) ΔABC drawn and labelled B1 1

(b) (i) $A_1 = (3, 1)$, $B_1 = (7, 3)$, $C_1 = (8, 2)$ B2 (-1 eeoo)

(ii) $\Delta A_1B_1C_1$ drawn and labelled B1 ft 3

(c) $A_2 = (2, -2)$, $B_2 = (6, -4)$, $C_2 = (4, -6)$ B2 (-1 eeoo)

$\Delta A_2B_2C_2$ drawn and labelled B1 ft 3

(d) (i) enlargement factor **2** B1

(ii) 270^o B1

antclockwise B1 (DEP)

NB: Last B1 is DEP on previous B and the B in (b) (i)

(OR 90^o, clockwise B1, B1 (DEP)) 3

OR d(i) enlargement factor **-2** B1

d(ii) 270^o clockwise B1, B1 (DEP)

OR 90^o anticlock. B1, B1 (DEP)

NB: The 3rd B of (d) is DEP on the 1st and 2nd Bs of (d)

(e) $\begin{pmatrix} 0 & 2 \\ -2 & 0 \end{pmatrix}$ B2 (-1 eeoo) 2 **12**

Total 12 marks

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9. (a) $(10 - t)(3 + t) = 0$ (solving trinomial quadratic) M1

$t = 10$ secs. A1 2

(b) 38.3, 42, 41.3, 38.3 B3 (-1 eeoo) 3

(c) curve

-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 B3 3

(d) 3.5 secs ($\pm$ 0.1 secs) (1 ss = 0.1sec) B1 ft 1

(e) Attempt to measure gradient at $t = 2$ M1

Answer rounding to 3 m/ sec A1 2

(f) $2 < t < 5$ (± 0.1 secs) B1 ft, B1 ft 2 **13**

Total 13 marks

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10. (a) $L = \sqrt{(3x)^2 + (4x)^2}$ M1

$5x$ (o.e) A1 2

(b) $2 \times \frac{1}{2} \times 3x \times 4x + 3x \times 10x$ OR $\frac{1}{2} \times (10x + 18x) \times 3x$ M1

$42x^2$ (o.e) A1 2

(c) $2 \times "42x^2" + 2 \times "5x" \times y + 10xy + 18xy = 1008$ M1

"$(10x + 10x + 18x)y = 1008 - 84x^2$" M1 (DEP)

$y = \frac{1008 - 84x^2}{38x}$ (c.c) A1 3

(d) $V = "42x^2" \times \frac{1008 - 84x^2}{38x}$ M1

$V = \frac{21x}{19}(1008 - 84x^2)$ (c.c) A1 2

(e) One of $\frac{21 \times 1008}{19}$ or $-\frac{3 \times 21 \times 84}{19}x^2$ (o.e) M1

$\frac{21 \times 1008}{19} - \frac{3 \times 21 \times 84}{19}x^2$ (o.e) A1

"$\frac{21 \times 1008}{19} - \frac{3 \times 21 \times 84}{19}x^2$"$=0$ (o.e) M1 (DEP)

$x = \sqrt{\frac{1008}{252}}$ (o.e) (isolating x from quadratic in x^2 only)

M1 (DEP)

$x = 2$ cm A1 5 **14**

Total 14 marks

11. Penalise ncc ONCE only

(a) $\sin 35 = \frac{EC}{2}$ M1

1.15 cm A1 2

(b) $\tan 35 = \frac{3}{BE}$ M1

4.28 cm A1 2

(c) $BC = \sqrt{"4.28"^2 + "1.15"^2}$ M1

4.43 cm , 4.44 cm A1 2

(d) $\tan \angle BCE = \frac{"4.28"}{"1.15"}$ (o.e) M1

75^o, 75.0^o A1 2

(e) ΔABP: $\angle BAP = 55$ and $\angle ABP = 105$ B1

OR ΔCPD: $\angle CDP = 145$ and $\angle DCP = 15$ B1

OR ΔCEP: $\angle CEP = 55$ and $\angle$ECP=105 B1

OR ΔBEP: $\angle EBP = 15$ and $\angle BEP = 145$ B1

$\angle BPA = 20^o$, 20.0^o B1 2

(f) X is a pt on *AE* st *BX* is perpendicular to *AE*

$\cos 55 = \frac{AX}{3}$ (*AX*=1.721) M1

$\sin 55 = \frac{BX}{3}$ (*BX* = 2.457)

AND

$\tan "20" = \frac{"2.456"}{PX}$ (*PX* = 6.748) => M1

AP = "*AX*" + "*PX*" = "1.721" + "6.748" M1 (DEP)

OR $\cos 55 = \frac{AX}{3}$ (*AX*=1.721) M1

$\cos 35 = \frac{XE}{"4.284"}$ ($XE = 3.5092$)

AND

$\left(DC = 2 \times \cos 35 = 1.6383\right)$ M1

$DP = \frac{"1.6383" \times \sin 15}{\sin "20"}$ (=1.2893)

AP = "*AX*" + "*XE*" + 2 + "*DP*" = "1.721"+"3.5092"+2+"1.2398"

M1 (DEP)

OR $\sin 35 = \frac{3}{AE}$ (AE = 5.2303) M1

$\cos 35 = \frac{CD}{2}$ (CD = 1.6383)

AND M1

$DP = \frac{"1.6383" \times \sin 15}{\sin "20"}$ (DP = 1.2398)

AP = "*AE*" + *ED* + "*DP*" = "5.2303" + 2 + "1.2398" M1 (DEP)

OR $\sin 35 = \frac{3}{AE}$ (AE = 5.2303) M1

$EP = \frac{\sin "105" \times "1.15"}{\sin "20"}$ (*EP* = 3.2478) M1

AP = "*AE*" + "*EP*" = "5.2303" + "3.2478" M1 (DEP)

OR
Special Case : Sine Rule

$\angle ABP = 105^o$ M1

$\frac{AP}{\sin "105"} = \frac{3}{\sin "20"}$ M1 (DEP)

$AP = \frac{3 \times \sin "105"}{\sin "20"}$ M1 (DEP)

AP = 8.46, 8.47 cm, 8.48 cm A1 4 14

Total 14 marks

TOTAL 100 MARKS

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