OCR
RECOGNISING ACHIEVEMENT

GCE

Mathematics

Advanced GCE **A2 7890 - 2**

Advanced Subsidiary GCE **AS 3890 - 2**

Mark Schemes for the Units

June 2008

3890-2/7890-2/MS/R/08

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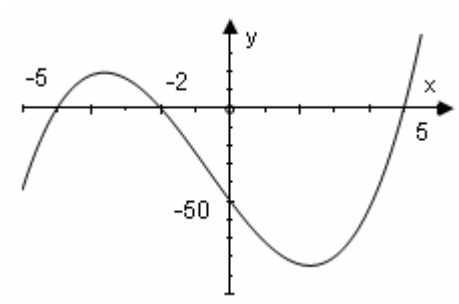
4721 Core Mathematics 1

1	**(i)**	$n = -2$	**B1**	
			1	
	(ii)	$n = 3$	**B1**	
			1	
	(iii)		**M1**	$\sqrt{4^3}$ or $64^{\frac{1}{2}}$ or $\left(4^{\frac{1}{2}}\right)^3$ or $\left(4^3\right)^{\frac{1}{2}}$ or $4\times\sqrt{4}$ with brackets correct if used
		$n = \frac{3}{2}$	**A1**	
			2	
2	**(i)**		**M1**	$y = (x \pm 2)^2$
		$y = (x-2)^2$	**A1**	
			2	
	(ii)	$y = -(x^3 - 4)$	**B1**	oe
			1	
3	**(i)**	$\sqrt{2\times 100} = 10\sqrt{2}$	**B1**	
			1	
	(ii)	$\frac{12}{\sqrt{2}} = \frac{12\sqrt{2}}{2} = 6\sqrt{2}$	**B1**	
			1	
	(iii)		**M1**	Attempt to express $5\sqrt{8}$ in terms of $\sqrt{2}$
		$10\sqrt{2} - 3\sqrt{2} = 7\sqrt{2}$	**A1**	
			2	
4		$y = x^{\frac{1}{2}}$		
		$2y^2 - 7y + 3 = 0$	**M1***	Use a substitution to obtain a quadratic or factorise into 2 brackets each containing $x^{\frac{1}{2}}$
		$(2y-1)(y-3) = 0$	**M1dep**	Correct method to solve a quadratic
		$y = \frac{1}{2}, y = 3$	**A1**	
			M1	Attempt to square to obtain x
		$x = \frac{1}{4}, x = 9$	**A1**	
			SR	**If first M1 not gained and 3 and ½ given as final answers, award B1**
			5	

5		**M1**	Attempt to differentiate
		A1	$kx^{-\frac{1}{2}}$
	$\frac{dy}{dx} = 4x^{-\frac{1}{2}} + 1$	**A1**	
	$= 4\left(\frac{1}{\sqrt{9}}\right) + 1$	**M1**	Correct substitution of $x = 9$ into their
$\frac{dy}{dx}$	$= \frac{7}{3}$	**A1**	$\frac{7}{3}$ only
		5	
6 **(i)**	$(x-5)(x+2)(x+5)$	**B1**	$x^2 - 3x - 10$ or $x^2 + 7x + 10$ or $x^2 - 25$ seen
	$= (x^2 - 3x - 10)(x+5)$	**M1**	Attempt to multiply a quadratic by a linear factor
	$= x^3 + 2x^2 - 25x - 50$	**A1**	
		3	
(ii)			
		B1	+ve cubic with 3 roots (not 3 line segments)
		B1√	(0, -50) labelled or indicated on y-axis
		B1	(–5, 0), (–2, 0), (5, 0) labelled or indicated on x-axis and no other x- intercepts
		3	
7 **(i)**	$8 < 3x - 2 < 11$	**M1**	2 equations or inequalities both dealing with all 3 terms resulting in $a < kx < b$
	$10 < 3x < 13$	**A1**	10 and 13 seen
	$\frac{10}{3} < x < \frac{13}{3}$	**A1**	
		3	
(ii)	$x(x+2) \geq 0$	**M1**	Correct method to solve a quadratic
		A1	0, –2
		M1	Correct method to solve inequality
	$x \geq 0, x \leq -2$	**A1**	
		4	

8 **(i)**	$\frac{dy}{dx} = 3x^2 - 2kx + 1$	**B1**	One term correct
		B1	Fully correct
		2	
(ii)	$3x^2 - 2kx + 1 = 0$ when $x = 1$	**M1**	their $\frac{dy}{dx} = 0$ soi
	$3 - 2k + 1 = 0$	**M1**	$x = 1$ substituted into their $\frac{dy}{dx} = 0$
	$k = 2$	**A1√**	
		3	
(iii)	$\frac{d^2y}{dx^2} = 6x - 4$	**M1**	Substitutes $x = 1$ into their $\frac{d^2y}{dx^2}$ and looks at sign
	When $x = 1$, $\frac{d^2y}{dx^2} > 0$ ∴ min pt	**A1**	States minimum **CWO**
		2	
(iv)	$3x^2 - 4x + 1 = 0$	**M1**	their $\frac{dy}{dx} = 0$
	$(3x - 1)(x - 1) = 0$	**M1**	correct method to solve 3-term quadratic
	$x = \frac{1}{3}, x = 1$		
	$x = \frac{1}{3}$	**A1**	**WWW** at any stage
		3	

