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MATHEMATICS **0580/43**

Paper 4 (Extended) **October/November 2016**

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	Mark	Part marks
1 (a) (i)	1050	2	**M1** for $924 \div 22$ oe or $924 \div 0.88$ oe If zero scored, **SC1** for 126 seen
(ii)	12	1	
(iii)	5 ¼ hrs or 5.25 hrs	2	**M1** for $9 \div (7 + 5)$ or $540 \div (7 + 5)$ If zero scored, **SC1** for answer 3.75h or 3h 45 mins
(b)	24.6[0]	3	**M2** for $15.99 \div \left(1 - \frac{35}{100}\right)$ oe or **M1** for 65% associated with 15.99
(c)	63	3	**M2** for $35 \times \sqrt{\frac{2835}{875}}$ oe or **M1** for $\sqrt{\frac{2835}{875}}$ or $\sqrt{\frac{875}{2835}}$ or better or $\frac{\sqrt{2835}}{?} = \frac{\sqrt{875}}{35}$ oe OR **M2** for $\sqrt{2835 \times \frac{35}{their(875 \div 35)}}$ oe or **M1** for $\frac{35}{their(875 \div 35)}$ or $\frac{their(875 \div 35)}{35}$
(d) (i)	0.661[0]	1	
(ii)	48	3	**M2** for $\frac{18.50 - 12.50}{12.50} \times 100$ or **M1** for $\frac{18.50 - 12.50}{12.50}$ or $\frac{18.50}{12.50} \times 100$

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2 (a)	–4.5 and 10.5	2	**B1** for each value
(b)	Correct curve	5	**B4** for correct curve with branches joined OR **B3 FT** for 9 or 10 points or **B2 FT** for 7 or 8 points or **B1 FT** for 5 or 6 points **and** **B1** independent for one branch on each side of the y-axis and **not touching** or crossing the y-axis
(c)	5	1	
(d) (i)	Line $y = 15 - 3x$ ruled and –0.4 to –0.31 0.35 to 0.45 2.2 to 2.3	4	**B3** for correct line and 2 correct values or **B2** for correct line or **M1** for ruled line with gradient –3 or through (0, 15) or **SC2** for no/wrong line and three correct values or **SC1** for no/wrong line and two correct values or for correct freehand line
(ii)	[a =] 6 [b =] –14 [c =] 0	3	**B2** for $6x^3 - 14x^2 + 2 = 0$ oe or **M1** for correct removal of denominator or collection of terms on one side
3 (a)	2.25 oe	2	**M1** for $8x + 4x = 22 + 5$ or better
(b)	$x \geqslant 3.5$ final answer	2	**M1** for $6x - 2x \geqslant 14$ or better
(c)	$(x - 7)(x + 3)$ final answer	2	**M1** for $x(x + 3) - 7(x + 3)$ or $x(x - 7) + 3(x - 7)$ or for $(x + a)(x + b)$ where $ab = -21$ or $a + b = -4$
(d)	$12x^2 + xy - 6y^2$ final answer	3	**M2** for $12x^2 + 9xy - 8xy - 6y^2$ or **M1** for any two of the four terms correct
4 (a)	Triangle drawn at (–4, 3), (–1, 3), (–1, 4)	2	**SC1** for correct reflection in $x = k$ or $y = 1$
(b)	Triangle drawn at (1, 7), (1, 6), (4, 6)	2	**SC1** for translation by $\begin{pmatrix} -2 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ 3 \end{pmatrix}$
(c)	Triangle drawn at (2, 3), (2, 1), (8, 1)	2	**M1** for two correct vertices or **SC1** for correct enlargement about the wrong centre
(d)	Rotation 90º clockwise oe (7, 4)	1 1 1	Accept –90°

