## Cambridge International Examinations

Cambridge International General Certificate of Secondary Education

## MATHEMATICS

0580/42
Paper 4 (Extended)
May/June 2017
MARK SCHEME
Maximum Mark: 130

## Published

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, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

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| Question | Answer | Marks | Part marks |
| :---: | :---: | :---: | :---: |
| 1(a)(i) | $600 \div(11+9) \times 11[=330]$ <br> with no errors seen | M1 | Could be in separate steps |
| 1(a)(ii) | 270 | 1 |  |
| 1(b)(i) | 372 cao nfww | 3 | B2 for answer 371.7... or M1 for $330 \times\left(1+\frac{1.5}{100}\right)^{8}$ oe not spoiled After zero scored, SC1 for answer 42 or 41.7... |
| 1(b)(ii) | 12.6 or 12.7 or 12.63 to 12.73 | 2 | M1 for $\frac{\text { their } \mathbf{( b ) ( \mathbf { i } ) - 3 3 0}}{330}$ or $\frac{\text { their } \mathbf{( b ) ( \mathbf { i } )}}{330} \times 100$ soi by 112.7 or 113 <br> After zero scored, SC1 for answer 12\% |
| 1(c)(i) | $\frac{99}{280}$ cao final answer | 1 |  |
| 1(c)(ii) | 27.5[0] | 3 | M2 for $24.75 \div \frac{100-10}{100}$ oe or M1 for recognising 24.75 as 90 [\%] oe |
| 1(d)(i) | 32 cao | 2 | M1 for $\left(1-\frac{20}{100}\right)\left(1-\frac{15}{100}\right)[x]$ oe or for $0.15 \times 0.8[x]$ oe |
| 1(d)(ii) | 13 cao | 2 | M1 for $\left(1-\frac{20}{100}\right)\left(1-\frac{15}{100}\right) \times x=40.84-32$ oe seen or for their $\mathbf{( d )} \mathbf{( i )}+\left(1-\left(\frac{\text { their } \mathbf{( d )} \mathbf{( i )}}{100}\right)\right) x=40.84 \mathrm{oe}$ |
| 2(a)(i) | Image at ( 8,1$),(10,5),(8,5)$ | 2 | B1 for translation $\binom{6}{k}$ or $\binom{k}{-5}$ or 3 correct points not joined |
| 2(a)(ii) | Image at (4, 10), (4, 8), (8, 8) | 2 | B1 for rotation $90^{\circ}$ anticlockwise but different centre or for rotation $90^{\circ}$ clockwise about $(4,10)$ or 3 correct points not joined |
| 2(a)(iii) | Image at (6, 3), (6, 5), (7, 5) | 2 | B1 for enlargement factor $\frac{1}{2}$ but incorrect centre or 3 correct points not joined |
| 2(b) | Reflection | 1 |  |
|  | $y=-x$ oe | 1 | If zero scored, M1 for correct use of matrix product |


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| :---: | :---: | :---: | :---: |
| 2(c)(i)(a) | $\binom{13}{16}$ | 2 | B1 for each in a 2 by 1 matrix or SC1 for (13 [,] 16) |
| 2(c)(i)(b) | $\left(\begin{array}{ll}2 & 10 \\ 3 & 15\end{array}\right)$ | 2 | B1 for answer any 2 by 2 matrix |
| 2(c)(i)(c) | $\frac{1}{2}\left(\begin{array}{cc}4 & -3 \\ -2 & 2\end{array}\right)$ oe isw | 2 | B1 for $k\left(\begin{array}{cc}4 & -3 \\ -2 & 2\end{array}\right)$ oe soi $(k \neq 0)$ or for determinant $=2$ oe soi |
| 2(c)(ii) | $\mathbf{N M}$ or MP or $\mathbf{N}^{2}$ oe or $\mathbf{P}^{\mathbf{2}}$ oe | 1 |  |
| 3(a)(i) | 175.5 nfww | 4 | M1 for at least four of $50,125,175,225,325 \text { soi }$ <br> M1 for $\Sigma f x$ with $x$ inside or on boundary of each interval $\text { M1 (dep on second M1) for } \frac{\text { their } \Sigma f x}{200}$ |
| 3(a)(ii) | Fully correct histogram | 4 | B1 for each correct bar <br> If zero scored, B1 for 0.2, 1.32, 0.7, 0.16 seen |
| 3(b)(i) | Fully correct cumulative frequency diagram | 3 | B1 for correct horizontal plots B1 for correct vertical plots <br> B1FT dep on at least B1 earned for points joined with smooth increasing curve or polygon If zero scored, SC1 for 4 correct plotted points |
| 3(b)(ii)(a) | 170 to 175 | 1 |  |
| 3(b)(ii)(b) | 152 to 158 | 2 | M1 for 42 to 48 written |
| 4(a) | -1.75 to -1.7 | 1 |  |
|  | 1.7 to 1.75 | 1 |  |
| 4(b)(i) | Correct ruled solid tangent at $(-1.5,3.5)$ | 1 |  |
| 4(b)(ii) | -7 to -5 | 2 dep | dep on close attempt at ruled solid tangent at $x=-1.5$ in part (b)(i) <br> M1 for rise/run dep on close attempt at ruled solid tangent at $x=-1.5$ |
| 4(c)(i) | 1 | 1 |  |
| 4(c)(ii) | Correct curve | 3 | B2 for 4 or 5 correct points or B1 for 2 or 3 correct points |


