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**CAMBRIDGE INTERNATIONAL EXAMINATIONS**

International General Certificate of Secondary Education

**MARK SCHEME for the November 2003 question papers****0580/0581 MATHEMATICS**

|                         |                                                 |
|-------------------------|-------------------------------------------------|
| <b>0580/01, 0581/01</b> | <b>Paper 1 (Core), maximum raw mark 56</b>      |
| <b>0580/02, 0581/02</b> | <b>Paper 2 (Extended), maximum raw mark 70</b>  |
| <b>0580/03, 0581/03</b> | <b>Paper 3 (Core), maximum raw mark 104</b>     |
| <b>0580/04, 0581/04</b> | <b>Paper 4 (Extended), maximum raw mark 130</b> |

These mark schemes are published as an aid to teachers and students, to indicate the requirements of the examination. They show the basis on which Examiners were initially instructed to award marks. They do not indicate the details of the discussions that took place at an Examiners' meeting before marking began. Any substantial changes to the mark scheme that arose from these discussions will be recorded in the published *Report on the Examination*.

All Examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes must be read in conjunction with the question papers and the *Report on the Examination*.

- CIE will not enter into discussions or correspondence in connection with these mark schemes.

CIE is publishing the mark schemes for the November 2003 question papers for most IGCSE and GCE Advanced Level syllabuses.

**Grade thresholds** taken for Syllabus 0580/0581 (Mathematics) in the November 2003 examination.

|             | maximum<br>mark<br>available | minimum mark required for grade: |    |    |    |
|-------------|------------------------------|----------------------------------|----|----|----|
|             |                              | A                                | C  | E  | F  |
| Component 1 | 56                           | -                                | 46 | 35 | 28 |
| Component 2 | 70                           | 51                               | 28 | 16 | -  |
| Component 3 | 104                          | -                                | 68 | 44 | 38 |
| Component 4 | 130                          | 101                              | 59 | 36 | -  |

The threshold (minimum mark) for B is set halfway between those for Grades A and C.

The threshold (minimum mark) for D is set halfway between those for Grades C and E.

The threshold (minimum mark) for G is set as many marks below the F threshold as the E threshold is above it.

Grade A\* does not exist at the level of an individual component.

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| Notes | Mark Scheme                        | Syllabus  |
|-------|------------------------------------|-----------|
|       | IGCSE EXAMINATIONS – NOVEMBER 2003 | 0580/0581 |

## TYPES OF MARK

Most of the marks (those without prefixes, and 'B' marks) are given for accurate results, drawings or statements.

- **M** marks are given for a correct method.
- **B** marks are given for a correct statement or step.
- **A** marks are given for an accurate answer following a correct method.

## ABBREVIATIONS

|        |                                                             |
|--------|-------------------------------------------------------------|
| a.r.t. | Anything rounding to                                        |
| b.o.d. | Benefit of the doubt has been given to the candidate        |
| c.a.o. | Correct answer <b>only</b> (i.e. no 'follow through')       |
| e.e.o. | Each error or omission                                      |
| o.e.   | Or equivalent                                               |
| SC     | Special case                                                |
| s.o.i. | Seen or implied                                             |
| ww     | Without working                                             |
| www    | Without wrong working                                       |
| ✓      | Work followed through after an error: no further error made |
| ✗      | Work followed through and another error found               |

**CAMBRIDGE**  
INTERNATIONAL EXAMINATIONS

**November 2003**

INTERNATIONAL GCSE

**MARK SCHEME**

**MAXIMUM MARK: 56**

**SYLLABUS/COMPONENT: 0580/01, 0581/01**

**MATHEMATICS**

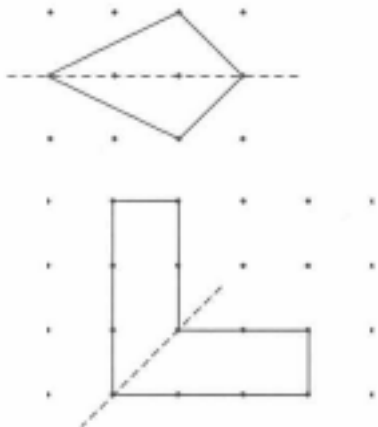
**Paper 1 (Core)**



|        |                                    |           |       |
|--------|------------------------------------|-----------|-------|
| Page 1 | Mark Scheme                        | Syllabus  | Paper |
|        | IGCSE EXAMINATIONS – NOVEMBER 2003 | 0580/0581 | 1     |

| Question Number | Mark Scheme Details |                                |       |                                                                                                                                                              | Part Mark |
|-----------------|---------------------|--------------------------------|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| 1               |                     | 400 (grams)                    | 1     |                                                                                                                                                              | 1         |
| 2               |                     | (\$).2.7(0)                    | 2     | <b>M1</b> for $\frac{15}{100} \times 18$ o.e.<br><b>SC1</b> for $\frac{85}{100} \times 18 = 15.3$                                                            | 2         |
| 3               | (a)                 | $\frac{2}{5}$                  | 1     | Accept equivalent fractions, decimals, percentages (with sign)                                                                                               | 2         |
|                 | (b)                 | 0                              | 1     | accept $\frac{0}{5}, \frac{0}{k}$ do not accept, none, not but condone it with 0                                                                             |           |
| 4               | (a)                 | 126°                           | 1     |                                                                                                                                                              | 3         |
|                 | (b)                 | 40(%)                          | 2     | <b>M1</b> for $\frac{144}{360} \times 100$ o.e.                                                                                                              |           |
| 5               |                     | 1.71(01...)                    | 2     | <b>M1</b> for $5 \sin 20^\circ$ or $5 \cos 70^\circ$ or 1.7                                                                                                  | 2         |
| 6               |                     | 6 or $\frac{6}{1}$             | 2     | <b>M1</b> for $\frac{60}{10}, \frac{1}{\frac{1}{6}}, \frac{1}{\frac{1}{10}}$                                                                                 | 2         |
| 7               |                     | 144°                           | 3     | <b>M2</b> for $\frac{(2 \times 10 - 4) \times 90}{10}$ or $\frac{(10 - 2) \times 180}{10}$ or $180 - \frac{360}{10}$ .<br>After 0, <b>SC1</b> for answer 36° | 3         |
| 8               |                     | $1250 \leq \text{r.l.} < 1350$ | 1 + 1 | <b>SC1</b> if reversed                                                                                                                                       | 2         |
| 9               | (a)                 | $10x^2 - 15xy$                 | 2     | <b>B1</b> for one term correct                                                                                                                               | 4         |
|                 | (b)                 | $6x(x + 2)$                    | 2     | <b>M1</b> for $6(x^2 + 2x)$ or $x(6x + 12)$ or $2(3x^2 + 6x)$ or $2x(3x + 6)$ or $3(2x^2 + 4x)$ or $3x(2x + 4)$                                              |           |
| 10              | (a)                 | 87°                            | 1     |                                                                                                                                                              | 3         |
|                 | (b)                 | 28°                            | 1     |                                                                                                                                                              |           |
|                 | (c)                 | $62^\circ \sqrt{\quad}$        | 1     | f.t. is $(90 - y)$                                                                                                                                           |           |