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5 (a)	$\frac{1}{64}$	2	**M1** for $\frac{1}{8} \times \frac{1}{8}$
(b)	$\frac{63}{64}$	1FT	**FT** 1 – *their* **(a)**
(c)	$\frac{30}{64}$ oe	2	**M1** for [2 ×] $\frac{3}{8} \times \frac{5}{8}$ oe
(d)	$\frac{7}{64}$	3	**M2** for $\frac{1}{8} \times \frac{1}{8} + \frac{1}{8} \times \frac{3}{8} + \frac{3}{8} \times \frac{1}{8}$ oe or **M1** for identifying combinations required, (8, 8) and (8, 6) and (8, 5) or identifying 6 out of the 7 possible outcomes
(e)	$\frac{24}{64}$ oe	3	**M2** for $\frac{1}{8} \times \frac{7}{8} + \frac{3}{8} \times \frac{4}{8} + \frac{2}{8} \times \frac{2}{8} + \frac{1}{8} \times \frac{1}{8}$ oe or $\frac{7}{8} \times \frac{1}{8} + \frac{6}{8} \times \frac{1}{8} + \frac{4}{8} \times \frac{2}{8} + \frac{1}{8} \times \frac{3}{8}$ oe or **M1** for the sum of any two correct products from above oe isw
6 (a)	$[\cos ABL =] \frac{40^2 + 61.1^2 - 92.1^2}{2 \times 40 \times 61.1}$ 130.11…	M2 A2	**M1** for correct implicit version **A1** for $[\cos ABL =]$ –0.644… or $-\frac{7873}{12220}$ or $-\frac{3149.2}{4888}$
(b)	[0]59.5 or 59.50 to 59.511	4	**M2** for $\frac{40 \sin 130.1}{92.1}$ or $\frac{61.1 \sin 130.1}{92.1}$ or **M1** for $\frac{\sin A}{40} = \frac{\sin 130.1}{92.1}$ or $\frac{\sin L}{61.1} = \frac{\sin 130.1}{92.1}$ **and** **A1** for 19.39 to 19.4… or 30.48 to 30.49…

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Question	Answer	Mark	Part marks
(c)	1h 50min	5	**M2** for $[BC =]\ 2 \times 40 \times \cos(180 - 130.1)$ oe or **M1** for $\frac{x}{40} = \cos(180 - 130.1)$ oe OR **M2** for $[BC =]\ \sqrt{\{40^2 + 40^2 - 2 \times 40 \times 40\cos(\textit{their}\ 80.2)\}}$ or **M1** for correct implicit version OR **M2** for $[BC =]\ \frac{40\sin(\textit{their}\ 80.2)}{\sin 49.9}$ or **M1** for correct implicit version **and** **M1** for $\frac{\textit{their}\ BC}{28}$ **A1** for 1.84[0…] to 1.841
7 (a) (i)	6000 [7600] 10200 4200	2	**B1** for 6000 or 10200 If **B0** then **B1FT** for *their* (UQ – LQ)
(ii)(a)	True, median price is lower	1	No inclusion of other statistic
(ii)(b)	False, A's UQ < 13 600 oe	1FT	**FT** *their* UQ in **(a)(i)**
(b)	11 025	4	Listed values are in thousands **M1** for 3, 7, 9, 11, 13, 18 soi **M1** for Σfm [1323] **M1** (dep on second **M1**) for *their* $\Sigma fm \div 120$
(c)	323.25 nfww	3	**M2** for $9948 - 0.25 \times 8760$ or **M1** for 0.25×8760
8 (a)	Attempt to use $18 - r$ in Pythagoras'	M1	
	$144 = r^2 - 324 + 18r + 18r - r^2$ oe	B2	or **B1** for $324 - 18r - 18r + r^2$
	$468 = 36r$ oe	A1	Correct simplification with no errors
(b)	$[2 \times]\ \sin^{-1}\left(\frac{12}{13}\right)$ oe	M1	or $\cos = \left(\frac{13^2 + 13^2 - 24^2}{2 \times 13 \times 13}\right)$ or better or $[180 -]\ 2 \times \sin^{-1}\left(\frac{5}{13}\right)$
	134.76…	A1	Not 67.4×2

