

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

**MARK SCHEME for the October/November 2011 question paper
for the guidance of teachers**

0580 MATHEMATICS

0580/42

Paper 4 (Extended), maximum raw mark 130

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Abbreviations

| | |
|-----|----------------------------|
| cao | correct answer only |
| cso | correct solution only |
| dep | dependent |
| ft | follow through after error |
| isw | ignore subsequent working |
| oe | or equivalent |
| SC | Special Case |
| www | without wrong working |
| art | anything rounding to |
| soi | seen or implied |

| Qu. | Answers | Mark | Part Marks |
|------------|--|-------------------------------------|---|
| 1 | (a) (i) 14.62 final answer | 3 | M2 for $0.85 \times 20 \times 0.86$ oe soi by 14.6(0) or M1 for 0.85×20 soi by 17 or 0.85×0.86 soi by 0.731 |
| | (ii) 20 www | 3 | M2 for $16.40 / 0.82$ oe or M1 for 16.40 associated with 82% |
| | (iii) 135 www | 2 | M1 for $(108 \times 5) / 4$ |
| | (b) $c + 4d = 27.10$ oe $c + 7d = 34.30$ oe Elimination of one variable | B1 B1 M1 | Could use other variables but must be consistent |
| | $(c =) 17.5(0)$ and $(d =) 2.4(0)$ | A1 | Correct answers from no working scores SC1 only |
| | (c) 36 cao | 3 | B1 for 7h 30 min or 7.5 or 450 (mins) seen and M1 for $270/t$ where $7 \leq t \leq 9$ |
| | (d) 606.744 or 606.74 or 606.7(0) or 607 | 2 | M1 for $540 \times (1.06)^2$ oe but not $(1 + 6\%)^2$ unless recovers For step by step method, must see 572.4(0) and a correct method for the second year M0 if any further addition or subtraction |

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| 2 | <p>(a) (i) 39</p> <p>(ii) $\frac{8}{x} + 2$ or $\frac{8+2x}{x}$ or $\frac{2(4+x)}{x}$ or $8x^{-1} + 2$ final answer</p> <p>(b) -2.5 oe</p> <p>(c) 2.2 oe</p> <p>(d) (i) $4x - 2 = \frac{2}{x} + 1$ At least 1 intermediate step and $4x^2 - 3x - 2 = 0$</p> <p>(ii) $\frac{-(-3) \pm \sqrt{(-3)^2 - 4(4)(-2)}}{2(4)}$</p> <p>1.18 and -0.43 cao</p> | 2 2 2 2 E1 B1 B1 B1B1 | <p>B1 for $(f(2) =) 6$ or 6^2 seen or $(4x - 2)^2 + 3$ seen</p> <p>M1 for $4\left(\frac{2}{x} + 1\right) - 2$</p> <p>M1 for $2 + x = 0.2x$ oe or $\frac{2}{x} = 0.2 - 1$ or better</p> <p>M1 for $\frac{2}{5/3} + 1$ allow 1.66 to 1.67 for 5/3 or $\frac{2}{2/x} + 1$</p> <p>oe with these four terms</p> <p>No errors</p> <p>B1 for $\sqrt{(-3)^2 - 4(4)(-2)}$ or better (41) and in form $\frac{p + \sqrt{q}}{r}$ or $\frac{p - \sqrt{q}}{r}$</p> <p>B1 for $-(-3)$ and $2(4)$ or better</p> <p>SC1 for 1.18 and -0.43 seen or 1.2 <u>and</u> -0.4 or 1.17... <u>and</u> -0.425...</p> |
| 3 | <p>(a) Reflection only $x = -1$ oe only</p> <p>(b) (i) Triangle $(-1, 2)$ $(-1, 6)$ $(-3, 6)$</p> <p>(ii) Triangle $(-1, -2)$ $(-1, -6)$ $(-3, -6)$</p> <p>(iii) Triangle $(1, -1)$ $(7, -1)$ $(7, 2)$</p> <p>(c) (i) Triangle drawn at $(2, 3)$ $(6, 7)$ $(6, 9)$</p> <p>(ii) Shear (only) y axis invariant (factor) 1</p> <p>(d) $\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}$</p> | B1 B1 B2 B2 B2 3 B1 B1 B1 B2 | <p>Two transformations scores 0</p> <p>B1 for vertices plotted only or for clockwise rotation about $(0,0)$</p> <p>B1 for vertices plotted only or for reflection in $x = y$</p> <p>B1 for vertices plotted only or for enlargement by 1.5 with correct orientation</p> <p>B2 for 2 correct vertices plotted or SC2 for 3 correct coordinates shown in working or SC1 for any 2 correct coordinates</p> <p>or M1 for $\begin{pmatrix} 1 & 0 \\ 1 & 1 \end{pmatrix} \begin{pmatrix} 2 & 6 & 6 \\ 1 & 1 & 3 \end{pmatrix}$</p> <p>Two transformations scores 0</p> <p>or $x = 0$ invariant</p> <p>B1 for either column or row correct</p> |