|        |                                                  |           |       |
|--------|--------------------------------------------------|-----------|-------|
| Page 2 | Downloaded from eduresourceza.com<br>Mark Scheme | Syllabus  | Paper |
|        | IGCSE EXAMINATIONS – NOVEMBER 2003               | 0580/0581 | 1     |

|    |     |                                                                                   |             |                                                                                                                   |   |
|----|-----|-----------------------------------------------------------------------------------|-------------|-------------------------------------------------------------------------------------------------------------------|---|
| 11 |     |  | 1           | Lines may be freehand but must go completely through the shape                                                    | 3 |
|    |     |                                                                                   | 1           |                                                                                                                   |   |
|    |     |                                                                                   | 1           |                                                                                                                   |   |
| 12 |     | $x = 4, y = 12$                                                                   | 3           | <b>M1</b> for attempting to eliminate one unknown by a correct method<br><b>A1</b> for one correct value (x or y) | 3 |
| 13 | (a) | (i) 2.4096...<br>(ii) 2.41 $\checkmark$                                           | 1<br>1      | f.t. from (i)                                                                                                     | 4 |
|    | (b) | 19.3 or 19.32(16...)                                                              | 2           | <b>B1</b> for 2.68 seen or implied by 19.2...                                                                     |   |
| 14 | (a) | Monday, Tuesday and Saturday                                                      | 1           | All three and no extras                                                                                           | 4 |
|    | (b) | -2o                                                                               | 3           | <b>B1</b> for -14 seen<br>+ <b>M1</b> for (their -14) $\div 7$                                                    |   |
| 15 | (a) | (i) 0.28<br>(ii) 0.275<br>(iii) 0.2857... or 0.286                                | 1<br>1<br>1 |                                                                                                                   | 4 |
|    |     | (b) $\frac{275}{1000}$ , 28%, $\frac{2}{7}$ or equivalent $\checkmark$            | 1           | f.t. from (a)                                                                                                     |   |
|    |     |                                                                                   |             |                                                                                                                   |   |
| 16 | (a) | 4.58(m)                                                                           | 2           | <b>M1</b> for $\sqrt{5^2 - 2^2}$ s.o.i. e.g. $\sqrt{21}$                                                          | 4 |
|    | (b) | 66.4o or 66.3o – 66.45o                                                           | 2           | <b>M1</b> for $\cos^{-1} \frac{2}{5}$ o.e. incl $\checkmark$                                                      |   |

|        |                                    |           |       |
|--------|------------------------------------|-----------|-------|
| Page 3 | Mark Scheme                        | Syllabus  | Paper |
|        | IGCSE EXAMINATIONS – NOVEMBER 2003 | 0580/0581 | 1     |

|    |     |                                        |   |                                                            |   |
|----|-----|----------------------------------------|---|------------------------------------------------------------|---|
| 17 | (a) | 3                                      | 1 | 10 <sup>8</sup> etc. penalise once only                    | 4 |
|    | (b) | -4                                     | 1 | accept -04                                                 |   |
|    | (c) | 0                                      | 1 |                                                            |   |
|    | (d) | -2                                     | 1 |                                                            |   |
| 18 | (a) | 0.4 or 2.6                             | 2 | <b>B1</b> for one correct<br><b>SC1</b> if (0.4,0) (2.6,0) | 6 |
|    | (b) | (i) 0                                  | 1 | Must be ruled                                              |   |
|    |     | (ii) Correct line from x = -1 to x = 4 | 1 |                                                            |   |
|    | (c) | (0,1), (4,5) ✓                         | 2 | <b>B1</b> for one correct<br>f.t. from (b) (ii)            |   |

**CAMBRIDGE**  
INTERNATIONAL EXAMINATIONS

**November 2003**

INTERNATIONAL GCSE

**MARK SCHEME**

**MAXIMUM MARK: 70**

**SYLLABUS/COMPONENT: 0580/02, 0581/02**

**MATHEMATICS**

**Paper 2 (Extended)**



|        |                                                  |           |       |
|--------|--------------------------------------------------|-----------|-------|
| Page 1 | Downloaded from eduresourceza.com<br>Mark Scheme | Syllabus  | Paper |
|        | IGCSE EXAMINATIONS – NOVEMBER 2003               | 0580/0581 | 2     |

\* indicates that it is necessary to look in the working following a wrong answer

|    |                                                     |                          |                                                                                                                                         |
|----|-----------------------------------------------------|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| 1  | 0.5 or $\frac{1}{2}$ c.a.o.                         | 1                        |                                                                                                                                         |
| 2  | (-)4504                                             | 1                        | Allow (-)4500                                                                                                                           |
| 3  | (a) 121<br>(b) $(n + 1)^2$                          | 1<br>1                   | Allow 49, 64, 81, 100, 121<br>$n^2 + 2n + 1$                                                                                            |
| 4  | 3/2500, 1/8, 0.00126                                | 2*                       | <b>M1</b> for all 3 evaluated as decimals (or fractions or percentages or stand. form)<br><b>SC1</b> reversed order                     |
| 5  | (a) -1, $\sqrt{36}$<br>(b) $\sqrt{2}$ , $\sqrt{30}$ | 1<br>1                   | Allow -1, $\pm 6$<br><b>SC1</b> (a) -1 and (b) $\sqrt{36}$ , $\sqrt{2}$ , $\sqrt{30}$                                                   |
| 6  | $l = mr/5$                                          | 2*                       | <b>M1</b> for $\frac{240 \times r \times m}{100 (\times 12)}$ o.e.                                                                      |
| 7  | 66.7                                                | 2                        | <b>M1</b> for $\frac{2.4}{3.6} \times 100$ o.e.                                                                                         |
| 8  | (a) -1<br>(b) 5k                                    | 1<br>1                   |                                                                                                                                         |
| 9  | (a) 32000<br>(b) 254 <u>50</u> 255 <u>50</u>        | 1<br>1, 1                | <b>SC1</b> both correct and reversed                                                                                                    |
| 10 | 11.5(2)                                             | 3*                       | <b>M1</b> $F = kv^2$ <b>M1</b> $k = 18/40^2$ or better                                                                                  |
| 11 | (a) 3110<br><br>(b) 322                             | 2*<br><br>1 $\checkmark$ | <b>M1</b> for $1936 \div 0.623$ or $1936 \times 1.61$<br>Allow 3107.54, 3107.5, 3108 or 3107.3<br><b>SC1</b> 3107<br>$1000000 \div (a)$ |
| 12 | (a) 45, 225<br>(b) 157.5                            | 1, 1<br>1                | Allow 158                                                                                                                               |
| 13 | (a) 5.5 or $5\frac{1}{2}$<br>(b) 21.5               | 1<br>2*                  | <b>M1</b> $172 \div 8$                                                                                                                  |
| 14 | (a) $\frac{x+3}{x(x+1)}$<br><br>(b) -3              | 3*<br><br>1 $\checkmark$ | <b>M1</b> $3(x+1) - 2x$<br><b>M1</b> denominator $x(x+1)$                                                                               |