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Question	Answer	Mark	Part marks
(c) (i)	332 or 332.1 to 332.2…	3	**M2** for $\frac{(360-134.8)}{360} \times \pi \times 13^2$ or **M1** for $\frac{134.8}{360} \times \pi \times 13^2$
(ii)	392 or 392.0 to 392.2…	3	**M2** for ½ × 24 × 5 + *their* **(c)(i)** or ½ × 13^2 × sin134.8 + *their* **(c)(i)** or **M1** for ½ × 24 × 5 or ½ × 13^2 × sin134.8
(iii)	15 700 or 15 670 to 15 690	1FT	**FT** for answer to 40 × *their* **(c)(ii)**
(d)	29.5 or 29.6 or 29.51 to 29.57…	2FT	**M1** for $\pi \times 13^2 \times h$ = *their* **(c)(iii)** or better
9 (a) (i)	$\begin{pmatrix} 12 \\ -5 \end{pmatrix}$	2	**M1** for $\begin{pmatrix} 12 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ -5 \end{pmatrix}$
(ii)	13 nfww	2FT	**M1FT** for $\sqrt{\textit{their}12^2 + \textit{their}(-5)^2}$ **FT** dep on *their* **(a)** being $\begin{pmatrix} a \\ b \end{pmatrix}$ where a, b are both non-zero
(b)(i)(a)	**b** – **a**	1	
(i)(b)	$\frac{3}{5}(\mathbf{b}-\mathbf{a})$ or $\frac{3}{5}\mathbf{b}-\frac{3}{5}\mathbf{a}$ final answer	1FT	**FT** $\frac{3}{5}$ *their* vector, in terms of **a** and **b**, in **(b)(i)(a)**
(i)(c)	$\frac{1}{5}(2\mathbf{a}+3\mathbf{b})$ or $\frac{2}{5}\mathbf{a}+\frac{3}{5}\mathbf{b}$ final answer	2	**M1** for **a** + *their* vector in **(b)(i)(b)** or any correct route
(ii)	$\frac{3}{2}$ oe	1	

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Question	Answer	Mark	Part marks
10 (a)	A: 14 $3n - 1$ oe	**3**	**B1** for 14 **B2** for $3n - 1$ oe or **M1** for $3n + k$, for any k oe
	B: –4 $26 - 6n$ oe	**3**	**B1** for –4 **B2** for $26 - 6n$ oe or **M1** for $k - 6n$, for any k oe
	C: 25 n^2 oe	**2**	**B1** for 25 **B1** for n^2 oe
	D: 20 $n^2 - n$ oe	**2**	**B1** for 20 **B1** for $n^2 - n$ oe
(b) (i)	$\frac{n(3n+1)}{2} = 155$	**M1**	Accept $\frac{3n^2+n}{2} = 155$
	$3n^2 + n = 310$		Intermediate step must include elimination of fraction eg $n(3n + 1) = 310$
	$3n^2 + n - 310 = 0$	**A1**	With no errors or omissions
(ii)	10 , $-\frac{31}{3}$ oe	**3**	**M2** for $(3n + 31)(n - 10)$ [= 0] or **M1** for $3n(n - 10) + 31(n - 10)$ or $n(3n + 31) - 10(3n + 31)$ or $(3n + a)(n + b)$ where $ab = -310$ or $a + 3b = 1$
(iii)	10	**1FT**	**FT** *their* **b(ii)** if only one positive integer solution

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Question	Answer	Mark	Part marks
11	5 and $-\frac{27}{2}$ oe	**7**	**M2** for $12 \times 2(2x - 1) + (x + 3)(2x - 1) = 12 \times 3(x + 3)$ oe or **M1** for a common denominator with 2 or more of the terms and **B2** for $2x^2 + 17x - 135$ [= 0] oe or **B1** for $48x - 24$ or $2x^2 - x + 6x - 3$ or $36x + 108$ or $2x^2 - x + 54x - 27$ or $132 - 12x$ or $37x + 111 - 2x^2 - 6x$ and **M2** for $(2x + 27)(x - 5)$ or *their* correct factors or formula or **M1** for $2x(x - 5) + 27(x - 5)$ or $x(2x + 27) - 5(2x + 27)$ or $(2x + a)(x + b)$ where $ab = -135$ or $a + 2b = 17$

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