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| 4 | <p>(a) (i) 28 cao</p> <p>(ii) 420</p> <p>(b) $(r^3 =) \frac{3 \times 1080}{4\pi}$ oe</p> <p>$(r =) \sqrt[3]{\frac{3 \times 1080}{4\pi}}$ oe</p> <p>6.36 or 6.37 www</p> <p>(c) (i) 24</p> <p>(ii) 232 (231.6 to 232.2)</p> | 2 | <p>M1 for $\frac{350 \times 16}{200}$ oe</p> <p>or $350 \div 12.5$ oe or 1.75×16 oe</p> <p>2ft ft for <i>their</i> 28×15</p> <p>M1 for <i>their</i> $28 \times \frac{240}{16}$ or $\frac{350 \times 240}{200}$ oe</p> <p>or 1.75×240 oe</p> <p>M1 Correct rearrangement soi by 257 to 258</p> <p>M1dep Dependent on previous M1</p> <p>A1 6.364 to 6.366</p> <p>B1</p> <p>3 M1 for $\pi \times 2.5^2 \times 1.8$ (soi by 35.3 to 35.4) or area = $20 \times 30 - \text{their } 24 \times \pi \times 2.5^2$ (soi by 128.7 to 129) and M1dep for $1080 - (\pi \times 2.5^2 \times 1.8) \times \text{their } 24$ or their area $\times 1.8$</p> |
| 5 | <p>(a) 63.45 or 63.5 cso</p> <p>(b) (i) 75 117 195 200</p> <p>(ii) 8 correct points plotted</p> <p>Curve (or polygon) correct through 8 points</p> <p>(c) (i) 65 to 67</p> <p>(ii) 52 to 55</p> <p>(iii) 21 to 24</p> <p>(iv) 44 to 52</p> <p>(v) Integer value of 200 – reading at 45 secs</p> | 4 | <p>M1 for 10, 30, 45, 55, 65, 75, 85, 95</p> <p>At least 6 correct mid-values soi</p> <p>and M1 for $\sum fx$</p> <p>$(6 \times 10 + 12 \times 30 + 20 \times 45 + \dots + 5 \times 95)$ (12690)</p> <p>where x is in the correct interval allow one further slip</p> <p>and M1 for their $\sum fx \div 200$ dep on second M1</p> <p>B2 B1 for 2 or 3 correct</p> <p>P3ft P2ft for 6 or 7</p> <p>P1ft for 4 or 5</p> <p>C1ft ft their increasing curve only if at least B1 in (b)(i). Ignore $t = 0$ to 20</p> <p>B1ft Or ft their curve at cf = 100</p> <p>B1</p> <p>B1</p> <p>B1 Must be integer</p> <p>2ft B1ft for integer value of reading at 45 secs</p> |

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| 6 | <p>(a) (i) 141 (141.3 to 141.4)</p> <p>(ii) 8.93 (8.93...)</p> <p>(b) (i) 2.98 or 2.976 to 2.977</p> <p>(ii) Answer rounds to 15.7</p> <p>(c) 535 or 536 (534.9 to 535.8)</p> | <p>2</p> <p>3</p> <p>2ft</p> <p>2ft</p> <p>5</p> | <p>M1 for $\pi \times 4.5 \times 10$</p> <p>M2 for $\sqrt{10^2 - 4.5^2}$ or M1 for $h^2 + 4.5^2 = 10^2$ implied by 79.75</p> <p>ft their (a)(ii) $\div 3$ www correct to 3sf or better M1 for their (a)(ii) $\div 3$</p> <p>ft their (a)(i) $\div 9$ correct to 3 sf or better or $\pi \times 1.5 \times \sqrt{\text{their } 2.98^2 + 1.5^2}$</p> <p>M1 for their (a)(i) $\div 9$ or $\pi \times 1.5 \times 10 \div 3$ oe or $\pi \times 1.5 \times \sqrt{\text{their } 2.98^2 + 1.5^2}$</p> <p>M1 for area of one circle $\pi \times 1.5^2$ or $\pi \times 4.5^2$ (7.0685 or 63.617) and M1 for their (a)(i) – their (b)(ii) (large cone SA – small cone SA) (141 – 15.7) (= 125.3 to 125.7) and M1 for $12 \times \pi \times 9$ (curved area of cylinder) (339.292..) and M1 for correct collection of 4 areas</p> |
| 7 | <p>(a) 8.7, –3.2, –10</p> <p>(b) 6 correct points plotted Smooth curve through 6 points and correct shape</p> <p>(c) Ruled tangent drawn at $x = 2$ Rise/run (using correct scales) 3.4 to 4</p> <p>(d) $k > 1.85$ or $k >$ any value greater than 1.85</p> <p>(e) (i) Correct ruled line for $-3 \leq x \leq 3$</p> <p>(ii) –1.75 to –1.9</p> <p>(f) (i) $x^2 + \frac{1}{x} = x + 2$</p> <p>(ii) $(y =) x + 2$</p> | <p>B3</p> <p>P2ft</p> <p>C1ft</p> <p>T1</p> <p>M1</p> <p>A1</p> <p>B1</p> <p>B2</p> <p>B1</p> <p>B2</p> <p>B1ft</p> | <p>8.66(..) or 8.67, –3.24, –9.99 if given to 2 dp B1 for each correct value</p> <p>P1ft for 5 or 4 correct</p> <p>C0 if curve crosses y-axis</p> <p>Not chord, allow slight daylight</p> <p>Dep T1</p> <p>Accept \geq Ignore $k <$ any value greater than 1.85</p> <p>SC1 for short ruled line or good freehand complete line or any ruled line grad –1 or ruled with y intercept of 1 (not $y = 1$)</p> <p>B1</p> <p>B1 for $x^2 - x - 2 + \frac{1}{x} = 0$ oe seen or $1 + x^3 = x^2 + 2x$ seen</p> <p>or their $ax + b$ numerical $a \neq 0$ and $b \neq 0$</p> |

