

## MARK SCHEME for the May/June 2008 question paper

### **0580, 0581 MATHEMATICS**

**0580/04, 0581/04** Paper 4 (Extended), maximum raw mark 130

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began.

All Examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

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<b>1 (a) (i)</b>	<b>250</b>	<b>B1</b>	
<b>(ii)</b>	their <b>(a)(i)</b> $\div 5 \times 52$ o.e. <b>2600</b> ft www2	<b>M1</b> <b>A1</b> ft	SC1 for $12.5 \div 5 \times 52$ , implied by 12.5
<b>(iii)</b>	$\frac{\text{their (a)(ii)} - 2450}{2450} \times 100$ o.e. <b>6.1(22.....)</b> ft www2	<b>M1</b> <b>A1</b> ft	$\frac{\text{their (a)(ii)}}{2450} \times 100 - 100, \frac{2450}{100} = \frac{150}{x}$ ft M & A only if their <b>(a)(ii)</b> > 2450
<b>(b) (i)</b>	$20 \div 5 \times 3$ <b>12</b> www2	<b>M1</b> <b>A1</b>	Accept 12, 8 or 8, 12
<b>(ii)</b>	their <b>(b)(i)</b> $\div 3$ and $(20 - \text{their (b)(i)}) \div 2.5$ <b>7 hours 12 mins</b> cao www2	<b>M1</b> <b>A1</b>	4 and 3.2 or 7.2 or 7h 20 mins seen imply <b>M1</b> Condone poor notation e.g. 7-12
<b>(iii)</b>	<b>2.78</b> (2.777–2.778) o.e. cao o.e. in other units	<b>B1</b>	o.e. must have units stated e.g. 0.7716..m/s, 46.29 – 46.30 m/min
<b>(iv)</b>	<b>16 07</b> o.e. ft	<b>B1</b> ft	ft their <b>(b)(ii)</b> + 08 55 iff finishes on same day and <b>(b)(ii)</b> has hours <b>and</b> mins
<b>(c)</b>	$20 \times 100000 \div 80$ o.e. <b>25 000 or <math>2.5 \times 10^4</math></b> www2	<b>M1</b> <b>A1</b>	25 000 seen in final ans. After M0, <b>SC1</b> for figs 25 or 0.00004 final answer <b>[13]</b>

<b>2 (a) (i)</b>	$(x + 4)(x - 5)$	<b>B2</b>	If B0, <b>SC1</b> if of form $(x \pm 4)(x \pm 5)$ ,
<b>(ii)</b>	<b>-4, 5</b> ft	<b>B1</b> ft	Only ft the SC -4, and 5 <b>not</b> from $(x - 4)(x + 5)$ .
<b>(b)</b>	$\frac{-(-2) \pm \sqrt{(-2)^2 - 4.3 - 2}}{2.3}$  <b>-0.55, 1.22</b> cao	<b>B1,B1</b>  <b>B1,B1</b>	<b>B1</b> for $(-2)^2 - 4(3)(-2)$ (or better) seen inside a square root. The expression must be in the form $\frac{p + (\text{or}-)\sqrt{q}}{r}$ then <b>B1</b> for $p = -(-2)$ and $r = 2.3$ or better Allow recoveries from incomplete lines If B0, <b>SC1</b> for <b>-0.5 and 1.2</b> or <b>both</b> answers correct to 2 or more decimal places (rounded or truncated). -0.54858, 1.21525...
<b>(c) (i)</b>	$(m - 2n)(m + 2n)$	<b>B1</b>	
<b>(ii)</b>	<b>-12</b>	<b>B1</b>	
<b>(iii)</b>	<b>20x + 5</b> o.e. cao final ans	<b>B2</b>	<b>B1</b> for $(4x^2 + 6x + 6x + 9)$ <b>or</b> $(x^2 - x - x + 1)$ <b>or</b> $(2x + 3 - 2(x - 1))(2x + 3 + 2(x - 1))$
<b>(iv)</b>	$4n^2 = m^2 - y$ o.e. $n^2 = \frac{m^2 - y}{4}$ o.e. $(n) = \sqrt{\frac{m^2 - y}{4}}$ o.e. www3 <b>Mark final answer</b>	<b>M1</b> <b>M1</b> <b>M1</b>	<b>M1</b> for correct re-arrangement for $n^2$ term (may be $-n^2$ ) <b>M1</b> for correct division by 4 or -4 <b>M1</b> for correctly taking square root of $n^2$ term <b>SC2</b> for $\sqrt{\frac{y \pm m^2}{4}}$ or $\sqrt{\frac{m^2 - y}{4}}$ o.e. ww
<b>(d) (i)</b>	<b>4 or -4 or <math>\pm 4</math></b>	<b>B1</b>	
<b>(ii)</b>	$n(m^4 - 16n^4)$ or $(m^2n - 4n^3)(m^2 + 4n^2)$ or $(m^2n + 4n^3)(m^2 - 4n^2)$ or $n(m - 2n)(m + 2n)(m^2 + 4n^2)$	<b>M1</b> <b>A1</b>	<b>Correctly</b> taking out $n$ or a <b>correct</b> factor with $n$ still in one bracket  Must be final answer <b>[17]</b>

