

**MARK SCHEME for the May/June 2011 question paper
for the guidance of teachers**

0580 MATHEMATICS

0580/42

Paper 4 (Extended), maximum raw mark 130

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Abbreviations

- cao correct answer only
- cso correct solution only
- dep dependent
- ft follow through after error
- isw ignore subsequent working
- oe or equivalent
- SC Special Case
- www without wrong working
- art anything rounding to
- soi seen or implied

Qu.	Answers	Mark	Part Marks
1 (a)	(i) 25	1	
	(ii) 15.5 (15.46 to 15.47)	1	
	(iii) 0.05 oe	2	B1 for 1/100 or 0.01 seen
(b)	8812.50 final answer www 3	3	Condone 8812.5 M2 for $7500 \times 5 \times 0.035 + 7500$ oe (implied by final answers 8810, 8812, 8813 or 8812.5(0) seen) or B2 for 1312.5 as final answer or M1 for $7500 \times 5 \times 0.035$ oe (implied by final answers 1310, 1312, 1313)
(c)	(i) $2^2 \times 3 \times 5$	2	Allow $2 \times 2 \times 3 \times 5$ M1 for any correct <u>product</u> of 3 factors = 60 seen or correct factor ladder or correct tree (condone 1's on tree/ladder)
	(ii) 12	2	M1 for $2^2 \times 3$ or $2 \times 2 \times 3$ oe
	(iii) 240	2	M1 for $2^4 \times 3 \times 5$ or $2 \times 2 \times 2 \times 2 \times 3 \times 5$ oe SC2 only for both correct answers (ii) (iii) reversed
2 (a)	3.02 (3.023...) www 4	4	M3 for $\sqrt{2^2 + 1.5^2 + 1.7^2}$ oe may be in two steps or $\sqrt{9.11}$ to 9.15... (3.018 to 3.026..) or M2 for $2^2 + 1.5^2 + 1.7^2$ oe implied by 9.11 to 9.15.... or M1 for any correct Pythag in 1 of the faces e.g. $2^2 + 1.5^2$
	(b) 34.1 to 34.3 cao www 3	3	M2 for $\sin = 1.7/\text{their } EC$ or $\cos = \text{their } EG/\text{their } EC$ or $\tan = 1.7/\text{their } EG$ or complete long method (M1 for CEG as required angle – accept on diagram if clear)
	(c)	(i) 2.95 cao (ii) Yes and because their (c)(i) < their (a)	1 1ft

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3 (a)	(i) 142 to 150	2	B1 for 7.1 to 7.5 seen
	(ii) (0)59 to (0)63	1	
	(iii) 148° to 152° drawn Distance 6.8 to 7.2 cm drawn	1	Both marks available from the position of <i>B</i> as lines don't need to be drawn.
	(iv) 328 to 332°	1	
	(v) 60 www 2	2	M1 for 20 ² or better seen
(b)	667 (666.6 to 666.7) www 3	3	B1 for 2.25 (h), 135 (mins), 8100 (sec) and M1 for 1500 ÷ their time in hours (time must be in range 2.09 to 3.25) (could be implied by 697 to 698)
(c)	(cos =) $\frac{1125^2 + 790^2 - 1450^2}{2 \times 1125 \times 790}$	M2	M1 for $1450^2 = 1125^2 + 790^2 - 2 \times 1125 \times 790 \cos Q$
	96.9 (96.87 to 96.88) www 4	A2	A1 for (cos =) -0.1197...(which implies M2)
4 (a)	4	1	
	- 5.8 or - 5.75 or - 5.7	1	
	- 2	1	
(b)	10 correct plots ft	P3ft	ft from their values in (a) generous with (- 0.25, 12.1) P2 for 8 or 9 correct plots ft or P1 for 6 or 7 correct plots ft
	Correct shape curve through 10 points (condone 2 points slightly missed) Two separate branches not crossing <i>y</i> -axis	C1ft	ft their points if shape correct – ignore anything between - 0.25 and 0.25
		B1	B1 C1 and B1 are independent
(c)	- 2.5 to - 2.3	1	
	- 0.5 to - 0.4	1	
	2.75 to 2.9	1	
(d)	Correct tangent drawn at <i>x</i> = -2	T1	Allow slight daylight
	- 4 to - 2.5	2	Dep on T1 M1 Rise/Tread attempt Dep on T1 or SC1 for answer in range 2.5 to 4 after T1