| Page 2 | Mark Scheme                        | Syllabus  | Paper |
|--------|------------------------------------|-----------|-------|
|        | IGCSE EXAMINATIONS – NOVEMBER 2003 | 0580/0581 | 2     |

|          |                                   |                |                                                                                                                                                                                                               |
|----------|-----------------------------------|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 15       | (a) angle bisector of angle P     | 2*             | <b>M1</b> correct construction method <b>A1</b> $\pm 1^\circ$<br><b>SC1</b> for accurate line but no arcs<br><b>M1</b> radius drawn, meets (a) and O labelled. <b>A1</b> $\pm 1^\circ$                        |
|          | (b) radius from T or U            | 2*             |                                                                                                                                                                                                               |
| 16       | (a) A(2,0) B(0,-6)                | 1, 1           | <b>SC1</b> correct and reversed<br><b>M1</b> $(AB^2) = "(0 - 2)^2 + "(-6 - 0)^2$ from (a)                                                                                                                     |
|          | (b) 6.32                          | 2*             |                                                                                                                                                                                                               |
|          | (c) (1,-3)                        | 1 $\checkmark$ |                                                                                                                                                                                                               |
| 17       | (a) 20                            | 1              | (b) – (c)                                                                                                                                                                                                     |
|          | (b) 98                            | 1              |                                                                                                                                                                                                               |
|          | (c) 62                            | 1              |                                                                                                                                                                                                               |
|          | (d) 124                           | 1              |                                                                                                                                                                                                               |
|          | (e) 36                            | 1 $\checkmark$ |                                                                                                                                                                                                               |
|          |                                   |                |                                                                                                                                                                                                               |
| 18       | (a) $5.8 \times 10^8$             | 1              | <b>M1</b> figs 58 $\div$ figs 59 or figs 9830508<br><b>M1</b> figs 59 $\div$ figs $58 \times 10^n$ or $\frac{1}{(b)} \times 10^n$<br>$n = 3$ or $6$                                                           |
|          | (b) 98                            | 2*             |                                                                                                                                                                                                               |
|          | (c) 10200                         | 2*             |                                                                                                                                                                                                               |
| 19       | (a) -6                            | 2              | <b>M1</b> $1 - 2(7/2)$<br><b>M1</b> $\frac{5x}{2}$ o.e., $2 - 4x = x$ or better                                                                                                                               |
|          | (b) (i) 0.4                       | 2              |                                                                                                                                                                                                               |
|          | (ii) (0.4, 0.2)                   | 1              |                                                                                                                                                                                                               |
| 20       | (a) (i) $-\frac{2}{3}p + q$       | 2*             | <b>M1</b> use of <b>AQ</b> = $\pm \frac{2}{3}p \pm q$ or <b>AO</b> + <b>OQ</b><br><b>M1</b> use of <b>BQ</b> = $\pm \frac{3}{4}q \pm p$ or <b>BO</b> + <b>OP</b><br><b>M1</b> $-\frac{1}{4}q + \frac{1}{3}BP$ |
|          | (ii) $-\frac{3}{4}q + p$          | 2*             |                                                                                                                                                                                                               |
|          | (b) $\frac{1}{3}p - \frac{1}{2}q$ | 2*             |                                                                                                                                                                                                               |
| 21       | (a) $60x + 80y \leq 1200$ seen    | 1              | Allow $0.6x + 0.8y \leq 12$<br><b>M1</b> intention <b>A1</b> accurate<br>Dep. on both lines<br>Allow 20, 0 or $20 + 0$                                                                                        |
|          | (b) $x \geq y$                    | 1              |                                                                                                                                                                                                               |
|          | (c) line $y = x$                  | 1              |                                                                                                                                                                                                               |
|          | line through (20,0) and (0,15)    | 2*             |                                                                                                                                                                                                               |
|          | shading out or R labelled         | 1              |                                                                                                                                                                                                               |
|          | (d) 20 c.a.o.                     | 1              |                                                                                                                                                                                                               |
| Total 70 |                                   |                |                                                                                                                                                                                                               |

TOTAL MARKS 70

**CAMBRIDGE**  
INTERNATIONAL EXAMINATIONS

**November 2003**

INTERNATIONAL GCSE

**MARK SCHEME**

**MAXIMUM MARK: 104**

**SYLLABUS/COMPONENT: 0580/03, 0581/03**

**MATHEMATICS**

**Paper 3 (Core)**



| Page 1 | Mark Scheme                 | Syllabus  | Paper |
|--------|-----------------------------|-----------|-------|
|        | MATHEMATICS – NOVEMBER 2003 | 0580/0581 | 3     |