9	**(i)**		
	$(x-2)^2+(y-1)^2=100$	**B1**	$(x-2)^2$ and $(y-1)^2$ seen
		B1	$(x\pm 2)^2+(y\pm 1)^2=100$
	$x^2+y^2-4x-2y-95=0$	**B1**	correct form
		3	
	(ii) $(5-2)^2+(k-1)^2=100$	**M1**	$x = 5$ substituted into their equation
	$(k-1)^2=91$ or $k^2-2k-90=0$	**A1**	correct, simplified quadratic in k (or y) obtained
	$k=1+\sqrt{91}$	**A1**	cao
		3	
	(iii) distance from (–3, 9) to (2, 1)		
	$=\sqrt{(2--3)^2+(1-9)^2}$	**M1**	Uses $(x_2-x_1)^2+(y_2-y_1)^2$
	$=\sqrt{25+64}$	**A1**	
	$=\sqrt{89}$		
	$\sqrt{89}<10$ so point is inside	**B1**	compares their distance with 10 and makes consistent conclusion
		3	
	(iv) gradient of radius $=\frac{9-1}{8-2}$	**M1**	uses $\frac{y_2-y_1}{x_2-x_1}$
	$=\frac{4}{3}$	**A1**	oe
	gradient of tangent $=-\frac{3}{4}$	**B1√**	oe
	$y-9=-\frac{3}{4}(x-8)$	**M1**	correct equation of straight line through (8, 9), any non-zero gradient
	$y-9=-\frac{3}{4}x+6$		
	$y=-\frac{3}{4}x+15$	**A1**	oe 3 term equation
		5	

10 (i)	$2(x^2-3x)+11$	**B1**	$p=2$
	$=2\left[\left(x-\frac{3}{2}\right)^2-\frac{9}{4}\right]+11$	**B1**	$q=-\frac{3}{2}$
	$=2\left(x-\frac{3}{2}\right)^2+\frac{13}{2}$	**M1**	$r=11-2q^2$ or $\frac{11}{2}-q^2$
		A1	$r=\frac{13}{2}$
		4	
(ii)	$\left(\frac{3}{2},\frac{13}{2}\right)$	**B1√**	
		B1√	
		2	
(iii)	$36-4\times2\times11$	**M1**	uses b^2-4ac
	$=-52$	**A1**	
		2	
(iv)	0 real roots	**B1**	cao
		1	
(v)	$2x^2-6x+11=14-7x$	**M1***	substitute for x/y or attempt to get an equation in 1 variable only
	$2x^2+x-3=0$	**A1**	obtain correct 3 term quadratic
	$(2x+3)(x-1)=0$	**M1dep**	correct method to solve 3 term quadratic
	$x=-\frac{3}{2}, x=1$	**A1**	
	$y=\frac{49}{2}, y=7$	**A1**	
			SR If A0 A0, one correct pair of values, spotted or from correct factorisation **www B1**
		5	

PART (a) ANSWERED ON INSERT

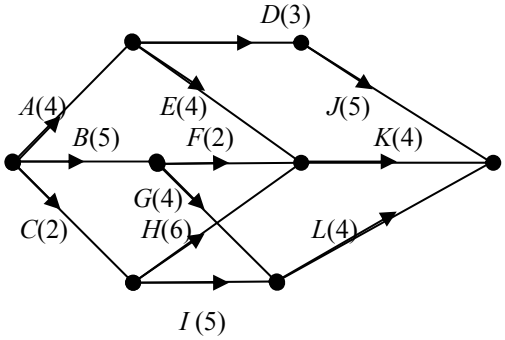
4 **(a)**

Stage	State	Action	Working	Suboptimal maximum
2	0	0	5	**5**
	1	0	4	**4**
	2	0	4	**4**
1	0	0	3+ **5 = 8**	**8**
		1	4+ **4 = 8**	**8**
	1	1	2+ **4 = 6**	
		2	4+ **4 = 8**	**8**
	2	1	6+ **4 = 10**	**10**
		2	5+ **4 = 9**	
0	0	0	4+ **8 = 12**	
		1	5+ **8 = 13**	**13**
		2	2+ **10 = 12**	

Length of longest path = 13
Route = (0;0) – (1;1) – (2;2) – (3;0)