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| 8 | (a) (i) $3^2 + 5^2 - 2 \times 3 \times 5 \cos 45$ 3.575... or 3.576 cao | M2 | M1 for correct implicit version |
| | (ii) 36.3 to 36.4 | E2 | A1 for 12.78 to 12.8 |
| | | 3 | M2 for $(\sin BCA =) \frac{3 \times \sin 45}{\text{their } 3.58}$ or M1 for $\frac{\sin BCA}{3} = \frac{\sin 45}{\text{their } 3.58}$ oe |
| (b) (i) 76 | B1 | 3 | M2 for $0.5 \times 3 \times 5 \times \sin 45 + 0.5 \times 5 \times 5 \sin$ their (b)(i) 5.3033... + 12.1286... or M1 for $0.5 \times 3 \times 5 \times \sin 45$ or $0.5 \times 5 \times 5 \sin$ their (b)(i) |
| (c) 48.2 (48.18 to 48.19) | 2 | M1 for $\cos PAB = \frac{2}{3}$ oe | |

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| 9 | <p>(a) (i) $\frac{120}{336}$ oe $\frac{5}{14}$ 0.357(1...)</p> | 3 | <p>Accept fraction, %, dec equivalents (3sf or better) throughout but not ratio or words isw incorrect cancelling/conversion to other forms Pen –1 once for 2sf answers</p> <p>M2 for $\frac{6}{8} \times \frac{5}{7} \times \frac{4}{6}$</p> <p>or M1 for $\frac{5}{7}$ seen</p> |
| | <p>(ii) $\frac{180}{336}$ oe $\frac{15}{28}$ 0.536 or 0.5357...</p> | 3 | <p>M2 for $\frac{2}{8} \times \frac{6}{7} \times \frac{5}{6} + \frac{6}{8} \times \frac{2}{7} \times \frac{5}{6} + \frac{6}{8} \times \frac{5}{7} \times \frac{2}{6}$</p> <p>Accept $3 \times \frac{2 \times 5 \times 6}{6 \times 7 \times 8}$</p> <p>or M1 for $\frac{2 \times 5 \times 6}{6 \times 7 \times 8}$ oe seen ($\frac{60}{336}$ oe $\frac{5}{28}$)</p> |
| | <p>(b) (i) $\frac{x}{25} \times \frac{x-1}{24} = \frac{7}{100}$</p> <p>$\frac{x^2 - x}{600} = \frac{7}{100}$</p> <p>or $x(x-1) = \frac{7}{100} \times 25 \times 24$</p> <p>$x^2 - x - 42 = 0$</p> | M2 | <p>M1 for $\frac{x}{25}$ or $\frac{x-1}{24}$ seen</p> |
| | <p>(ii) $(x+6)(x-7)$</p> <p>(iii) –6, 7</p> <p>(iv) 18</p> | M1 E1 B2 B1ft B1ft | <p>Or better, min requirement is $x^2 - x = 7 \times 6$</p> <p>With no errors or omissions</p> <p>SC1 any other $(x+a)(x+b)$ where $a \times b = -42$ or $a + b = -1$</p> <p>Correct or follow through dep on at least SC1 in (b)(ii)</p> <p>Correct or ft 25 – their positive integer solution Dep on pos and neg answer to (b)(iii) Answer must be positive integer</p> |