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**CAMBRIDGE INTERNATIONAL MATHEMATICS**

**0607/43**

Paper 4 (Extended)

**May/June 2016**

MARK SCHEME

Maximum Mark: 120

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**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.

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**Abbreviations**

- awrt answers which round to
- 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) | 13205.2  | 1    |   |
| (ii)      | 13200  | 1    |   |
| (iii)     | 13210  | 1    |   |
| (iv)      | 13205.173                                      | 1    |   |
| (b)       | 120  | 1    |   |
| 2 (a)     | $(3x + 2)(x - 4)$                              | 2    | <b>SC1</b> for $(3x + a)(x + b)$ where $ab = -8$<br>or $a + 3b = -10$   |
| (b)       | $-\frac{2}{3} < x < 4$                         | 2FT  | <b>B1</b> for either correct  |
| (c)       | 221.8 or 221.8...<br>318.2 or 318.18 to 318.19 | 3    | <b>B2</b> for either correct<br>or <b>M1</b> for<br>$\sin x = \text{their} \left( -\frac{2}{3} \right)$ where $-1 < \text{their} \left( -\frac{2}{3} \right) < 1$<br>or <b>M1</b> for sketch<br>or <b>M1</b> for 41.8 or -41.8 seen |
| 3 (a)     | 62.5   | 3    | <b>B1</b> for $y = k(x + 1)^3$<br><b>B1</b> for $k = 0.5$<br><br>OR<br><b>M2</b> for $\frac{y}{32} = \frac{(4 + 1)^3}{(3 + 1)^3}$   |
| (b)       | 2  | 2    | <b>B1FT</b> for $x + 1 = \sqrt[3]{\text{their } 27}$  |
| (c)       | $x = \sqrt[3]{2y} - 1$ oe final answer         | 3    | <b>M1</b> for division by <i>their</i> $k$<br><b>M1</b> for cube root<br><b>M1</b> for subtracting 1, must be final step  |

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| Question  | Answer  | Mark              | Part Marks  |
|-----------|---|-------------------|---|
| 4 (a) (i) | $A = 4r^2 - \pi r^2$ oe final answer                                | 2                 | M1 for $ar^2 - b\pi r^2$  |
| (ii)      | 30.9 or 30.88 to 30.90[...]   | 1                 |   |
| (b)       | $8r + 2\pi r$ oe final answer                                       | 3                 | B1 for $8r$ oe<br>B1 for $2\pi r$ oe<br><br>If B0 scored then M1 for $r + r + \frac{1}{4} \times 2\pi r$ oe   |
| 5 (a)     | $0.5 \times 12.4 \times x \times \sin 30 [= 34.1]$ oe               | 1                 |   |
| (b)       | 6.21 or 6.205 to 6.206  | 3                 | B2 for 38.50 to 38.51<br>or M1 for $11^2 + 12.4^2 - 2 \times 11 \times 12.4 \times \cos 30$   |
| (c)       | 62.3 or 62.4 or 62.33 to 62.41...                                   | 3                 | M2 for $\sin A = \frac{11 \times \sin 30}{\text{their } 6.21}$<br>or $\cos A = \frac{12.4^2 + (\text{their } (b))^2 - 11^2}{2 \times 12.4 \times \text{their } (b)}$<br><br>or M1 for $\frac{11}{\sin A} = \frac{\text{their } 6.21}{\sin 30}$ oe |
| (d)       | 6.2   | 2                 | M1 for $12.4 \times \sin 30$ oe   |
| 6 (a)     | 166 or 165.6 to 165.7   | 2                 | M1 for correct use of mid-pts at least 4 of (150, 157.5, 162.5, 167.5, 172.5, 182.5)  |
| (b) (i)   | 2.6, 13.2, 16.4, 23.6, 16.4, 1.73                                   | 2                 | B1 for 4 or 5 correct   |
| (ii)      | Suitable vertical scale<br>Correct column widths<br>Correct heights | 1<br>1<br>2FT dep | B1 for 4 or 5 correct<br>dep on at least B1 in (b)(i)   |
| 7 (a)     | 90000   | 4                 | M3 for $1.05 \times 1.1 \times a = 103950$ or better<br>M2 for $\frac{103950}{1.05 \text{ or } 1.1}$ oe or M2 for $1.05 \times 1.1$<br>M1 for $103950 = 105\%$  |
| (b)       | 2028  | 3                 | M2 for $1.05^n = \frac{200000}{103950}$ where $n > 1$<br>or<br>M1 for $103950 \times 1.05^n$ where $n > 1$<br><br>If 0 scored SC2 for 13.4 or 13.41... seen   |