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<p>5 (a)</p> <p>(b)</p> <p>(c)</p> <p>(d)</p> <p>(e)</p>	<p>2, 3, 4, 5</p> <p>(i) $2x(x + 5y)$ (ii) $3(a - 2b)(a + 2b)$</p> <p>(i) $\frac{1}{2}x(x + 17) = 84$ or $x(x + 17) = 2 \times 84$ Correct proof of $x^2 + 17x - 168 = 0$ (ii) $(x - 7)(x + 24)$ (iii) 7 and -24 ft</p> <p>-3 www 3</p> <p>$\sqrt{(-5)^2 - 4 \times 2 \times -6}$ $p = -5$ and $r = 2 \times 2$</p> <p>3.39, -0.89 final answers</p>	<p>3</p> <p>2</p> <p>3</p> <p>M1</p> <p>E1</p> <p>2</p> <p>1ft</p> <p>3</p> <p>B1</p> <p>B1</p> <p>B1</p> <p>B1</p> <p>B1B1</p>	<p>M2 for $1 < n \leq 5$ seen (M1 for $1 < n$ or $n \leq 5$) Allow $2 \leq n < 6$ in M2 or M1 case If 0, B2 for 3 correct with no extras or 4 correct with 1 extra.</p> <p>B1 for $x(2x + 10y)$ or $2(x^2 + 5xy)$ B2 for $(3a - 6b)(a + 2b)$ or $(a - 2b)(3a + 6b)$ or correct answer seen in working or B1 for $3(a^2 - 4b^2)$ If B0, SC1 for $a^2 - b^2 = (a - 2b)(a + 2b)$</p> <p>Condone $\frac{1}{2}x \times x + 17 = 84$ but only for M mark No errors or omission of brackets anywhere</p> <p>SC1 for $(x + a)(x + b)$ where a and b are integers and $a + b = 17$ or $ab = -168$</p> <p>Correct or ft from their factors if quadratic</p> <p>B2 for $15 - 6 = x - 4x$ oe or better M1 for $15 - x = 2(3 - 2x)$ or better or $7\frac{1}{2} - x/2 = 3 - 2x$</p> <p>$(\sqrt{73})$</p> <p>Dependent on $\frac{p + \sqrt{q}}{r}$ or $\frac{p - \sqrt{q}}{r}$ or $(x - \frac{5}{4})^2$ B1 $\sqrt{3 + \frac{25}{16}}$ B1</p> <p>SC1 for 3.4 or 3.386... or 3.39 seen and -0.9 or -0.886... or -0.89 seen</p>
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6 (a)	(i) $45 < t \leq 55$	1	Allow any indication e.g. 4 th interval
	(ii) 52.6 (52.63.....) www 3	3	M1 for $6 \times 10 + 15 \times 27.5 + 19 \times 40 + 37 \times 50 + 53 \times 62.5 + 20 \times 75 (= 7895)$ Allow 1 error/omission and M1 dep for $\div 150$
	(b) (i) 40, 77, 130, 150	2	B1 for 2 or 3 correct values
	(ii) Correct scales 6 correct plots ft	S1 P3ft	ft from (i) if increasing values. (35, 21) must be inside square 20 – 22 but (55, 77) may be inside or edge of square P2 for 4 or 5 correct plots ft P1 for 2 or 3 correct plots ft
	Curve or ruled lines through the 6 points	C1ft	ft their points if increasing condone graph starting at (20, 6)
(c)	(i) 54 to 55	1	
	(ii) 18.5 – 22.5	2	B1 for UQ = 62.5 to 65 or LQ = 42.5 to 44 seen
	(iii) Their reading at 60 – their reading at 50	1	
	(iv) $\frac{150 - \text{their reading at } 50 (\pm 2)}{150}$ oe	2	SC1 for $\frac{\text{their reading at } 50 (\pm 2)}{150}$ oe
	(v) If their (iv) is $\frac{k}{150}$, then ft their $\frac{k}{150} \times \frac{k-1}{149}$	2ft	In (iv) and (v), condone answers as decimals to 3 sf Penalise first occurrence only of 2sf decimals isw cancelling/conversion M1 for $\frac{k}{150} \times \frac{k-1}{149}$

