

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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1 (a) (i)	250	B1	
(ii)	their (a)(i) $\div 5 \times 52$ o.e. 2600 ft www2	M1 A1 ft	SC1 for $12.5 \div 5 \times 52$, implied by 130
(iii)	$\frac{\text{their (a)(ii)} - 2450}{2450} \times 100$ o.e. 6.1 (22.....) ft www2	M1 A1 ft	$\frac{\text{their (a)(ii)}}{2450} \times 100 - 100, \frac{2450}{100} = \frac{150}{x}$ ft M & A only if their (a)(ii) > 2450
(b) (i)	$20 \div 5 \times 3$ 12 www2	M1 A1	Accept 12, 8 or 8, 12
(ii)	their (b)(i) $\div 3$ and $(20 - \text{their (b)(i)}) \div 2.5$ 7 hours 12 mins cao www2	M1 A1	4 and 3.2 or 7.2 or 7h 20 mins seen imply M1 Condone poor notation e.g. 7-12
(iii)	2.78 (2.777–2.778) o.e. cao o.e. in other units	B1	o.e. must have units stated e.g. 0.7716..m/s, 46.29 – 46.30 m/min
(iv)	16 07 o.e. ft	B1 ft	ft their (b)(ii) + 08 55 iff finishes on same day and (b)(ii) has hours and mins
(c)	$20 \times 100000 \div 80$ o.e. 25 000 or 2.5×10^4 www2	M1 A1	25 000 seen in final ans. After M0, SC1 for figs 25 or 0.00004 final answer [13]

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

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3			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.
(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.	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	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.	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	B4	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 ± 0.5) for $\sum fx$ (at least four correct products) M1 (dependent on 2 nd M1) for dividing sum by 200 or 180 + their p + their q
(c)	8.2 (8.19–8.20), 11.4, 5 (5.00–5.01)	B4	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
5 (a) (i)	$360 \div 8$ or $(8 - 2) \times 180$	M1	allow 6×180

(15)

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	180 – their $(360 \div 8)$ o.e. $\div 8$	M1	dependent
(ii)	45° used or use implied o.e.	E1	Accept sketch with values
(b) (i)	$\frac{l}{12} = \cos 45$ o.e. $(PH =)$ 8.49 (8.485....) www2	M1 A1	For o.e. allow implicit expression Accept $\sqrt{72}$, $2\sqrt{18}$, $3\sqrt{8}$, $6\sqrt{2}$
(ii)	$(PQ =)$ $2 \times$ their $PH + 12$ o.e. $(PQ =)$ 29.(0) (28.96–29.00) ft www2	M1 A1 ft	ft their PH accept surd form
(iii)	their $PH \times$ their $PH \div 2$ o.e. (Area $APH =$) 36 (35.95–36.1) ft www2	M1 A1 ft	ft their PH
(iv)	(their PQ) ² – $4 \times$ their area of triangle o.e. (Area octagon =) 695 (694.0–697.1) cao www3	M2 A1	If M0, M1 for a clear collection of areas leading to the octagon possibly without any calculation shown
(c) (i)	0.5 of their PQ o.e. 14.5 (14.47–14.53) cao www2	M1 A1	e.g. $6 + PH$, $6 \tan 67.5^\circ$ accept surd form
(ii)	$\pi \times (\text{their } r)^2$ $\frac{\text{their circle area}}{\text{their octagon area}} \times 100$ 94.8 (94.35 to 95.60) cao www3	M1 M1 A1	(660.5...) Dependent on first M1 and circle smaller than the octagon

[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. $x < 2$ o.e. $y > \frac{1}{2}x$ o.e. $y < 2x + 4$ o.e.	B1 B1 B1 B2	For all four, condone strict inequalities and only penalise first incorrect sign, which may be = or an inequality sign 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)	cyclic	B1	Condone concyclic
(ii)	Any one of 40, 45, 50 Any one of 20, 25, 30 Any one of 105, 110, 115	B1 B1 B1	Angle $BCT = 40^\circ$ 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.
(iii)	Any one of 80, 85, 90	B1	
(iv)	Any one of 210, 215, 220, 225, 230	B1	
(b) (i)	Similar (or enlargement)	B1	
(ii)	$\left(\frac{7}{10}\right)^2$ or $\left(\frac{10}{7}\right)^2$ o.e. seen 9.8 (9.79 to 9.81) www2	M1 A1	(0.49), (2.04) It is possible to do (iii) then (ii) and full marks can still be scored
(iii)	$\frac{1}{2} \times 10 \times \text{height} = 20$ 4 www2	M1 A1	

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8 (a)	108(.16) (allow 108.2(0)) www2	M1 A1	M1 for method of compound interest used
(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)	$-\mathbf{p} + \frac{2}{3}\mathbf{r}$	B1	
(iv)	$\mathbf{p} + \frac{1}{2}\mathbf{r}$	B1	
(b) (i)	$\frac{3}{2} \times (-\mathbf{p} + \frac{2}{3}\mathbf{r})$ or $-\frac{3}{2}\mathbf{p} + \mathbf{r}$ isw after correct answer seen	B1 ft	ft only $\frac{3}{2} \times$ their (a)(iii)
(ii)	$\overrightarrow{QP} + \overrightarrow{PS}$ o.e. $-\frac{3}{2}\mathbf{p}$ 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 <i>g</i> and <i>i</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 $4 \times n, n \times 4, n4$ [13]