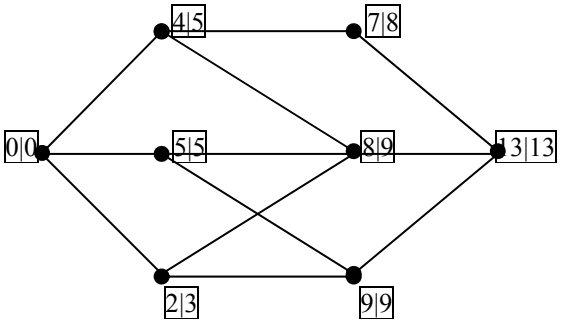
B1 5, 4, 4 identified as suboptimal maxima for stage 2
M1 Transferring suboptimal maxima from stage 2 to stage 1 correctly
A1 Correct additions or totals seen for all rows in stage 1
B1 8, 8, 10 identified as suboptimal maxima for stage 1 (cao)
M1 Transferring suboptimal maxima from stage 1 to stage 0 correctly
A1 Correct additions or totals seen for all rows in stage 0
B1 13
B1 Correct route or in reverse (including (0; 0) and (3; 0)) **[8]**

(b)(i)



M1 A reasonable attempt, arcs should be labelled
A1 Any correct form
Condone extra dummies provided precedences are not violated, accept networks with multiple end vertices
Arc weights may be shown but are not necessary **[2]**

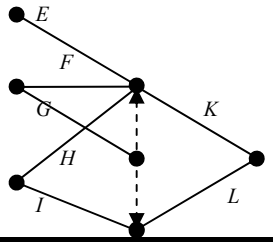
(ii)



Minimum project completion time = 13 days
Critical activities *B*, *G*, *L*

Follow through their network if possible
Values at vertices may be recorded using any consistent notation
M1 Forward pass with no more than one independent error
A1 Forward pass correct
M1 Backward pass with no more than one independent error (follow through their 13)
A1 Backward pass correct
B1 13 stated, cao
B1 *B*, *G*, *L* correct answer only **[6]**

(iii)



Not follow through
B1 A directed dummy from end of *G* to start of *K*
B1 A directed dummy from end of *G* to start of *L*
Condone extra dummies provided precedences are not violated
Watch out for *K* following *I* **[2]**

Total = 18

Grade Thresholds

Advanced GCE Mathematics (3890-2, 7890-2)
June 2008 Examination Series

Unit Threshold Marks

7892		Maximum Mark	A	B	C	D	E	U
4721	Raw	72	63	55	47	39	32	0
	UMS	100	80	70	60	50	40	0
4722	Raw	72	56	49	42	35	29	0
	UMS	100	80	70	60	50	40	0
4723	Raw	72	55	47	40	33	26	0
	UMS	100	80	70	60	50	40	0
4724	Raw	72	56	49	43	37	31	0
	UMS	100	80	70	60	50	40	0
4725	Raw	72	57	49	41	34	27	0
	UMS	100	80	70	60	50	40	0
4726	Raw	72	49	43	37	31	25	0
	UMS	100	80	70	60	50	40	0
4727	Raw	72	54	47	41	35	29	0
	UMS	100	80	70	60	50	40	0
4728	Raw	72	61	53	45	37	29	0
	UMS	100	80	70	60	50	40	0
4729	Raw	72	56	47	38	29	20	0
	UMS	100	80	70	60	50	40	0
4730	Raw	72	56	47	38	29	21	0
	UMS	100	80	70	60	50	40	0
4731	Raw	72	59	50	42	34	26	0
	UMS	100	80	70	60	50	40	0
4732	Raw	72	60	52	45	38	31	0
	UMS	100	80	70	60	50	40	0
4733	Raw	72	56	48	41	34	27	0
	UMS	100	80	70	60	50	40	0
4734	Raw	72	55	48	41	34	28	0
	UMS	100	80	70	60	50	40	0
4735	Raw	72	56	49	42	35	28	0
	UMS	100	80	70	60	50	40	0
4736	Raw	72	53	46	39	32	26	0
	UMS	100	80	70	60	50	40	0
4737	Raw	72	61	54	47	40	34	0
	UMS	100	80	70	60	50	40	0

Specification Aggregation Results

Overall threshold marks in UMS (ie after conversion of raw marks to uniform marks)

	Maximum Mark	A	B	C	D	E	U
3890	300	240	210	180	150	120	0
3891	300	240	210	180	150	120	0
3892	300	240	210	180	150	120	0
7890	600	480	420	360	300	240	0
7891	600	480	420	360	300	240	0
7892	600	480	420	360	300	240	0

The cumulative percentage of candidates awarded each grade was as follows:

	A	B	C	D	E	U	Total Number of Candidates
3890	33.3	50.4	65.4	77.0	86.6	100	14679
3891	100	100	100	100	100	100	1
3892	57.2	76.7	88.2	94.1	97.6	100	1647
7890	45.4	67.3	82.4	92.1	97.8	100	10512
7891	33.3	66.7	100	100	100	100	6
7892	56.5	77.9	90.0	95.4	98.2	100	1660

For a description of how UMS marks are calculated see:
http://www.ocr.org.uk/learners/ums_results.html

Statistics are correct at the time of publication.

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