MATHEMATICS   **0580/04, 0581/04**

Paper 4 (Extended)

SPECIMEN MARK SCHEME (New Format)

2 hours 30 minutes

MAXIMUM MARK: 130

This document consists of **8** printed pages.

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1	(a)	(i)	2 400	B2	SC1 for figures 24
		(ii)	520 000	B2	SC1 for figures 52
	(b)	(i)	1 : 5 000 000 or n = 5 000 000	B2	SC1 for 5 000 000 seen in final answer or n = figs 5 oe in final answer
		(ii)	Time = 2hrs 8 mins or 128 (mins)	B1	
			= 2.13(33..) (hours) oe soi	B1	Implies previous B1 Accept $^{128}/_{60}$
			1580 ÷ their time 738 – 742 cso	M1 A1	soi is by correct answer www 4 (12.3 seen earns B1M1) **[10]**
2	(a)		Axes to correct scale	S1	Accept 2mm accuracy throughout
	(b)		Correct **triangle** A(2,1)B(3,3)C(5,1)	B1	Condone absence of labels
	(c)		$A_1(1,2)$, $C_1(1,5)$, $B_1(3,3)$ ft their ABC	B2	B1 for 2 correct points Condone absence of labels and sides but not incorrect suffices
	(d)		$A_2(-2,1)$, $C_2(-5,1)$, $B_2(-3,3)$ ft their $A_1B_1C_1$	B2	B1 for 2 correct points Condone absence of labels and sides but not incorrect suffices SC1 for rotation of their $A_1B_1C_1$ 90° clockwise about the origin If triangle ABC is rotated correctly treat as mis-read
	(e)		Reflection y-axis oe cso	B1 B1	Indep (Only possible answer)
	(f)	(i)	$A_3(2, -1)$, $C_3(5, -4)$, $B_3(3,0)$	B3	B2 for 2 correct points plotted Condone absence of labels and sides If B0, M1 for any set up of matrix multiplication seen for at least one point and A1 for correct result (If correct triangle $A_2B_2C_2$ used treat as MR, and the co-ords are (–2, 3), (–5, 6), (–3, 6))
		(ii)	Shear, y-axis invariant oe	B1,B1	Allow factor of either +1 or –1 if invariant line omitted, but dependent on shear or stretch
		(iii)	$\begin{pmatrix} 1 & 0 \\ 1 & 1 \end{pmatrix}$	B2	B1 for the left hand column **[15]**

3	(a)	(i)	$0.5 \times 40.3 \times 26.8 \sin 92$ oe	M1	Any other method must be complete ($s = 58.13 - 58.15$)
			$539.6 - 540$	A1	**ww scores zero**
		(ii)	$\dfrac{AB}{\sin 92} = \dfrac{40.3}{\sin 55}$ oe	M1	$(AB^2) = 40.3^2 + 26.8^2$ M1 $-2 \times 40.3 \times 26.8 \cos 92$
			$(AB =) \dfrac{40.3 \times \sin 92}{\sin 55}$	M1	$(AB =)$ square root of above and a correct combination M1 (dep) Accept if found in **(i)** **ww scores zero**
			49.2 or $49.16 - 49.18$	A1	
		(iii)	55 Angles in the same segment oe	B1 B1dep	
		(iv)	33 correct or ft	B1	ft $88 -$ their 55, if answer is positive
		(v)	Similar or enlarged	B1	
		(vi)	$\dfrac{XD}{40.3} = \dfrac{20.1}{26.8}$ oe $30.2(25)$	M1 A1	$\dfrac{XD}{\sin their(iii)} = \dfrac{20.1}{\sin their(iv)}$ $30.2(309\ldots)$ cao Any other method must be complete **ww scores zero**
	(b)	(i)	$\dfrac{y}{y+2} = \dfrac{y+1}{2y-1}$ oe $y(2y-1) = (y+1)(y+2)$ $2y^2 - y = y^2 + y + 2y + 2$ $y^2 - 4y - 2 = 0$	M1 M1 E1	May be implied by next line Accept correct ratio statement May be implied by next line Implies previous M2 Dep (no errors in any line) If M0, SC1 for $y(2y-1) - (y+1)(y+2) =$ $2y^2 - y - y^2 - y - 2y - 2 =$ $y^2 - 4y - 2$
		(ii)	$\dfrac{4 \pm \sqrt{16+8}}{2}$	B1,B1	If of form $\dfrac{p + (or-)\sqrt{q}}{r}$ B1for 4 and 2, B1 for $4^2 - 4(1)(-2)$ If of form $p + (or-)\dfrac{\sqrt{q}}{r}$ B1 for $4^2 - 4(1)(-2)$ but may recover the other B1 from answers
			$-0.45, 4.45$ cao	B1,B1	SC1 for rounding or truncating to 1 dp or more $- 0.44948\ldots, 4.44948\ldots$ **ww scores max of 2**
		(iii)	$7.9(0)$ or better $7.8989..$ ft	B1ft	ft $2 \times$ a positive root -1 [19]