| Question Number | Mark Scheme                                      | Part Marks                          | Notes                                                                                                                                                                                                     | Question Total |
|-----------------|--------------------------------------------------|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| 1 a)            | 24                                               | 1                                   |                                                                                                                                                                                                           |                |
| b)              | 25 or $5^2$                                      | 1                                   |                                                                                                                                                                                                           |                |
| c)              | 27 or $3^3$                                      | 1                                   |                                                                                                                                                                                                           |                |
| d)              | 23                                               | 1                                   |                                                                                                                                                                                                           |                |
|                 | 29                                               | 1                                   |                                                                                                                                                                                                           |                |
| e)              | 26                                               | 1                                   | condone 6, 26 or $6 \times 26$                                                                                                                                                                            |                |
| f)              | 28 cao                                           | 1                                   |                                                                                                                                                                                                           |                |
| g)              | 21 and 27                                        | 1                                   | condone $21 \times 27$                                                                                                                                                                                    | 8              |
| 2 a) i)         | 1300 or 1 pm                                     | 1                                   |                                                                                                                                                                                                           |                |
| ii)             | 1030                                             | 1                                   | allow 10.30, 10:30 etc                                                                                                                                                                                    |                |
| iii)            | 9                                                | 2                                   | <b>B1</b> for either 24 or 33 seen or <b>M1</b> for 2 correct horizontal lines drawn or 24 and 33 marked on axis                                                                                          |                |
| b) i)           | 4.35, 8.7(0)                                     | 2                                   | <b>B1</b> for one correct                                                                                                                                                                                 |                |
| ii)             | Correct straight line (through (10, 8.6 to 8.8)  | 2                                   | <b>P1</b> for (5, 4.2 to 4.4) or (10, 8.6 to 8.8)                                                                                                                                                         |                |
| iii)            | 9.2(0) ( $\pm 0.1$ )                             | 1                                   | no ft.                                                                                                                                                                                                    |                |
| iv)             | 575 ( $\pm 5$ )                                  | 1                                   | no ft.                                                                                                                                                                                                    | 10             |
|                 |                                                  |                                     |                                                                                                                                                                                                           | 18             |
| 3 a)            | 6000                                             | 2                                   | <b>M1</b> for $25 \times 30 \times 8$                                                                                                                                                                     |                |
| b) i)           | art 4400                                         | 3                                   | <b>M2</b> for $\pi \times 10^2 \times 14$ or <b>SC1</b> for $\pi \times 5^2 \times 14$                                                                                                                    |                |
| ii)             | art 10400                                        | 1 $\checkmark$                      | ft <i>their a + bi</i>                                                                                                                                                                                    |                |
| iii)            | art 13.9                                         | 3 $\checkmark$                      | ft for <i>(their bii) <math>\div (25 \times 30)</math></i><br><b>M2</b> for <i>(their bii) <math>\div (25 \times 30)</math> oe</i><br>or <b>M1</b> for <i>(their bi) <math>\div (25 \times 30)</math></i> | 9              |
| 4 a)            | 4, 7, 6, 4, 4, 2, 3                              | 2                                   | <b>SC1</b> for 5 or 6 correct or 7 correct tallies                                                                                                                                                        |                |
| b)              | 1 cao                                            | 1                                   |                                                                                                                                                                                                           |                |
| c)              | 2 cao                                            | 2                                   | <b>M1</b> for attempt at ranking list seen                                                                                                                                                                |                |
| d)              | 2.5 cao                                          | 2                                   | <b>M1</b> <i>their <math>\sum f(x) \div \sum f</math> imp by 2.5</i> seen                                                                                                                                 |                |
| e) i)           | 0.23(3....) or $\frac{7}{30}$                    | 1 $\checkmark$                      | allow 23%<br>ft from their table                                                                                                                                                                          |                |
| ii)             | 0.3 or $\frac{3}{10}$ or $\frac{9}{30}$          | 1 $\checkmark$                      | ft from their table                                                                                                                                                                                       |                |
| f)              | 40                                               | 1 $\checkmark$                      | ft <i>their table</i> $\times 10$ . Allow 40/300                                                                                                                                                          | 10             |
|                 |                                                  |                                     |                                                                                                                                                                                                           | 19             |
| 5 a)            | 6<br>-4                                          | 1<br>1                              |                                                                                                                                                                                                           |                |
| b) i)           | Rotation through $180^\circ$ about (2.5, 6) o.e. | <b>M1</b><br><b>A1</b><br><b>A1</b> | Half turn <b>M1</b> <b>A1</b> , -1 for "symmetry"<br>allow correct description of point                                                                                                                   |                |
| ii)             | Enlargement s.f. 3 centre (1,7)                  | <b>B1</b><br><b>B1</b><br><b>B1</b> | accept scale 3, $\times 3$ etc<br>accept 'B' for (1,7)                                                                                                                                                    |                |
| c) i)           | 3 cao                                            | 1                                   | ignore units                                                                                                                                                                                              |                |
| ii)             | 1 : 9 cao                                        | 2                                   | <b>SC1</b> for 27 seen<br><b>M1</b> for correct answer nlt                                                                                                                                                |                |
| d)              | $-\frac{2}{3}, -\frac{6}{9}, -0.66$ or better    | 2                                   | <b>SC1</b> for $\frac{2}{3}$ oe or -k                                                                                                                                                                     | 13             |

| Page 2 | Mark Scheme                 | Syllabus  | Paper |
|--------|-----------------------------|-----------|-------|
|        | MATHEMATICS – NOVEMBER 2003 | 0580/0581 | 3     |