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7 (a)	87.5 (87.45 to 87.52) www 4	4	M1 for $\frac{1}{2} \times 2.5 \times 9.5$ soi by 11.875 or 71.2... and M2 for $\frac{1}{2} \times 2.5^2 \times \sin 60 \times 6$ oe (16.23 to 16.24) or M1 for $\frac{1}{2} \times 2.5^2 \times \sin 60$ (2.706..) or 1 trapezium (8.1189..)
(b)	107.9 to 108.0.....www3	3	Must see at least 4 figures M2 for $\frac{55}{360} \times \pi \times 15^2$ or M1 for $\frac{55}{360}$ seen
(c) (i)	2.29 (2.291 to 2.293) www 2	2	M1 for $108 = 15\pi r$ oe allow 107.9 to 108.0... for their 108
(c) (ii)	14.8 (14.82 to 14.83) cao www 3	3	M2 for $\sqrt{15^2 - \text{their } 2.29^2}$ (M1 for $h^2 + \text{their } 2.29^2 = 15^2$)
(d)	70.9 to 71.5 cao www 3	3	M2 for $\frac{\pi}{3}$ (their $2.29^2 \times \text{their } 14.8 - \text{their } 1.145^2$ $\times \text{their } 7.4$) (not 15 or 7.5) or $\frac{7}{8} \times \frac{\pi}{3} \times \text{their } 2.29^2 \times \text{their } 14.8$ or M1 for $1/8$ oe e.g. $\frac{7.5^3}{15^3}$ or $7/8$ or $(\frac{1}{2} \text{ their } R$ and $\frac{1}{2} \text{ their } h)$ seen
8 (a)	Correct enlargement	2	B1 for any enlargement of 2 in correct orientation
(b) (i)	Stretch only y- axis oe invariant (factor) 4	1 1 1	
(b) (ii)	$\begin{pmatrix} 4 & 0 \\ 0 & 1 \end{pmatrix}$	2ft	Ft their factor 4 SC1 for $\begin{pmatrix} k & 0 \\ 0 & 1 \end{pmatrix} k \neq 0, \neq 1$ or $\begin{pmatrix} 1 & 0 \\ 0 & 4 \end{pmatrix}$ ft their factor 4
(c)	Shear only x-axis oe invariant (factor) 2	1 1 1	

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9 (a)	(i) 3, 8, 15 in correct positions	2	B1 for 2 correct values in correct positions
	(ii) 12	3	M2 for $12 \times (12 + 2) (= 168)$ or $12, (12 + 2)$ or M1 for $n^2 + 2n = 168$ then M1 for $(n + a)(n + b)$ where a and b are integers and $ab = -168$ or $a + b = 2$ oe
	(b) (i) $2 + 3n$ oe	2	Allow unsimplified e.g. $5 + 3(n - 1)$ B1 for $3n$ oe seen
	(ii) 2^{n-1} oe	2	B1 for 2^k seen
(c)	$a = \frac{1}{2}, b = 1\frac{1}{2}$ cao	6	B1 for 12 or 30 seen but if 30 clearly only from Diagram 4 then B0. M1 for any 1 of $a + b + 1 = 3$ oe $8a + 4b + 2 = 12$ oe $27a + 9b + 3 = 30$ oe M1 for a 2 nd of the above equations M1 (indep) for correctly eliminating a or b from pair of linear equations B1 for one correct value