4	(a)		Using a right-angled triangle with 25 and 7 $25^2 - 7^2$ oe (or $50^2 - 14^2$) (BD) = 48 (or 24 × 2)	M1 M1 E1	25 and 7 seen is sufficient (or 50, 14) Must be a correct numerical calculation oe includes trig methods, which can round to 24, then 48 for the E mark Dep on M2, correctly established
	(b)	(i)	$\cos^{-1}\left(\dfrac{7}{25}\right)\times 2$ oe 147° cao	M1 A1	If scale drawing seen then M0 www 2 147.47…. score M1 only
		(ii)	air 32 -34 or ft	B1	ft 180 – their 147
	(c)	(i)	$\mathbf{q} + \mathbf{p}$ oe	B1	
		(ii)	$\mathbf{q} - \mathbf{p}$ oe	B1	
	(d)		$\overrightarrow{OC} + \overrightarrow{CE}$ oe e.g. their $(\mathbf{q} - \mathbf{p}) + 2 \times$ their $(\mathbf{q} + \mathbf{p})$ $\mathbf{p} + 3\mathbf{q}$ cao	M1 A1	any correct unsimplified expression $2\mathbf{q}$ + their (c) (i) www 2
	(e)		$\overrightarrow{OC} + \frac{1}{2}\overrightarrow{OB}$ oe $0.5\mathbf{p} + 2.5\mathbf{q}$ cao	M1 A1	any correct unsimplified expression $2\mathbf{q} + \frac{1}{2}$ their (c) (i) www 2
	(f)				Accept any reasonable notation in both parts
		(i)	$\begin{pmatrix} 0 \\ 24 \end{pmatrix}$	B1	
		(ii)	$\begin{pmatrix} 7 \\ -24 \end{pmatrix}$	B1 B1	
	(g)		50	B1	
					[16]

5	(a)	(i)	3	B1	
		(ii)	–4.25 to –4	B1	
	(b)	(i)	–1.6, 2.0, 8.6 to 8.63	B2	B1 for any one correct
		(ii)	9.2	B1	
	(c)		–9, 3	B1,B1	–1 each extra incorrect value
	(d)		$0 < x < 6$, (i.e.0 to 6 **only**) oe	B2	Accept (0,6), [0,6], (0, 3) to (6, –9). SC1 for other inequality errors or answers using 0 and 6 as boundaries
	(e)	(i)	correct line drawn	B1	
		(ii)	3	B1	**[11]**
6	(a)		$\dfrac{105}{x}$	B1	Do not allow $x =$, but allow other letter and condone presence of units
	(b)		$\dfrac{105}{x+4}$	B1	Do not allow $x =$, but allow other letter and condone presence of units
	(c)		$\dfrac{105}{x} - \dfrac{105}{x+4} = 0.8$ oe	M2	SC1 if ± signs between terms incorrect or SC1 for their (a) – their (b) = 0.8 oe if **(a)** and **(b)** are fractions with linear denominators
			$105(x + 4) – 105x = 0.8x(x + 4)$ oe	M1	Dep on M2 or SC1 and allow all over $x(x + 4)$ at this stage
			$0.8x^2 + 3.2x – 420 = 0$ oe		Condone any sign error in any expanding done first (this is taken into account in the E mark)
			$x^2 + 4x – 525 = 0$	E1	Completed without any errors dep on M3
	(d)	(i)	$(x + 25)(x – 21)$	B2	B1 for $(x – 25)(x + 21)$
		(ii)	-25, 21	B1	ft - allow 25 and -21 from above only
	(e)		46	B1 ft	ft $2 \times$ a positive root $+ 4$
	(f)		$210 \div$ (their (e)) 4.57 or better (4.565…) ft	M1 A1 ft	www 2, but 4.6 ww scores zero **[12]**