|         |                                                                                                                                                                      |        |                                                                                                                                                                                                                                                                |           |
|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| 6 a) i) | 27                                                                                                                                                                   | 1      |                                                                                                                                                                                                                                                                |           |
| ii)     | 6                                                                                                                                                                    | 2      | <b>M1</b> for $(39 - 3) \div 6$                                                                                                                                                                                                                                |           |
| iii)    | $\frac{P-3}{6}$ oe                                                                                                                                                   | 2      | <b>M1</b> for $P-3$ seen or $\frac{P}{6} = \frac{6x+3}{6}$ oe<br>seen                                                                                                                                                                                          |           |
| b) i)   | $4x + 3$                                                                                                                                                             |        | <b>M1</b> for $9x + 4 - 2x - (3x + 1)$ oe<br>allow $9x + 4 - 2x - 3x + 1$ oe for <b>M1</b><br>or <b>SC1</b> for $4x$ or $(+)3$ in answer<br>space                                                                                                              |           |
| ii)     | 10, 16 and 23                                                                                                                                                        | 3      | <b>M1</b> for $9x + 4 = 49$ oe <b>A1</b> for $x = 5$                                                                                                                                                                                                           | 10        |
|         |                                                                                                                                                                      |        |                                                                                                                                                                                                                                                                | <b>23</b> |
| 7 a) i) | 44                                                                                                                                                                   | 2      | <b>SC1</b> for 40 to 48                                                                                                                                                                                                                                        |           |
| ii)     | 52                                                                                                                                                                   | 3      | <b>B1</b> for 6 or 8 or 12 or 9 or 21 or 28<br>or 32 or 112 seen<br>+ <b>M1</b> for adding 6 rectangles o.e.                                                                                                                                                   |           |
| iii)    | cuboid or rectangular<br>prism                                                                                                                                       | 1      | allow rectangular cuboid but not<br>cube or cubical                                                                                                                                                                                                            |           |
| iv)     | 52                                                                                                                                                                   | 1 ✓    | ft from <i>their aii</i> (not strict ft)                                                                                                                                                                                                                       |           |
| v)      | 24                                                                                                                                                                   | 2      | <b>M1</b> for $2 \times 3 \times 4$                                                                                                                                                                                                                            |           |
| b) i)   | $2(pq + qr + pr)$ oe as final<br>answer                                                                                                                              | 2      | <b>SC1</b> for $pq$ or $qr$ or $pr$ seen or imp.<br>for both parts. Other letters used<br>consistently MR-1                                                                                                                                                    |           |
| ii)     | $pqr$ as final answer                                                                                                                                                | 2      | <b>M1</b> for $pqr$ seen                                                                                                                                                                                                                                       | 13        |
| 8 a)    | 12.5<br>NB 4021 answer 12.5<br>working uses 75 and<br>800                                                                                                            | 3      | <b>M1</b> for $7.5 \times 12$ oe or $80/12$ oe seen<br>+ <b>M1</b> for $\frac{90-80}{80} \times 100$ (explicit) or<br>$\frac{7.50-6.66\dots}{6.66\dots} \times 100$ (explicit)<br>after M0 <b>SC2</b> for <i>figs</i> 124 to 126<br>ww or <b>SC1</b> for 112.5 |           |
| b)      | 120 minutes                                                                                                                                                          | 3      | <b>B1</b> for $\frac{2}{5}$ or 180 or $\frac{3}{5} \times 300$ seen<br>+ <b>M1</b> for $\frac{2}{5} \times 300$ oe or $300-180$                                                                                                                                |           |
| c) i)   | Accurate $\perp$ bisector of<br>AB, with arcs $\pm 1^\circ \pm 1\text{mm}$<br>complete inside figure<br>Accurate bisector of $\angle C$<br>with arcs <i>as above</i> | 2<br>2 | <b>SC1</b> if accurate without arcs <u>or</u><br>incomplete line. Ignore extra lines<br><br><b>SC1</b> if accurate without arcs <u>or</u><br>incomplete line <i>as above</i>                                                                                   |           |
| ii)     | correct area shaded<br>                                                           | 2 ✓    | Areas marked as diagram<br>ft from clear intention to draw perp.<br>bisector and angle bisector                                                                                                                                                                | 12        |
| 9 a) i) | 150 (km)                                                                                                                                                             | 1      |                                                                                                                                                                                                                                                                |           |
| ii)     | 15 000 000 oe ( $\sqrt{\phantom{x}}$ )                                                                                                                               | 2      | <b>M1</b> for <i>their a)i)</i> $\times 100 \times 1000$<br>or <b>SC1</b> for <i>their a)i)</i> $\times 10^n$ when $n > 0$                                                                                                                                     |           |
| b) i)   | 1270 to 1320                                                                                                                                                         | 2      | <b>M1</b> for <i>their</i> $8.6 \times \text{their } 150$ must<br>have some evidence for <i>their</i> 8.6                                                                                                                                                      |           |
| ii)     | (0)45 to (0)48 oe                                                                                                                                                    | 1      |                                                                                                                                                                                                                                                                |           |
| iii)    | 245 to 248                                                                                                                                                           | 2      | <b>SC1</b> for any answer in the range<br>$180 < x < 270$                                                                                                                                                                                                      | 8         |
|         |                                                                                                                                                                      |        |                                                                                                                                                                                                                                                                | <b>20</b> |

| Page 3 | Mark Scheme                 | Syllabus  | Paper |
|--------|-----------------------------|-----------|-------|
|        | MATHEMATICS – NOVEMBER 2003 | 0580/0581 | 3     |

|       |                                                                    |                  |                                                          |            |
|-------|--------------------------------------------------------------------|------------------|----------------------------------------------------------|------------|
| 10 a) | 1 6 15 20 15 6 1<br>Sum 64<br>1 7 21 35 35 21 7 1<br>Sum 128       | 1<br>1<br>2<br>1 | <b>SC1</b> if 6 or 7 correct                             |            |
| b) i) | 512 accept $2^9$                                                   | 2                | <b>SC1</b> for 256                                       |            |
| ii)   | $2^n$                                                              | 2                | <b>SC1</b> for $2 \times 2 \times 2$ seen or description |            |
| c)    | 165 330 462<br>The first 6 numbers<br>repeated in reverse<br>order | 1<br>1           |                                                          | <b>11</b>  |
|       |                                                                    |                  |                                                          | <b>11</b>  |
|       |                                                                    |                  | <b>TOTAL</b>                                             | <b>104</b> |

**CAMBRIDGE**  
INTERNATIONAL EXAMINATIONS

**November 2003**

INTERNATIONAL GCSE

**MARK SCHEME**

**MAXIMUM MARK: 130**

**SYLLABUS/COMPONENT: 0580/04, 0581/04**

**MATHEMATICS**

**Paper 4 (Extended)**



|        |                                                  |           |       |
|--------|--------------------------------------------------|-----------|-------|
| Page 1 | Downloaded from eduresourceza.com<br>Mark Scheme | Syllabus  | Paper |
|        | IGCSE EXAMINATIONS – NOVEMBER 2003               | 0580/0581 | 4     |

Marks in brackets are totals for questions or part questions.

