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MATHEMATICS **0580/43**

Paper 4 (Extended) **May/June 2017**

MARK SCHEME

Maximum Mark: 130

Published

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Abbreviations

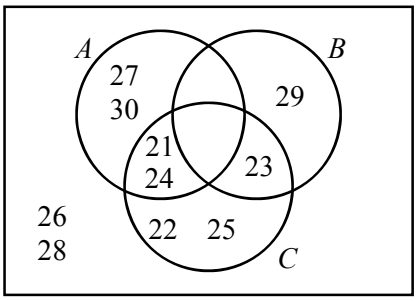
cao correct answer only
dep dependent
FT follow through after error
isw ignore subsequent working
oe or equivalent
SC Special Case
nfww not from wrong working
soi seen or implied

Question	Answer	Marks	Part marks
1(a)(i)	9550	**1**	
1(a)(ii)	23 158 750	**2FT**	**FT** *their* **(a)(i)** × 2425 correctly evaluated **M1** for *their* lower bound × 2425
1(a)(iii)	23 160 000	**1FT**	**FT** *their* **(a)(ii)** rounded to 4 sf
1(a)(iv)	2.316×10^7	**1FT**	**FT** *their* **(a)(iii)** or *their* **(a)(ii)** rounded to 3sf or more and in standard form
1(b)	520 nfww	**3**	**M2** for $546 \times \frac{100}{(100+5)}$ oe or **M1** for 105[%] associated with 546 oe
1(c)	3380 or 3376 to 3377	**2**	**M1** for $3000 \times \left(1+\frac{3}{100}\right)^4$ oe
2(a)	38	**1**	
	118	**1**	
	62	**1FT**	**FT** 180 – *their y*
2(b)	69	**3**	**B2** for *ACB* = 42 or **B1** for *ADB* = 42 If zero scored, **SC1** for *ACB* = *their ADB*
2(c)	107	**2**	**B1** for *QPS* = 73 or [reflex] *QOS* = 214
3(a)	0 2.25 2 1.25	**4**	**B1** for each
3(b)	Fully correct smooth curve	**4**	**B3 FT** for 7 or 8 points **or B2 FT** for 5 or 6 points **or B1 FT** for 3 or 4 points

Question	Answer	Marks	Part marks
3(c)	1	**1**	
3(d)(i)	[y =] x + 1	**1**	
3(d)(ii)	–2.2 to –2.1	**1**	
	–0.45 to –0.4	**1**	
	0.51 to 0.6	**1**	If zero scored, **SC1** for *their* line in **(d)(i)** drawn. It must be of the form $y = mx + c$ ($m \neq 0$) and drawn 'fit for purpose'
3(e)	$-1.33 < k < 0$ to 0.1	**2FT**	**FT** Strict ft of *their* max point and min point dep on cubic graph or accept correct answer from calculus **B1** for each If zero scored, **SC1** for two correct values reversed
4(a)(i)	17.5 or 17.46....nfww	**6**	**B3** for triangle height 3.46[4...] or $\sqrt{12}$ oe or **M2** for $\sqrt{4^2 - 2^2}$ or **M1** for $h^2 + 2^2 = 4^2$ **and M2** for $2 \times 7 + \frac{1}{2} \times 2 \times$ *their* h oe or **M1** for $\frac{1}{2} \times 2 \times$ *their* h
4(a)(ii)	140 or 139.6 to 139.7...	**1FT**	**FT** *their* **(a)** × 8
4(b)(i)	2.62 or 2.618…	**3**	**M2** for [r^2 =] $\frac{280}{13\pi}$ oe or **M1** for 280 = $\pi \times r^2 \times 13$
4(b)(ii)	10.2 or 10.20… or $10\frac{10}{49}$	**3**	**M2** for $\frac{280}{14^3}$ [×100] oe or **B1** for 2744 or 14^3 seen
5(a)(i)	80 33 20	**1, 1, 1**	
5(a)(ii)	17.3 nfww	**4**	**M1** for 5, 15, 22.5, 27.5, 40 soi **M1** for $\sum fx$ with *their f* 's and x in correct interval including both boundaries **M1** (dep on 2nd **M1**) for $\sum fx \div 200$