| Question | Answer | Marks | Part marks |
| :---: | :---: | :---: | :---: |
| 4(d)(i) | -0.95 to -0.8 | 1 |  |
|  | 1.1 to 1.45 | 1 |  |
| 4(d)(ii) | their $(-0.95$ to -0.8$)<x<$ their ( 1.1 to 1.45 ) oe | 1FT | correct or FT their (d)(i) |
| 4(e)(i) | 0.125 oe and 0.03125 oe and 0.000976 to 0.000977 oe | 1 |  |
| 4(e)(ii) | 0 | 1 | accept zero, nought, etc |
| 5(a)(i) | 94.2 or 94.3 or 94.24 to 94.26 | 2 | M1 for $\pi \times 3 \times 10$ |
| 5(a)(ii) | 9.54 or 9.539... | 3 | M2 for $\sqrt{10^{2}-3^{2}}$ or M1 for $h^{2}+3^{2}=10^{2}$ oe |
| 5(a)(iii) | 89.9 or 89.90 to $89.92 \ldots$ | 2 | $\text { M1 for } \frac{1}{3} \times \pi \times 3^{2} \times \text { their }(\mathbf{a})(\mathbf{i i )}$ |
| 5(b) | 108 or 107.9 to 108.1 nfww | 4 | M3 for $\frac{\pi \times 3 \times 10}{\pi \times 10^{2}} \times 360$ oe or $\frac{\text { their } \mathbf{( a ) ( \mathbf { i } )}}{\pi \times 10^{2}} \times 360$ oe or $\frac{2 \times \pi \times 3}{2 \times \pi \times 10} \times 360$ oe or M2 for $\frac{x}{360} \times \pi \times 10^{2}=\operatorname{their}(\mathbf{a})(\mathbf{i})$ oe or $\frac{x}{360} \times 2 \times \pi \times 10=2 \times 3 \times \pi$ oe or M1 for $\frac{x}{360} \times \pi \times 10^{2}$ seen or $\frac{x}{360} \times 2 \times \pi \times 10$ seen |
| 5(c) | 46.6 to 46.8 | 4 | M3 for $\frac{\text { their } \mathbf{( b )}}{360} \times \pi \times 10^{2}-\frac{1}{2} \times 10 \times 10 \times \sin ($ their $(\mathbf{b}))$ oe or M1 for $\frac{\text { their } \mathbf{( b )}}{360} \times \pi \times 10^{2}$ or their (a)(i) soi and M1 for $\frac{1}{2} \times 10 \times 10 \times \sin ($ their $(\mathbf{b}))$ soi |
| 6(a) | $\frac{1}{3}, \frac{6}{7}$ correctly placed | 1 |  |
|  | $\frac{4}{7}, \frac{3}{7}$ correctly placed | 1 |  |


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| :---: | :---: | :---: | :---: |
| 6 (b) | $\frac{2}{21} \mathrm{oe}$ | 2 | $\text { M1 for } \frac{2}{3} \times \frac{1}{7}$ |
| 6(c)(i) | $\frac{15}{21} \mathrm{oe}$ | 3 | M2 for $\frac{2}{3} \times \frac{6}{7}+\frac{1}{3} \times \frac{3}{7}$ oe <br> or M1 for $\frac{2}{3} \times \frac{6}{7}$ oe or $\frac{1}{3} \times \frac{3}{7}$ oe seen |
| 6(c)(ii) | 50 | 2FT | FT (70 $\times$ their $(\mathbf{c})(\mathbf{i})$ ) rounded up or down to integer <br> M1 for $70 \times$ their $\mathbf{( c ) ( i ) ~}$ |
| 6(d) | $\frac{10}{243} \text { oe }$ | 2 | M1 for $\frac{2}{3} \times \frac{1}{3} \times \frac{1}{3} \times \frac{1}{3} \times \frac{1}{3}[\times k]$ oe nfww where $k$ is positive integer less than 5 |
| 7(a)(i) | 4.5 or $4 \frac{1}{2}$ or $\frac{9}{2}$ final answer | 3 | M2 for $[2](4 x+7)=[2](6 x-2)$ oe <br> or M1 for $2(2 x+6)+2(2 x+1)$ oe or $4(3 x-1)$ oe <br> or M1 for correctly reaching $a x=b$ from their linear equation |
| 7(a)(ii) | $(2 x+6)(2 x+1)=(3 x-1)^{2}$ | M1 | May be seen in different stages |
|  | $5 x^{2}-20 x-5[=0]$ oe | B3 | B1 for $4 x^{2}+2 x+12 x+6$ or better B1 for $9 x^{2}-3 x-3 x+1$ or better |
|  | $\frac{-(-20) \pm \sqrt{(-20)^{2}-4(5)(-5)}}{2(5)}$ <br> oe | M2 | FT their 3 term quadratic provided formula used or complete the square <br> M1 for $\sqrt{(-20)^{2}-4(5)(-5)}$ oe or if in form $\frac{-(-20)+\sqrt{q}}{2(5)}$ or $\frac{-(-20)-\sqrt{q}}{2(5)} \mathbf{F T} \pm$ their quadratic <br> or for completing the square <br> M2 for $2 \pm \sqrt{1+2^{2}}$ <br> or M1 for $(x-2)^{2}$ |
|  | 4.24 or 4.236... cao | B1 |  |
| 7(b)(i) | $(x+5)(x-1)$ final answer | 2 | $\begin{aligned} & \text { B1 for } x(x-1)+5(x-1) \\ & \text { or } x(x+5)-[1](x+5)) \\ & \text { or for }(x+a)(x+b) \text { where } a b=-5 \\ & \text { or } a+b=4 \end{aligned}$ |