|   |     |                                                                                                                                                                        |                               |                                                                                                                                                                                                                                                   |
|---|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | (a) | 144:96<br><u>Final</u> answer 3:2 or 1.5:1 or 1:0.667                                                                                                                  | B1<br>B1<br>(2)               | After <b>B0</b> , allow <b>SC1</b> for reversed<br>“correct” final ans. www2                                                                                                                                                                      |
|   | (b) | (i) 32 (children)<br>(ii) 54 (adults off)<br>(iii) 110 (adults on)<br>(iv) 26 (=x) w.w.w.                                                                              | B1<br>B1<br>B1<br>B1<br>(4)   |                                                                                                                                                                                                                                                   |
|   | (c) | $300 \times \frac{4}{thier(6+5+4)}$<br>80 children                                                                                                                     | M1<br>A1<br>(2)               | www2                                                                                                                                                                                                                                              |
|   | (d) | (i) <u>Final Ans.</u> 21 13 or (0)9 13 pm<br>(ii) $7 \text{ h } 20 \text{ min (o.e.)} \times \frac{10}{110} \left( \text{or} \times \frac{100}{110} \right)$<br>40 min | B1<br>M1<br>A1<br>(3)<br>(11) | Condone hrs but hrs and <u>minutes</u> $\Rightarrow$ <b>BO</b><br>Implied by 6 h 40 min or 400 min<br>www2                                                                                                                                        |
| 2 | (a) | (i) 1.8(02..)                                                                                                                                                          | B1                            | Throughout (a)(i)(ii)(iii) <u>NO</u> misreads allowed.                                                                                                                                                                                            |
|   |     | (ii) $1.99^2 = \frac{80h}{3600}$ o.e.<br>(h =) 178(.2 )                                                                                                                | M1<br>A1                      | Must be $h$ , not $\sqrt{h}$<br>ww2 ( <u>Must</u> be correct – e.g. 178.4<br>$\Rightarrow$ <b>MO</b> ww)                                                                                                                                          |
|   |     | (iii) $A^2 = \frac{hm}{3600}$<br>$3600A^2 = hm$<br>$\frac{3600A^2}{m} = h$                                                                                             | M1<br>M1<br>M1<br>(6)         | (First step must be correct from correct formula for <u>first</u> <b>M1</b> .)<br>Correctly squares at any stage<br>Correctly multiplies at any stage<br>Correctly divides at any stage<br>Only a correct answer in this form can get <b>M3</b> . |
|   | (b) | (i) $(x+4)(x-4)$<br>(ii) $x(x-16)$<br>(iii) $(x-8)(x-1)$                                                                                                               | B1<br>B1<br>B2<br>(4)         | i.s.w. solutions in all (b)<br>Condone loss of <b>final</b> bracket in any (b)                                                                                                                                                                    |

| Page 2 | Mark Scheme                        | Syllabus  | Paper |
|--------|------------------------------------|-----------|-------|
|        | IGCSE EXAMINATIONS – NOVEMBER 2003 | 0580/0581 | 4     |

|   |                                                                                                                                                                     |             |                                                                                                                                |
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|   | (c) (i) $x(3x - 9) = 2x^2 - 8$ o.e.<br>$2x^2 - 8 = 3x^2 - 9x$<br>$x^2 - 9x + 8 = 0$                                                                                 | M1          | No error seen and some working to reach final quoted equation. Must have = 0. (E = established)                                |
|   |                                                                                                                                                                     | E1          |                                                                                                                                |
|   | (ii) $x = 1$<br>$x = 8$                                                                                                                                             | B1          |                                                                                                                                |
|   |                                                                                                                                                                     | B1          |                                                                                                                                |
|   | (iii) time = 15 (sec) c.a.o.<br>distance = 120 (m) c.a.o.                                                                                                           | B1          |                                                                                                                                |
|   |                                                                                                                                                                     | B1          |                                                                                                                                |
|   |                                                                                                                                                                     | (6)         |                                                                                                                                |
|   |                                                                                                                                                                     | <b>(16)</b> |                                                                                                                                |
| 3 | (a) (i) $17^2 + 32^2 - 2.17.32 \cos 40^\circ$<br><br>$\sqrt{\text{their } 479.54}$<br><br>Answer in range 21.89 to 21.91 (m)                                        | M2          | Allow M1 for sign error or correct implicit eqn                                                                                |
|   |                                                                                                                                                                     | M1          | Dep M2. <u>NOT</u> for $\sqrt{225 \cos 40^\circ}$ or $\sqrt{2146}$                                                             |
|   |                                                                                                                                                                     | A1          | www4                                                                                                                           |
|   |                                                                                                                                                                     | M1          | or $17^2 = 32^2 + (\text{their } 21.9)^2 - 2.32. (\text{their } 21.9) \cos T$                                                  |
|   |                                                                                                                                                                     | M1          | $\cos T = \frac{32^2 + (\text{their } 21.9)^2 - 17^2}{2.32. (\text{their } 21.9)}$                                             |
|   |                                                                                                                                                                     | A1          | Accept $29.93^\circ$ to $29.94^\circ$ . www3                                                                                   |
|   |                                                                                                                                                                     | (7)         |                                                                                                                                |
|   |                                                                                                                                                                     | B1          | All bearings must be $0^\circ \leq \theta \leq 360^\circ$ to score                                                             |
|   |                                                                                                                                                                     | B1✓         | $\sqrt{(180^\circ + \text{their } 125^\circ)}$ correct                                                                         |
|   |                                                                                                                                                                     | B1✓         | $\sqrt{(\text{their } 305^\circ + \text{their } T)}$ correct                                                                   |
|   |                                                                                                                                                                     | (3)         |                                                                                                                                |
|   |                                                                                                                                                                     | M1          | or $\hat{FXT} = \tan^{-1} \frac{32}{30}$ clearly identified.                                                                   |
|   | (ii) $\frac{\sin T}{17} = \frac{\sin 40^\circ}{\text{their } 21.9}$<br><br>$\sin T = \frac{17 \sin 40^\circ}{\text{their } 21.9}$ (0.499)<br><br>$29.9^\circ$       | A1          | (43.15239°) www2 <u>NOT</u> 43.1                                                                                               |
|   |                                                                                                                                                                     | (2)         |                                                                                                                                |
|   |                                                                                                                                                                     | <b>(12)</b> |                                                                                                                                |
|   |                                                                                                                                                                     |             |                                                                                                                                |
|   |                                                                                                                                                                     |             |                                                                                                                                |
|   |                                                                                                                                                                     |             |                                                                                                                                |
|   |                                                                                                                                                                     |             |                                                                                                                                |
|   |                                                                                                                                                                     |             |                                                                                                                                |
|   |                                                                                                                                                                     |             |                                                                                                                                |
|   |                                                                                                                                                                     |             |                                                                                                                                |
|   |                                                                                                                                                                     |             |                                                                                                                                |
|   |                                                                                                                                                                     |             |                                                                                                                                |
| 4 | (a) Scale correct<br><br>8 correct plots (0, 0), (1, 25), (2, 37.5), (3, 43.8), (4, 46.9), (5, 48.4), (6, 49.2), (7, 49.6)<br><br>Reasonable curve through 8 points | S1          | $0 \leq t \leq 7$ (14 cm) and $0 - 60 \uparrow$ (12 cm)                                                                        |
|   |                                                                                                                                                                     | P3          | Allow P2 for 6 or 7 correct<br>P1 for 4 or 5 correct<br>Accuracy better than 2mm horizontally.<br>In correct square $\uparrow$ |
|   |                                                                                                                                                                     | C1          | Not for linear or <u>bad</u> quality                                                                                           |
|   |                                                                                                                                                                     | (5)         |                                                                                                                                |
|   |                                                                                                                                                                     |             |                                                                                                                                |

