UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

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)	$\frac{\textit{their (a)(ii)} - 2450}{2450} \times 100$ o.e. **6.1**(22……..) ft www2	M1 A1ft	$\frac{\textit{their (a)(ii)}}{2450} \times 100 - 100$, $\frac{2450}{100} = \frac{150}{x}$ 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 – *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** $\times 10^4$ www2	M1 A1	25 000 seen in final ans. After M0, **SC1** for figs 25 or 0.00004 final answer **[13]**

2 (a) (i) (ii)	$(x + 4)(x - 5)$ **–4, 5** ft	B2 B1 ft	If B0, **SC1** if of form $(x \pm 4)(x \pm 5)$, 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)	**20*x* + 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) (ii)	**4 or –4 or** ± 4 $n(m^4 - 16n^4)$ or $(m^2n - 4n^3)(m^2 + 4n^2)$ or $(m^2n + 4n^3)(m^2 - 4n^2)$ or $n(m - 2n)(m + 2n)(m^2 + 4n^2)$	B1 M1 A1	**Correctly** taking out *n* or a **correct** factor with *n* still in one bracket Must be final answer **[17]**

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. 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)	$\left(\frac{7220}{200}\right) = \mathbf{36.1}$ cso www4	**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 2nd 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 **(15)**
5 (a) (i)	$360 \div 8$ or $(8-2) \times 180$	**M1**	allow 6×180

	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. (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 × 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 × their PH ÷ 2 o.e. (Area APH =) **36** (35.95–36.1) ft www2	M1 A1 ft	ft their PH
(iv)	(their PQ)^2 – 4 × 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, 6tan67.5° 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° 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	**[11]**

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 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 $4\times n$, $n\times 4$, $n4$ **[13]**