7	(a)	$1.5 < x \leq 2$	B1	
	(b)	$(8 \times 0.25 + 27 \times 0.75 + 45 \times 1.25 + \dots\dots$ $\dots\dots\dots\dots 3 \times 3.75)$ their $345.5 \div 200$ 1.7275, 1.727, 1.728 or 1.73 cso	M1 M1 M1 A1	For mid-values (allow two slips) For Σfx (allow two slips) dep on first M1, or mid-values ± 0.05 for $\div 200$ dep on second M1 www 4
	(c)	8, 35, 80, 130, 169, 190, 197, 200	B2	If B0, allow M1 for clear attempt to add accumulatively
	(d)	axes correct scale 8 points plotted ft part (c) (0.5, 8), (1, 35), (1.5, 80), (2, 130), (2.5, 169), (3, 190), (3.5, 197), (4, 200) curve (or polygon) either correct or through 8 points and correct shape	S1 P3dep C1	Not reversed and must reach 200 vertically, even if not labelled **dep on at least M1 in (c)** 8 points from their values For x-values (**upper boundary values**), points must touch grid line For y-values, even, must touch grid line, odd must be inside square. P2 for 6 or 7 points ft P1 for 4 or 5 points ft Allow 1 mm tolerance Ignore any bars drawn if they do not compromise the points and graph
	(e) (i)	1.65-1.75	B1	
	(ii)	1.5	B1	
	(iii)	23 – 29 integers only	B2	If B0 allow SC1 for non-integer in correct range, or 172 – 177 seen (may be written on graph)
	(f)	54 – 56.5	B2	SC1 for figures 108 – 113 or 87 – 92 Accept if written on graph www 2 **[18]**

8	(a)	$1.2 \times 0.3 \times 3$ oe $\times\ 60$ oe 64.8 cao	M1 M1dep A1	(1.08) or 3×60 (180) $\times\ 1.2 \times 0.3$ (0.36) www 3
	(b)	$1.2 \times 0.8 \times 15 \times 60$ oe (= 864 seen) Their 864 – their (a) $\div$ their (a) $\times$ 100 1230 (%) or better (1233.3…) cao	M1 M1ind M1dep A1	Their (a) $\frac{8}{3} \times 5$ oe seen or their 864 $\div$ their (a) $\times$ 100 (1333.3..) subtract 100 (Dep on second M1) www 4 (1330 or 1333.3…www M1M1M0)
	(c)	$\pi r^2 \times$ figs13 = figs 2 oe $2 \div 0.0013$ $(r^2) = \dfrac{2}{\pi \times 0.0013}$ oe 22.1 or 22.12 – 22.14 cao	M1 M1ind M1dep A1	(implied by 1538.46…) Dep on M2 (489.7..) www 4 figs 221… imply first M1
	(d)	$0.8 + 1.2 + 0.8 = (2.8)$ $50.40 = $ area $\times\ 0.12$ oe Length $\times$ their perimeter = their area oe 150 cao	M1 M1ind M1 A1	Accept 2.8 seen Accept 420 seen www 4 **[15]**

9	(a)		Sketch of 4 by 4 diagram	B1	
	(b)	(i)	25, 40	B1,B1	
		(ii)	n^2	B1	
			$(n+1)^2$ oe	B1	
			$(n+1)^2 + n^2 - 1$ or $(2n^2 + 2n)$ or $2n(n+1)$ oe	B2	Any one of these oe isw and if B0 allow SC1 for their $(n+1)^2$ + their $(n^2) - 1$ or an expression containing $2n^2$, as the highest order term, soi
	(c)	(i)	$\frac{2}{3} + f + g = 4$	B1	
		(ii)	$\frac{2}{3} \times 2^3 + f \times 2^2 + g \times 2$ oe	M1	ie for substituting 2
			$4f + 2g = \frac{32}{3}$	B1	No errors Allow 10, $\frac{2}{3}$ 10., 10.7, …
		(iii)	$2f + 2g = \frac{20}{3}$ $4f + 2g = \frac{32}{3}$	M1	for **correctly** setting up for elimination of one variable
			$(f =)2, (g =)\frac{4}{3}$ oe cao	A1A1	www 3 accept $\frac{6}{3}$ for 2
		(iv)	880	B1 ft	ft their values of f and g [14]