| Page 3 | Mark Scheme                        | Syllabus  | Paper |
|--------|------------------------------------|-----------|-------|
|        | IGCSE EXAMINATIONS – NOVEMBER 2003 | 0580/0581 | 4     |

|                                                       |                                                    |             |                                                             |
|-------------------------------------------------------|----------------------------------------------------|-------------|-------------------------------------------------------------|
| (b) (i)                                               | $f(8) = 49.8$ or $49\frac{103}{128}$ o.e.          | B1          | Do not accept improper fractions                            |
|                                                       | $f(9) = 49.9$ or $49\frac{231}{256}$ o.e.          | B1          |                                                             |
| (ii)                                                  | $f(t \text{ large}) \approx 50$                    | B1          |                                                             |
|                                                       |                                                    | (3)         |                                                             |
| (c) (i)                                               | Tangent drawn at $t = 2$                           | B1          | Not a chord and not daylight                                |
|                                                       | Uses vert/horiz using scale                        | M1          | Can be given after <b>B0</b> if line not too far out        |
| **                                                    | Answer correct for their tangent                   | A1 ✓        |                                                             |
| (ii)                                                  | Acceleration or units                              | B1          | Accept $\text{ms}^{-2}$ , $\text{m/s}^2$ , $\text{m/s/s}$ . |
|                                                       |                                                    | (4)         |                                                             |
| (d) (i)                                               | Straight line through (0, 10)                      | B1          | } Must be ruled and full length to earn B2                  |
|                                                       | Straight line gradient 6                           | B1          |                                                             |
| **                                                    | (ii) one $\sqrt{\quad}$ intersection value for $t$ | B1 ✓        |                                                             |
| **                                                    | Second $\sqrt{t}$ <u>and</u> range                 | B1 ✓        |                                                             |
| (iii)                                                 | Distance = area (under curve)                      | M1          |                                                             |
|                                                       | First particle ( $f(t)$ ) goes further             | A1          |                                                             |
|                                                       |                                                    | (6)         |                                                             |
|                                                       |                                                    | <b>(18)</b> |                                                             |
| <u>Marking final answers throughout this question</u> |                                                    |             |                                                             |
| 5 (a) (i)                                             | 0.2 o.e.                                           | B1          | Accept 2/10, 1/5, 20%                                       |
| (ii)                                                  | 0.4 o.e.                                           | B1          | After first <b>B0</b> , condone "2 in 10" type answers.     |
| (iii)                                                 | 0.5 o.e.                                           | B1          | Never condone 2 : 10 type                                   |
| (iv)                                                  | 0.1 o.e.                                           | B1          |                                                             |
| (v)                                                   | 0                                                  | B1          | Accept "none", "nothing", 0/10, nil, zero                   |
|                                                       |                                                    | (5)         |                                                             |
| (b) (i)                                               | $2/10 \times 1/9$                                  | M1          |                                                             |
|                                                       | $1/45$ o.e.                                        | A1          | Accept 2/90, 0.0222 2.22% www2                              |
| (ii)                                                  | $3/10 \times 2/9$                                  | M1          |                                                             |
|                                                       | $1/15$ o.e.                                        | A1          | Accept 6/90 etc, 0.0666(or 7), 6.66 or 6.67% www2           |
| (iii)                                                 | (their) $1/45 +$ (their) $1/15$                    | M1          |                                                             |
|                                                       | $4/45$ o.e.                                        | A1          | Accept 8/90 etc, 0.0888(or 9), 8.88 or 8.89% www2           |
| (iv)                                                  | <u>Clearly</u> $1 -$ (their) 4.45 o.e.             | M1          | Alternative method must be complete                         |
|                                                       | $41/45$                                            | A1          | Accept 82/90 etc, 0.911, 91.1% www2                         |
|                                                       |                                                    | (8)         |                                                             |
|                                                       |                                                    | <b>(13)</b> |                                                             |

| Page 4 | Mark Scheme                        | Syllabus  | Paper |
|--------|------------------------------------|-----------|-------|
|        | IGCSE EXAMINATIONS – NOVEMBER 2003 | 0580/0581 | 4     |

|   |         |                                                                                                                               |                          |                                                                                                                                                                          |
|---|---------|-------------------------------------------------------------------------------------------------------------------------------|--------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 6 | (a)     | $\pi(30)^2 (50)$<br>141 000 (cm <sup>3</sup> )                                                                                | M1<br>A1<br>(2)          | (141 300 to 141 430) www2                                                                                                                                                |
|   | (b) (i) | 18 (cm)                                                                                                                       | B1                       |                                                                                                                                                                          |
|   | (ii)    | $\cos\left(\frac{1}{2}\angle AOB\right) = (\text{their } 18)/30$<br>x2<br>$\angle AOB = 106.26^\circ$ c.a.o                   | M1<br>M1dep<br>A1<br>(4) | Allow M1 or M2 at similar stages for other methods e.g. $\sin A = 18/30$ then $(180^\circ - 2A)$<br>Must have 2 decimal places seen.<br>ww1 (condone = 106.3 afterwards) |
|   | (c) (i) | (their) $\frac{106.3}{360}$ used<br>$\pi(30)^2$ used<br>834 to 835.3 (cm <sup>2</sup> )                                       | M1<br>M1<br>A1<br>M1     | www3                                                                                                                                                                     |
|   | (ii)    | $\frac{1}{2} \cdot 30.30 \sin (\text{their } 106.3^\circ)$ or<br>$\frac{1}{2} \cdot 48.18$<br>431.8 to 432 (cm <sup>2</sup> ) | A1                       | www2                                                                                                                                                                     |
|   | (iii)   | Ans. Rounds to 403 cm <sup>2</sup>                                                                                            | A1<br>(6)                |                                                                                                                                                                          |
|   | (d) (i) | 50 x (their) 403                                                                                                              | M1                       |                                                                                                                                                                          |
|   | **      | 20 100 to 20 200 (cm <sup>3</sup> )                                                                                           | A1√                      | √ correct for their “403” www2                                                                                                                                           |
|   | ** (ii) | 20.1 to 20.2 (litres)                                                                                                         | B1√<br>(3)               | √ their previous answer ÷ 1000                                                                                                                                           |
|   | (e)     | $k\left[\frac{1}{2}\text{their (a)} - \text{their (d) (i)}\right]$<br>50.3 to 51 (litres)                                     | M1<br>A1<br>(2)<br>(17)  | $k = 1$ (cm <sup>3</sup> ) $k = .001$ (litres) $k = \text{other} \Rightarrow$ consistent conversion error.<br>Marking final answer www2                                  |
| 7 | (a) (i) | $F \begin{pmatrix} 2 \\ -4 \end{pmatrix}$                                                                                     | M1 A1                    | M marks for letters, A marks for descriptions. If <u>no</u> letter given, allow <b>SC1</b> for correct description                                                       |
|   | (ii)    | D x = 1                                                                                                                       | M1 A1                    |                                                                                                                                                                          |
|   | (iii)   | E (2, -1)                                                                                                                     | M1 A1                    |                                                                                                                                                                          |
|   | (iv)    | C (s.f.) 3                                                                                                                    | M1 A1                    |                                                                                                                                                                          |
|   | (v)     | A Shear                                                                                                                       | M1 A1<br>(10)            |                                                                                                                                                                          |