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3			<p>Accept all probability answers as fractions (non-reduced or reduced), decimals or percentages.          –1 once for 2 sf answers or correct words.          Condone numerical errors in simplifying or converting after correct answers seen.          Ratio answers score zero throughout.</p>
(a) (i)	$\frac{1}{3}, \frac{3}{8}, \frac{6}{8}, \frac{2}{8}$ o.e.	B3	–1 each error bod if no letters given
(ii)	$\frac{2}{3} \times \frac{5}{8}$ $\frac{5}{12}$ o.e. www2	M1 A1	$\frac{10}{24}$ , etc., 0.416(6...)
(iii)	their $\frac{5}{12} + \frac{1}{3} \times \frac{6}{8}$ $\frac{2}{3}$ o.e. cao www2	M1 A1	$\frac{16}{24}, \frac{8}{12}$ , etc., 0.666(6...)
(b) (i)	$\frac{3}{10} \times \frac{2}{9} \times \frac{1}{8}$ $\frac{1}{120}$ o.e. www2	M1 A1	$\frac{6}{720}$ , etc., 0.00833(3...)
(ii)	$\frac{119}{120}$ o.e.	B1ft	$\frac{714}{720}$ , etc., 0.991(6...) ft 1 – their (i) not for 7/10 Could start again and have a correct answer independently [10]

4 (a) (i)	36 (36.0–36.4)	B1	
(ii)	50 (50.0–50.4)	B1	
(iii)	29 (28.6–29.4)	B1	
(iv)	20	B2	If B0, SC1 for 19 or 21 or 180 seen
(b) (i)	$p = 16, q = 4$	B1,B1	If B0, SC1 if $p$ and $q$ add up to 20
(ii)	$\left(\frac{7220}{200}\right) = 36.1$ cso www4	B4	<p>Answer 36 scores 4 marks after some correct working shown with no incorrect working seen          M1 for using mid-values at least four correct from 5, 15, 25, 35, 45, 55, 65, 75          M1 (dep on correct mid values or mid-values <math>\pm 0.5</math>) for <math>\sum fx</math> (at least four correct products)          M1 (dependent on 2<sup>nd</sup> M1) for dividing sum by 200 or 180 + their <math>p</math> + their <math>q</math></p>
(c)	8.2 (8.19–8.20), 11.4, 5 (5.00–5.01)	B4	<p>B3 for 2 correct          or B2 for 1 correct          After B0, SC2 for fd's 2.7(3...) o.e., 3.8 o.e, 1.6(6...) o.e.          or SC1 for 2 of fd's correct (15)</p>
5 (a) (i)	$360 \div 8$ or $(8 - 2) \times 180$	M1	allow $6 \times 180$

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	180 – their (360 ÷ 8) o.e. ÷ 8	M1	dependent
(ii)	45° used or use implied o.e.	E1	Accept sketch with values
(b) (i)	$\frac{l}{12} = \cos 45$ o.e.	M1	For o.e. allow implicit expression
	(PH =) <b>8.49</b> (8.485....) www2	A1	Accept $\sqrt{72}$ , $2\sqrt{18}$ , $3\sqrt{8}$ , $6\sqrt{2}$
(ii)	(PQ =) $2 \times$ their PH + 12 o.e.	M1	ft their PH accept surd form
	(PQ =) <b>29.0</b> (28.96–29.00) ft www2	A1 ft	
(iii)	their PH × their PH ÷ 2 o.e.	M1	ft their PH
	(Area APH =) <b>36</b> (35.95–36.1) ft www2	A1 ft	
(iv)	(their PQ) <sup>2</sup> – 4 × their area of triangle o.e.	M2	If M0, M1 for a clear collection of areas leading to the octagon possibly without any calculation shown
	(Area octagon =) <b>695</b> (694.0–697.1) cao www3	A1	
(c) (i)	0.5 of their PQ o.e.	M1	e.g. $6 + PH$ , $6 \tan 67.5^\circ$ accept surd form
	<b>14.5</b> (14.47–14.53) cao www2	A1	
(ii)	$\pi \times (\text{their } r)^2$	M1	(660.5...)
	$\frac{\text{their circle area}}{\text{their octagon area}} \times 100$	M1	Dependent on first M1 and circle smaller than the octagon
	<b>94.8</b> (94.35 to 95.60) cao www3	A1	