Question	Answer	Marks	Part marks
5(b)(i)	$\frac{30}{210}$ oe	**2**	**M1** for $\frac{6}{15}\times\frac{5}{14}$ If zero scored, **SC1** for answer $\frac{36}{225}$ oe
5(b)(ii)	$\frac{108}{210}$ oe	**3**	**M2** for $\frac{6}{15}\times\frac{9}{14}+\frac{9}{15}\times\frac{6}{14}$ oe or $1-\frac{9}{15}\times\frac{8}{14}-\frac{6}{15}\times\frac{5}{14}$ or **M1** for $\frac{6}{15}\times\frac{9}{14}$ or $\frac{9}{15}\times\frac{6}{14}$ or $\frac{9}{15}\times\frac{8}{14}+\frac{6}{15}\times\frac{5}{14}$ If zero scored, **SC1** for answer $\frac{108}{225}$ oe
5(c)	150	**1**	
6(a)(i)	Translation	**1**	
	$\begin{pmatrix}3\\-13\end{pmatrix}$ oe	**1**	
6(a)(ii)	Enlargement	**1**	
	[sf] $-\frac{1}{2}$ oe	**1**	
	(0, –4)	**1**	
6(b)	Image at (0, 0) (0, 6) (–4, 6) (–4, 2)	**2**	**B1** for rotation of 90º anticlockwise about the wrong centre or 90º clockwise about (3, –1) or 4 points correct but not joined.
6(c)	Image at (4, 0) (10, 0) (10, –4) (6, –4)	**2**	**B1** for reflection in $y = k$ or in $x = 1$ or 4 points correct but not joined
6(d)	Enlargement	**1**	
	[sf] 3	**1**	
	Origin oe	**1**	

Question	Answer	Marks	Part marks
7(a)	[x =] –5 [y =] 7 with correct working	**4**	**M1** for correctly equating one set of coefficients **M1** for correct method to eliminate one variable OR **M1** for correctly rearranging one equation **M1** for correct method to eliminate one variable **A1** $x = -5$ **A1** $y = 7$ both dep on **M2** If zero scored, **SC1** for 2 values satisfying one of the original equations **SC1** if no correct working shown, but 2 correct answers given
7(b)	[a =] 36 [b =] –6	**3**	**B2** for either correct or **M1** for $a = b^2$ or for $x^2 + bx + bx + b^2$ or better or for $(x-6)^2$ seen and **M1** for $2b = -12$ soi
7(c)	$\frac{7x^2 - 12x - 10}{(2x-5)(x-1)}$ oe final answer nfww	**4**	**B1** for common denom $(2x-5)(x-1)$ seen oe isw **M1** for $x(x-1) + (3x+2)(2x-5)$ soi isw **B1** for $6x^2 - 15x + 4x - 10$ soi
8(a)(i)	4 points correctly plotted	**2**	**B1** for 2 or 3 points correctly plotted
8(a)(ii)	Positive	**1**	
8(b)	mean 3.1	**3**	**M2** for $\frac{\text{sum of products}}{30}$ or **M1** for at least 4 correct products soi
	median 3	**2**	**M1** for 15.5 oe indicated
	mode 5	**1**	
	range 5	**1**	
8(c)	24 nfww	**3**	**M1** for $\frac{x \times 52 + 45 \times 75 + 11 \times 91}{x + 45 + 11}$ [= 70.3] **M1** for clearing *their* fraction

Question	Answer	Marks	Part marks
9(a)	1120 or 1121**.**	**4**	**M2** for $[AC^2 =]$ $525^2 + 872^2 - 2\times525\times872\times\cos 104$ or **M1** for implicit version **A1** for 1 257 000 to 1 258 000
9(b)	[*QB* or *x* =] 872 × tan 1 seen	**M2**	**M1** for $\tan 1 = \frac{QB}{872}$
	tan = *their QB* ÷ 525	**M1**	
	1.7 or 1.660 to 1.661 nfww	**A1**	dep on **M3**
9(c)(i)	222 000 or 222 100**.** .... or 222 101	**2**	**M1** for $\frac{1}{2}\times525\times872\times\sin104$
9(c)(ii)	5.55 or 5.550 to 5.553 nfww	**2FT**	**FT** *their* **(c)(i)** × $100^2 \div 20\,000^2$ **M1** for *their* **(c)(i)** × $100^2 \div 20\,000^2$ or restart
10(a)		**4**	All 8 regions correct **M3** for 6 or 7 regions correct **M2** for 4 or 5 regions correct **M1** for 3 regions correct
10(b)(i)	$\notin$	**1**	
10(b)(ii)	$\varnothing$	**1**	
10(c)	21, 23, 24, 29	**2FT**	Correct or **FT** **SC1** for 1 omission or 4 correct and 1 extra
10(d)(i)	5	**1FT**	Correct or **FT** if less than 10
10(d)(ii)	9	**1FT**	Correct or **FT** if less than 10
10(e)	$\subset$ or $\subseteq$	**1**	

Question	Answer	Marks	Part marks
11	64 $(n+3)^2$ oe final answer	**1, 2**	**M1** for a quadratic expression seen or second differences 2
	17 $3n+2$ oe final answer	**1, 2**	**B1** for $3n+k$ (any k) or $kn+2$ ($k \neq 0$)
	47 $(n+3)^2-(3n+2)$ oe isw	**1, 2FT**	**FT** *their* difference expressions $A - B$ **M1** for expression $an^2 + bn + c$ seen or second differences 2
	$\frac{7}{6}$ $\frac{n+2}{n+1}$ oe final answer	**1, 2**	**B1** for $\frac{n+k+1}{n+k}$ seen