

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

**0580 MATHEMATICS**

**0580/21**

Paper 2 (Extended), maximum raw mark 70

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

|     |                            |
|-----|----------------------------|
| 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      |

| Qu. | Answers   | Mark                         | Part Marks   |
|-----|---|------------------------------|--|
| 1   | 7.5(0) cao  | 2                            | <b>M1</b> for $\frac{258.75}{4.6}$   |
| 2   | $5.92 \times 10^8$  | 2                            | <b>M1</b> figs 592 on answer line<br>or <b>M1</b> $296 \times 10^6$ oe in working  |
| 3   | cos38 sin38 sin158 cos158   | 2                            | <b>M1</b> correct decimals seen<br>0.3(74..) –0.9(271..) 0.7(88..) 0.6(15..)   |
| 4   | Answer given  | 3                            | <b>M1</b> $\frac{19}{15}$ <b>M1</b> $\frac{6}{15}$ or $\times \frac{15}{6}$ seen<br><b>E1</b> $= \frac{19}{6} = 3\frac{1}{6}$  |
| 5   | (a) 7853 to 7855<br>or 7850 or 7860 www<br>(b) 0.7853 to 0.7855 or 0.785 or 0.786 | 2<br><br><b>1ft</b>          | <b>M1</b> for $\pi \times 50^2$<br><br>Their (a) $\div 10\ 000$ evaluated  |
| 6   | 135 cao   | 3                            | <b>M1</b> for 720 or $(6 - 2) \times 180$ oe seen in working<br>and <b>M1</b> for equation $180 + 4x =$ their 720<br>or<br><b>M1</b> for $(360 - 180) \div 4 (= 45)$ oe seen in<br>working<br>and <b>M1</b> dep for $180 -$ their 45 |
| 7   | (a) $(y =) 80$<br>(b) $(z =) 40$<br>(c) $(t =) 10$                                | 1<br><br>1<br><br><b>1ft</b> | Follow through 90 – their y or 50 – their z  |
| 8   | 2.81(25)  | 3                            | <b>M1</b> $V = k/\sqrt{d}$ or <b>M1</b> $V = \sqrt{(k/d)}$<br><b>A1</b> $k = 4.5$ <b>A1</b> $k = 20.25$  |
| 9   | (a) Correct perpendicular bisector with<br>arcs<br>(b) $60^\circ$                 | 2<br><br>1                   | <b>B1</b> correct line<br><b>B1</b> correct construction arcs  |
| 10  | 0.38 or $\frac{19}{50}$   | 4                            | <b>B1</b> 0.8, 0.6 or 0.55 then<br><b>M1</b> $0.45 \times$ their 0.6 <b>M1</b> $0.2 \times$ their 0.55<br>or <b>M2</b> $1 - (0.45 \times 0.4 + 0.55 \times$ their 0.8)   |

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|    |  |     |  |
|----|--|-----|--|
| 11 | (a) $\begin{pmatrix} 8 & 5 \\ 20 & 13 \end{pmatrix}$                         | 2   | <b>B1</b> two or three entries correct   |
|    | (b) $\begin{pmatrix} 1\frac{1}{2} & -\frac{1}{2} \\ -2 & 1 \end{pmatrix}$ oe | 2   | <b>B1</b> $\frac{1}{2}\begin{pmatrix} a & c \\ b & d \end{pmatrix}$ <b>B1</b> $(k)\begin{pmatrix} 3 & -1 \\ -4 & 2 \end{pmatrix}$  |
| 12 | (a) Negative   | 1   | Ignore embellishments  |
|    | (b) Correct point  | 1   |  |
|    | (c) (i) Accurate ruled line  | 1   |  |
|    | (ii) English mark  | 1ft | Follow through their (c)(i)  |
| 13 | (a) $\frac{1}{2}\mathbf{a} + \frac{1}{2}\mathbf{b}$ oe                       | 2   | <b>M1</b> unsimplified or any correct route<br><br>e.g. $\mathbf{a} + \frac{1}{2}(\mathbf{b} - \mathbf{a})$ or <b>OA + AC</b>  |
|    | (b) $-1\frac{1}{2}\mathbf{a} + 1\frac{1}{2}\mathbf{b}$ oe                    | 2   | <b>M1</b> unsimplified or any correct route<br><br>e.g. $\mathbf{CD} = 1\frac{1}{2}\mathbf{AB}$ or $\mathbf{b} - \mathbf{a} + \frac{1}{2}(\mathbf{b} - \mathbf{a})$  |
| 14 | (a) 2.84   | 2   | <b>M1</b> correct substitution of $g$ and $l$ seen   |
|    | (b) $\frac{4\pi^2 l}{T^2}$ oe  | 3   | <b>M1</b> each correct move but third move marked on answer line   |
| 15 | (a) 156  | 4   | <b>M1</b> intention to find area under graph<br><b>B2</b> completely correct area statement<br>or <b>B1</b> two areas found correctly (or one trapezium area)  |
|    | (b) 12   | 1ft | Their (a)/13   |
| 16 | (a) 3.61   | 3   | <b>M1</b> $(3 - 1)^2 + (0 - 3)^2$ oe <b>M1</b> $\sqrt{2^2 + 3^2}$  |
|    | (b) $y = \frac{1}{2}x + 2\frac{1}{2}$ oe                                     | 3   | <b>B2</b> $y = \frac{1}{2}x + k$ or $y = kx + 2\frac{1}{2}$<br><br>or <b>B1</b> $kx + 2\frac{1}{2}$ or $\frac{1}{2}x + k$<br><br>If 0 scored <b>B1</b> $m = \frac{1}{2}$<br><br><b>B1</b> $c = 2\frac{1}{2}$ clearly identified in working |

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|                                  |  |                                    |  |
|----------------------------------|--|------------------------------------|--|
| <b>17</b>                        | (a) $\frac{1}{2}$                      | <b>2</b>                           | <b>B1</b> $f(-2)$ seen   |
|                                  | (b) $\sqrt[3]{x-1}$ or $\sqrt[3]{x-1}$ | <b>2</b>                           | <b>M1</b> $x-1 = y^3$ or $\sqrt[3]{y-1}$   |
|                                  | (c) 1 2                                | <b>3</b>                           | <b>M2</b> $(x-1)(x-2) = 0$<br>or <b>M1</b> $(x+a)(x+b) = 0$ where<br>$ab = 2$ or $a+b = -3$<br>If 0 scored give <b>M1</b> for $x^2 - 3x + 2 = 0$ |
| <b>18</b>                        | (a) 4324 cao                           | <b>2</b>                           | <b>M1</b> $\frac{1}{6} \times 23 \times 24 \times 47$ or better  |
|                                  | (b) (i) 4, 9                           | <b>2</b>                           | <b>B1</b> either correct   |
|                                  | (ii) $(n+1)^2$ or $n^2 + 2n + 1$       | <b>1</b>                           |  |
| (c) $\frac{2}{3}n(n+1)(2n+1)$ oe | <b>2</b>                               | <b>M1</b> recognising $V_n = 4T_n$ |  |