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| Question  | Answer  | Mark                             | Part Marks   |
|-----------|---|----------------------------------|--|
| <b>8</b>  | (a) $6\mathbf{p} - \mathbf{q}$  | <b>2</b>                         | <b>B1</b> for $\overline{XD} = -\mathbf{q}$ or <b>M1</b> for $\overline{AD} = \overline{AX} + \overline{XD}$ oe      |
|           | (b) $3\mathbf{p} + \mathbf{q}$ oe   | <b>2</b>                         | <b>M1</b> for $\overline{AC} = 9\mathbf{p}$ or $\overline{XC} = 3\mathbf{p}$ or correct route                        |
|           | (c) $3\mathbf{p} - 2\mathbf{q}$ oe  | <b>3</b>                         | <b>M1</b> for $\overline{BD} = \text{their (a)}$<br><b>M1</b> for $\overline{CB} = \overline{CD} + \overline{DB}$ oe |
| <b>9</b>  | (a) $[QR =] P$<br>$[PQR =] Q$<br>$[ST =] Q$<br>$[SQ =] T$<br>$[PTP =] T$<br>$[TPP =] S$ | <b>6</b>                         | <b>B1</b> for each   |
|           | (b) (i) Points (2, 2) (2, 1) (5, 1)   | <b>2</b>                         | <b>B1</b> for (2, 1) or (5, 1) correct   |
|           | (ii) Points (2, -2) (2, -1) (5, -1)   | <b>1FT</b>                       | <b>FT</b> their <i>B</i> reflected in <i>x</i> -axis   |
|           | (iii) Rotation<br>90 [anticlockwise] oe<br>[Centre] (0, 0) oe                           | <b>1</b><br><b>1</b><br><b>1</b> |  |
| <b>10</b> | (a) (i) Points correctly plotted  | <b>3</b>                         | <b>B2</b> for 4 or 5 correct points<br><b>B1</b> for 2 or 3 correct points   |
|           | (ii) Positive   | <b>1</b>                         |  |
|           | (b) (i) 32.7  | <b>1</b>                         |  |
|           | (ii) 23.6   | <b>1</b>                         |  |
|           | (c) (i) $[y =] -5.57 + 0.892x$  | <b>2</b>                         | <b>B1</b> for $-5.57 + kx$ , or <b>B1</b> for $a + 0.892x$ ,<br>If 0 scored <b>SC1</b> for $-5.6 + 0.89x$            |
|           | (ii) 21.2 or 21.19...   | <b>1FT</b>                       | <b>FT</b> their (c)(i) using $x = 30$  |
|           | (iii) Outside range oe  | <b>1</b>                         |  |

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| Question   | Answer   | Mark        | Part Marks   |
|------------|--|-------------|--|
| 11 (a)     | Correct sketch                                       | 4           | <b>B1</b> Correct graph for $x > 3$<br><b>B1</b> Correct graph for $x < 1$<br><b>B1</b> Correct graph for $1 < x < 3$<br><b>B1</b> Approximately correct intercepts  |
| (b)        | $x = 1$<br>$x = 3$<br>$y = 3$                        | 1<br>1<br>1 |  |
| (c)        | (2, 2)   | 1           |  |
| (d)        | 1.38, 2, 3.62  | 3           | <b>B1</b> for each   |
| 12 (a)     | 18   | 2           | <b>M1</b> for $4x + 6x = 180$  |
| (b)        | 18   | 2           | <b>M1</b> for $180 - 6x - 3x$  |
| (c)        | 90   | 3           | <b>M2</b> for $180 - 3x - x - x$<br>or <b>B1</b> for $CED = x$ or $DCE = 4x$   |
| 13 (a) (i) | 4.71 or $1.5\pi$ or 4.712 to 4.713                   | 2           | <b>M1</b> for $\frac{60}{360} \times \pi \times 3^2$   |
| (ii)       | 12.5 or $1.5\pi + 4.5\sqrt{3}$ oe or 12.50 to 12.51  | 3           | <b>M2</b> for $0.5 \times 3 \times \frac{3}{\cos 60} \times \sin 60 + \text{their(a)}$ oe<br>or <b>M1</b> for $\frac{3}{\cos 60}$  |
| (iii)      | 31.4 or $7.5\pi + 4.5\sqrt{3}$ oe or 31.35 to 31.36  | 3           | <b>B1</b> for hyp = 6<br><b>M1</b> for $\frac{60}{360} \times \pi \times (\text{their}6)^2$  |
| (b)        | 263 or $31.5\pi + 94.5\sqrt{3}$ oe or 262.6 to 262.7 | 4           | <b>M3</b> for $1.5\pi + 6\pi + 24\pi + 4.5 \times \sqrt{3} + 18 \times \sqrt{3} + 72 \times \sqrt{3}$<br>or <b>M1</b> for $1.5\pi + 6\pi + 24\pi$<br><b>and M1</b> for $4.5 \times \sqrt{3} + 18 \times \sqrt{3} + 72 \times \sqrt{3}$<br>or <b>M1</b> for correct new triangle in diagram 4<br>or <b>M1</b> for correct new sector in diagram 5<br>or <b>M1</b> for correct new triangle in diagram 6 |

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| Question   | Answer   | Mark | Part Marks   |
|------------|--|------|--|
| 14 (a) (i) | $\left(\frac{x}{x+y}\right)^2$ oe final answer     | 2    | <b>B1</b> for $\frac{x}{x+y}$  |
| (ii)       | $2 \times \frac{xy}{(x+y)^2}$ oe final answer      | 3    | <b>M2</b> for $\frac{x}{(x+y)} \times \frac{y}{(x+y)}$ oe<br>or <b>B1</b> for $\frac{y}{x+y}$ seen     |
| (b) (i)    | $\frac{x(x-1)}{(x+y)(x+y-1)}$ oe final answer      | 3    | <b>B2</b> for $\frac{x-1}{x+y-1}$<br>or <b>B1</b> for $x+y-1$ seen                                     |
| (ii)       | $2 \times \frac{xy}{(x+y)(x+y-1)}$ oe final answer | 3    | <b>M2</b> for $\frac{x}{(x+y)} \times \frac{y}{(x+y-1)}$ oe<br>or <b>B1</b> for $\frac{y}{x+y-1}$ seen |