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| :---: | :---: | :---: | :---: |
| 7(b)(ii) | $\begin{aligned} & 5(x+1)-8 x=x(x+1) \\ & \text { or } 5 x+5-8 x=x^{2}+x \end{aligned}$ | M2 | Could be seen in different stages M1 for $5(x+1)-8 x$ seen or for common denominator of $x(x+1)$ for LHS or both sides soi |
|  | -5 and 1 cao | A2 | A1 for $x^{2}+4 x-5[=0] \mathrm{oe}$ |
| 8(a) | $66[.0]$ or 66.03 to 66.04 | 2 | M1 for $\tan =\frac{9}{4}$ oe |
| 8(b) | $\sqrt{3^{2}+4^{2}}$ or $\frac{1}{2} \sqrt{6^{2}+8^{2}}$ | M1 | Any alternative method must be full and complete and result in exactly 5 |
| 8(c) | 60.9 or 60.94 to 60.95 | 2 | M1 for $\tan =\frac{9}{5}$ oe |
| 8(d) | 5.83 or 5.84 or 5.827 to 5.840 | 6 | M1 for $[P B$ or $P C=] \sqrt{9^{2}+5^{2}}$ or $[X C=] \sqrt{9^{2}+5^{2}}-7.5$ <br> M1 for angle $B P X=2 \times \operatorname{invsin} \frac{3}{\text { their } P B}$ oe <br> B1 for $[P B$ or $P C=] \sqrt{106}=10.29$ to 10.30 <br> or $X C=2.79$ to $2.8[0]$ <br> or angle $B P X=33.9$ or 33.86 to $33.90 \ldots$ <br> M2 for <br> $\sqrt{(\text { their } P B)^{2}+7.5^{2}-2 \times \text { their } P B \times 7.5 \times \cos (\text { their } B P X)}$ <br> oe <br> or M1 for correct implicit equation |
| 9(a)(i) | 100 | 1 |  |
| 9(a)(ii) | 92.3 or 92.29... to 92.31 | 3 | M2 for $200 \div\left(2+\frac{10}{60}\right)$ oe <br> or M1 for $200 \div$ their time interval or M1 for $\frac{10}{60}$ soi oe |
| 9(b)(i) | 240 nfww | 3 | M2 for $\frac{V}{2}\left(\frac{30}{60}+\frac{20}{60}\right)=100$ oe <br> or M1 for any correct relevant area seen in terms of $V$ |
| 9(b)(ii) | $\frac{2}{9}$ oe | 2FT | FT for their (b)(i) $\div 1080$ to 3 sf or better M1 for their (b)(i) $\times \frac{1000}{3600}$ soi |


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| :---: | :--- | ---: | :--- |
| $10(\mathrm{a})$ | -11 | $\mathbf{1}$ |  |
| $10(\mathrm{~b})$ | 7 | $\mathbf{2}$ | M1 for $3 x-2=19$ or better |
| $10(\mathrm{c})$ | 25 | $\mathbf{2}$ | M1 for $3 \times 3^{x}-2$ oe |
| $10(\mathrm{~d})$ | $9 x^{2}-8 x+2$ final answer | $\mathbf{3}$ | M1 for $(3 x-2)^{2}+3 x-2+x$ oe |
| $10(\mathrm{e})$ | $\frac{x+2}{3}$ oe final answer | $\mathbf{2}$ | M1 for $x=3 y-2$ or $y+2=3 x$ or $\frac{y}{3}=x-\frac{2}{3}$ or better |