[17]

6 (a) (i)	$\begin{pmatrix} 2 \\ 1 \end{pmatrix}$	B1	Allow (2 1), condone omission of brackets
(ii)	$\begin{pmatrix} 2 \\ 1 \end{pmatrix}$ ft	B1ft	Allow (2 1), condone omission of brackets ft their (i) if a vector
(b)	Translation $\begin{pmatrix} 0 \\ -4 \end{pmatrix}$ o.e.	B1, B1	Allow (0 -4), condone omission of brackets, allow in words Any extra transformation spoils both marks
(c)	$y > 0$ o.e.	B1	<b>For all four, condone strict inequalities and only penalise first incorrect sign, which may be = or an inequality sign</b>
	$x < 2$ o.e.	B1	
	$y > \frac{1}{2}x$ o.e.	B1	
	$y < 2x + 4$ o.e.	B2	
			If B0, B1 for $2x$ or for 4 if other co-efficient is not zero $y < \frac{1}{2}x + 4$ gets zero

[9]

7 (a) (i)	<b>cyclic</b>	B1	Condone concyclic
(ii)	Any one of <b>40, 45, 50</b>	B1	<b>Angle BCT = 40° is inconsistent with ST parallel to OB. So different values of angles x, y, z, OCT and AOC can be arrived at, depending on route taken.</b>
	Any one of <b>20, 25, 30</b>	B1	
	Any one of <b>105, 110, 115</b>	B1	
(iii)	Any one of <b>80, 85, 90</b>	B1	
(iv)	Any one of <b>210, 215, 220, 225, 230</b>	B1	
(b) (i)	<b>Similar</b> (or enlargement)	B1	
(ii)	$\left(\frac{7}{10}\right)^2$ or $\left(\frac{10}{7}\right)^2$ o.e. seen	M1	(0.49), (2.04)
	<b>9.8</b> (9.79 to 9.81) www2	A1	It is possible to do (iii) then (ii) and full marks can still be scored
(iii)	$\frac{1}{2} \times 10 \times \text{height} = 20$	M1	
	<b>4</b> www2	A1	

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8 (a)	108(.16) (allow 108.2(0))      www2	M1 A1	M1 for method of compound interest
(b)	148(.02...) 324(.3...)	B1 B1	
(c)	Correct axes full domains 5 correct pts 100, 148 ft, 219, 324ft, 480  Smooth exponential curve, correct shape through 5 points	S1 P3ft  C1	Condone absence of labels P2ft for 4 correct, P1ft for 3 correct Points must be in correct square vertically, including on line Scale error – remove that part and try to mark the rest
(d) (i)	265 – 270	B1ft	If out of range, then ft their graph at 25 years
(ii)	17 or 18    cao	B1	
(e) (i)	$\frac{(100) \times 7 \times 20}{(100)}$ o.e. 100 + 7 × 20 or better	M1 E1	No errors
(ii)	380	B1	
(iii)	Correct straight ruled line for x – range 0 to 35	L2	P1ft for 2 of (0,100), (20,240) (40,380)ft correctly plotted
(f)	27 – 29    cao	B1	[17]

9 (a) (i)	p + r	B1	Answers in bracketed column form penalise only once throughout
(ii)	-p + r	B1	
(iii)	$-p + \frac{2}{3}r$	B1	
(iv)	$p + \frac{1}{2}r$	B1	
(b) (i)	$\frac{3}{2} \times (-p + \frac{2}{3}r)$ or $-\frac{3}{2}p + r$ isw after correct answer seen	B1 ft	ft only $\frac{3}{2} \times$ their (a)(iii)
(ii)	$\overrightarrow{QP} + \overrightarrow{PS}$ o.e. $-\frac{3}{2}p$ www 2	M1 A1 ft	o.e. is any correct route of at least 2 vectors ft their (b)(i) – r
(c)	lie on a straight line	B1	dependent on their (b)(ii) being a multiple of p [8]

10(a) (i)	4	B1	
(ii)	24	B1	
(b) (i)	x + 12, x + 14    o.e.	B1,B1	Any order ignore ref to g and i
(ii)	(x + 14 – x) and (x + 12 – (x + 2)) 14 – 10 or 14 – 12 + 2 or 4	E1	x + 12 and x + 14 must be seen to be used No errors seen
(iii)	(x + 2)(x + 12) – x(x + 14)  24	B1  E1	Subtraction can be implied later  Dep on B1 and no errors anywhere for the E mark
(c) (i)	4	B1	
(ii)	20	B1	
(d) (i)	4	B1	
(ii)	x + 2n    o.e., x + 2 + 2n    o.e.	B1,B1	
(iii)	4n	B1	Allow 4 × n, n × 4, n4 [13]