|        |                                    |           |       |
|--------|------------------------------------|-----------|-------|
| Page 5 | Mark Scheme                        | Syllabus  | Paper |
|        | IGCSE EXAMINATIONS – NOVEMBER 2003 | 0580/0581 | 4     |

|   |       |                                                                        |      |                                                                                                                                                                                                                    |
|---|-------|------------------------------------------------------------------------|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|   | (b)   | $(-1 \ -2) \begin{pmatrix} 1 & 3 \\ 5 & 7 \end{pmatrix}$ or QP         | M1   | Penalty –1 for <u>each</u> wrong one thought possible.                                                                                                                                                             |
|   |       | $(-11 \ -17)$ <u>final</u> ans                                         | A2   | Allow <b>SC1</b> for one correct                                                                                                                                                                                   |
|   |       | $(1 \ 2 \ 3) \begin{pmatrix} -1 \\ 2 \\ 3 \end{pmatrix}$ or RS         | M1   |                                                                                                                                                                                                                    |
|   |       | (12)                                                                   | A2   | Brackets essential here.                                                                                                                                                                                           |
| 8 | (a)   | (i) $10 < M \leq 15$                                                   | B1   | Must clearly mean this and not 32                                                                                                                                                                                  |
|   |       | (ii) Midpoints 5, 12.5, 17.5, 22.5, 32.5                               | M1   | Allow for 3 or 4 correct                                                                                                                                                                                           |
|   |       | $\sum fx$ (60 + 400 + 490 + 540 + 780)                                 | M1   | (2270) Needs previous <b>M1</b> or only marginally out                                                                                                                                                             |
|   |       | (their) $2270 \div 120$                                                | M1   | dep previous <b>M1</b>                                                                                                                                                                                             |
|   |       | 18.9 (2) (kg)                                                          | A1   | www4                                                                                                                                                                                                               |
|   | (iii) | (1)                                                                    |      |                                                                                                                                                                                                                    |
|   |       | 36°                                                                    | B1   |                                                                                                                                                                                                                    |
|   | (b)   |                                                                        | (6)  |                                                                                                                                                                                                                    |
|   |       | Horizontal scale 2 cm $\equiv$ 5 units<br>(numbered or used correctly) | S1   | $0 \leq M \leq 40$ . Accuracy < 2 mm.<br>If <b>S0</b> (e.g. 1 cm $\equiv$ 5 units) can score <b>B5</b><br>If <b>S0</b> (e.g. 0, 10, 15) can only score on correct width bars. Penalty –1 for polygon superimposed. |
|   |       | Heights 3k, 16k, 14k, 12k, 4k cm                                       | B5   | If not scored, decide on their “k” and allow SC1 for each “correct” bar.<br>(Needs $\geq 2$ bars to decide on value of k if k $\neq 1$ .)                                                                          |
|   |       | Their k = 1                                                            | B1   |                                                                                                                                                                                                                    |
| 9 | (a)   |                                                                        | (7)  |                                                                                                                                                                                                                    |
|   |       |                                                                        | (13) |                                                                                                                                                                                                                    |
|   |       | (i) (Diagram) 5 only                                                   | B1   |                                                                                                                                                                                                                    |
|   |       | (ii) (Diagram) 4 only                                                  | B1   |                                                                                                                                                                                                                    |
|   | (iii) | (Diagram) 2 only                                                       | B1   |                                                                                                                                                                                                                    |
|   |       |                                                                        | (3)  |                                                                                                                                                                                                                    |

| Page 6 | Mark Scheme                        | Syllabus  | Paper |
|--------|------------------------------------|-----------|-------|
|        | IGCSE EXAMINATIONS – NOVEMBER 2003 | 0580/0581 | 4     |

|     |                                                  |        |                                                                    |
|-----|--------------------------------------------------|--------|--------------------------------------------------------------------|
| (b) | Diagram 1 9 (cm <sup>2</sup> )                   | B1     | 9.00 to 3 s.f.                                                     |
|     | Diagrams 2 and 3 have same area                  | B1     |                                                                    |
|     | One of them $\frac{1}{2} \times 3 \times 3$      | M1     |                                                                    |
|     | $4\frac{1}{2}$ (cm <sup>2</sup> )                | A1     | www2                                                               |
|     | Diagram 4 $\frac{1}{4} \pi 3^2$ s.o.i.           | M1     | (7.07 cm <sup>2</sup> )                                            |
|     | $\frac{1}{2} \times 6 \times 6$ – their $9\pi/4$ | M1     | indep. i.e. $18 - k\pi$ where k numerical                          |
|     | 10.9 (cm <sup>2</sup> )                          | A1     | www3                                                               |
|     | Diagram 5 $22\frac{1}{2}^\circ$ s.o.i            | M1     |                                                                    |
|     |                                                  |        |                                                                    |
|     | $6 \tan 22\frac{1}{2}^\circ$                     | M1     | (2.485) (This is AD <u>or</u> DE)                                  |
|     | $\frac{1}{2} (6 - \text{their } 2.485) \times 6$ | dep.M1 | or $18 - \frac{1}{2} \times 6 \times \text{their } 2.485$ . (o.e.) |
|     | 10.5 (cm <sup>2</sup> )                          | A1     | www4                                                               |
|     |                                                  | (11)   |                                                                    |
|     |                                                  | (14)   |                                                                    |