MARK SCHEME for the May/June 2008 question paper

0580, 0581 MATHEMATICS

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

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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.	M1	SC1 for $12.5 \div 5 \times 52$, implied by 130
	2600 ft www2	A1 ft	
(iii)	$\dfrac{their\ (a)(ii) - 2450}{2450} \times 100$ o.e.	M1	$\dfrac{their\ (a)(ii)}{2450} \times 100 - 100$, $\dfrac{2450}{100} = \dfrac{150}{x}$
	6.1(22……..) ft www2	A1ft	ft M & A only if their (a)(ii) > 2450
(b) (i)	$20 \div 5 \times 3$	M1	
	12 www2	A1	Accept 12, 8 or 8, 12
(ii)	their (b)(i) $\div 3$ and $(20 -$ their (b)(i)$) \div 2.5$	M1	4 and 3.2 or 7.2 or 7h 20 mins seen imply M1
	7 hours 12 mins cao www2	A1	Condone poor notation e.g. 7-12
(iii)	2.78 (2.777–2.778) o.e. cao	B1	o.e. must have units stated e.g.
	o.e. in other units		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.	M1	
	25 000 or 2.5×10^4 www2	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)	$\dfrac{-(-2) \pm \sqrt{(-2)^2 - 4.3 - 2}}{2.3}$	B1,B1	B1 for $(-2)^2 - 4(3)(-2)$ (or better) seen inside a square root. The expression must be in the form $\dfrac{p + (\text{or}-)\sqrt{q}}{r}$ then B1 for $p = -(-2)$ and $r = 2.3$ or better Allow recoveries from incomplete lines
	–0.55, 1.22 cao	B1,B1	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.	M1	M1 for correct re-arrangement for n^2 term (may be $-n^2$)
	$n^2 = \dfrac{m^2 - y}{4}$ o.e.	M1	M1 for correct division by 4 or – 4
	$(n) = \sqrt{\dfrac{m^2 - y}{4}}$ o.e. www3	M1	M1 for correctly taking square root of n^2 term
	Mark final answer		SC2 for $\sqrt{\dfrac{y \pm m^2}{4}}$ or $\sqrt{\dfrac{m^2 - y}{4}}$ 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	Correctly taking out n or a correct factor with n still in one bracket
		A1	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)	$\dfrac{1}{3}$, $\dfrac{3}{8}$, $\dfrac{6}{8}$, $\dfrac{2}{8}$ o.e.	B3	–1 each error bod if no letters given
(ii)	$\dfrac{2}{3} \times \dfrac{5}{8}$ $\dfrac{5}{12}$ o.e. www2	M1 A1	$\dfrac{10}{24}$, etc., 0.416(6…)
(iii)	their $\dfrac{5}{12} + \dfrac{1}{3} \times \dfrac{6}{8}$ $\dfrac{2}{3}$ o.e. cao www2	M1 A1	$\dfrac{16}{24}$, $\dfrac{8}{12}$, etc., 0.666(6….)
(b) (i)	$\dfrac{3}{10} \times \dfrac{2}{9} \times \dfrac{1}{8}$ $\dfrac{1}{120}$ o.e. www2	M1 A1	$\dfrac{6}{720}$, etc., 0.00833(3…)
(ii)	$\dfrac{119}{120}$ o.e.	B1ft	$\dfrac{714}{720}$, 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)	$\left(\dfrac{7220}{200}\right) = \mathbf{36.1}$ 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 $(360 \div 8)$ o.e. $\qquad \div 8$	**M1**	dependent
(ii)		$45°$ used or use implied o.e.	**E1**	Accept sketch with values
(b) (i)		$\dfrac{l}{12} = \cos 45$ o.e.	**M1**	For o.e. allow implicit expression
		$(PH =)$ **8.49** $(8.485….)$ www2	**A1**	Accept $\sqrt{72}$, $2\sqrt{18}$, $3\sqrt{8}$, $6\sqrt{2}$
(ii)		$(PQ =)\ 2 \times$ their $PH + 12$ o.e.	**M1**	
		$(PQ =)$ **29.(0)** $(28.96\text{–}29.00)$ ft www2	**A1 ft**	ft their PH accept surd form
(iii)		their $PH \times$ their $PH \div 2$ o.e.	**M1**	
		(Area $APH =$) **36** $(35.95\text{–}36.1)$ ft www2	**A1 ft**	ft their PH
(iv)		(their $PQ)^2 - 4 \times$ 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 =) **695** $(694.0\text{–}697.1)$ cao www3	**A1**	
(c) (i)		0.5 of their PQ o.e.	**M1**	e.g. $6 + PH$, $6\tan 67.5°$
		14.5 $(14.47\text{–}14.53)$ cao www2	**A1**	accept surd form
(ii)		$\pi \times$ (their $r)^2$	**M1**	$(660.5…)$
		$\dfrac{\text{their circle area}}{\text{their octagon area}} \times 100$	**M1**	Dependent on first M1 and circle smaller than the octagon
		94.8 $(94.35 \text{ to } 95.60)$ 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**	**For all four, condone strict inequalities and only penalise first incorrect sign, which may be = or an inequality sign**
	$x < 2$ o.e.		**B1**	
	$y > \dfrac{1}{2}x$ o.e.		**B1**	
	$y < 2x + 4$ o.e.		**B2**	If B0, B1 for $2x$ or for 4 if other co-efficient is not zero
				$y < \dfrac{1}{2}x + 4$ gets zero **[9]**

7 (a) (i)	**cyclic**		**B1**	Condone concyclic
(ii)	Any one of **40, 45, 50**		**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.**
	Any one of **20, 25, 30**		**B1**	
	Any one of **105, 110, 115**		**B1**	
(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)	$\left(\dfrac{7}{10}\right)^2$ or $\left(\dfrac{10}{7}\right)^2$ o.e. seen		**M1**	(0.49), (2.04)
	9.8 $(9.79 \text{ to } 9.81)$ www2		**A1**	It is possible to do **(iii)** then **(ii)** and full marks can still be scored
(iii)	$\dfrac{1}{2} \times 10 \times height = 20$		**M1**	
			A1	
	4 www2			**[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	**S1** **P3ft**	Condone absence of labels **P2ft** for 4 correct, **P1ft** for 3 correct Points must be in correct square vertically, including on line
		Smooth exponential curve, correct shape through 5 points	**C1**	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)		$\dfrac{(100) \times 7 \times 20}{(100)}$ o.e. $100 + 7 \times 20$ 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)	$\mathbf{p} + \mathbf{r}$	**B1**	**Answers in bracketed column form penalise only once throughout**
(ii)	$-\mathbf{p} + \mathbf{r}$	**B1**	
(iii)	$-\mathbf{p} + \dfrac{2}{3}\mathbf{r}$	**B1**	
(iv)	$\mathbf{p} + \dfrac{1}{2}\mathbf{r}$	**B1**	
(b) (i)	$\dfrac{3}{2} \times (-\mathbf{p} + \dfrac{2}{3}\mathbf{r})$ or $-\dfrac{3}{2}\mathbf{p} + \mathbf{r}$ isw after correct answer seen	**B1 ft**	ft only $\dfrac{3}{2} \times$ their **(a)(iii)**
(ii)	$\overrightarrow{QP} + \overrightarrow{PS}$ o.e. $-\dfrac{3}{2}\mathbf{p}$ 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]