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**CAMBRIDGE INTERNATIONAL EXAMINATIONS**  
International General Certificate of Secondary Education

## **MARK SCHEME for the May/June 2014 series**

### **0580 MATHEMATICS**

**0580/23**

Paper 2 (Extended), maximum raw mark 70

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

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

Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the May/June 2014 series for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level components and some Ordinary Level components.

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### Abbreviations

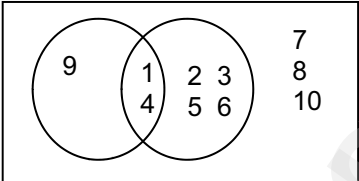
|     |                            |
|-----|----------------------------|
| cao | correct answer only        |
| dep | dependent                  |
| FT  | follow through after error |
| isw | ignore subsequent working  |
| oe  | or equivalent              |
| SC  | Special Case               |
| nfw | not from wrong working     |
| soi | seen or implied            |

| Qu. | Part | Answers                    | Mark | Part Marks                                                                                                                      |
|-----|------|----------------------------|------|---------------------------------------------------------------------------------------------------------------------------------|
| 1   |      | - 16                       | 1    |                                                                                                                                 |
| 2   |      | 84                         | 2    | <b>M1</b> for $\frac{7}{6+8+9+7}$ or $\frac{360}{6+8+9+7}$                                                                      |
| 3   |      | 1030                       | 2    | <b>M1</b> for $1350 \div 1.313$                                                                                                 |
| 4   |      | $5a(3a^2 - b)$             | 2    | <b>B1</b> for $a(15a^2 - 5b)$ or $5(3a^3 - ab)$                                                                                 |
| 5   | (a)  | 0.059161...                | 1    |                                                                                                                                 |
|     | (b)  | $5.9161... \times 10^{-2}$ | 1FT  | ft <i>their</i> part (a)                                                                                                        |
| 6   |      | $3x^6y^4$                  | 2    | <b>B1</b> for $x^6$ or $y^4$ in a product on answer line                                                                        |
| 7   | (a)  | 74                         | 1    |                                                                                                                                 |
|     | (b)  | 8.69                       | 1    |                                                                                                                                 |
| 8   |      | 48                         | 2    | <b>M1</b> for $15^2$ or $\left(\frac{1}{15}\right)^2$ or $\frac{1}{15^2}$<br>or $\sqrt{10800}$ or $\frac{1}{\sqrt{10800}}$      |
| 9   |      | $t < -\frac{6}{7}$         | 2    | <b>M1</b> for $5t + 2t < 17 - 23$<br>If zero scored <b>SC1</b> for $-\frac{6}{7}$ with incorrect inequality sign or equals sign |

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|    |     |                                                                                                                                                      |                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|----|-----|------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 10 |     | $\frac{5}{4}$ oe<br>$\frac{5 \times 9}{4 \times 9}$ and $\frac{7 \times 4}{9 \times 4}$ oe or better<br><br>$\frac{17}{36}$ oe working must be shown | <b>B1</b><br><b>M1</b><br><b>FT</b><br><b>A1</b> | Do not allow decimals for the <b>B1</b> , <b>M1</b> , or <b>A1</b><br><br>e.g. $\frac{45}{36}$ and $\frac{28}{36}$<br><br>Follow through <i>their</i> $\frac{5}{4}$ for the <b>M1</b> mark.<br>Alt method 1: <b>B1</b> for $\frac{1}{4} + \frac{2}{9}$<br><b>M1</b> for $\frac{1 \times 9}{4 \times 9}$ and $\frac{2 \times 4}{4 \times 9}$ oe e.g. $\frac{9}{36}$ and $\frac{8}{36}$<br>Alt method 2: <b>B1</b> for $\frac{1}{4} - \frac{7}{9} + 1$<br><b>M1</b> for oe e.g. $\frac{9}{36}$ and $\frac{8}{36}$<br>ISW converting fraction answer to a decimal. |
| 11 |     | 3.5                                                                                                                                                  | 3                                                | <b>M1</b> for $y = k \sqrt[3]{x+3}$<br><b>A1</b> for $k = \frac{1}{2}$<br><br>Alternative method:<br><b>M2</b> for $\frac{y}{\sqrt[3]{340+3}} = \frac{1}{\sqrt[3]{5+3}}$ oe                                                                                                                                                                                                                                                                                                                                                                                     |
| 12 | (a) | $(3x-4)(x+2)$                                                                                                                                        | 2                                                | <b>M1</b> for $(3x+a)(x+b)$<br>where $a+3b=2$ or $ab=-8$<br>if M0 then <b>SC1</b> for $3\left(x-\frac{4}{3}\right)(x+2)$                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|    | (b) | $1\frac{1}{3}, -2$                                                                                                                                   | 1FT                                              | dep on M1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 13 |     | $y = -0.5x + 11.5$ oe                                                                                                                                | 3                                                | <b>B2</b> for $y = -0.5x + k$ oe<br>or $y = kx + 11.5$ , $k \neq 0$ oe<br>or $-0.5x + 11.5$ oe<br><br>or <b>B1</b> for gradient = $-0.5$ oe<br>and <b>B1</b> for y-intercept = $11.5$ oe<br><br>If zero scored then,<br><b>SC1</b> for $9 = \text{their } m \times 5 + c$<br><br>or $13 = \text{their } m \times -3 + c$                                                                                                                                                                                                                                        |

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|    |     |                                                                                     |             |                                                                                                                                                                                                                                                     |
|----|-----|-------------------------------------------------------------------------------------|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 14 |     | 8.23 or 8.234 to 8.235                                                              | 3           | <b>M2</b> for $[PR=] \frac{12.5 \times \sin 37}{\sin 66}$<br>or <b>M1</b> for $\frac{PR}{\sin 37} = \frac{12.5}{\sin 66}$ oe                                                                                                                        |
| 15 |     | 427.8<br>427.4                                                                      | 3           | <b>M2</b> for $2 \times (127.35 + 86.55)$ or<br>$2 \times (127.35 + 86.45)$<br>or <b>B1</b> for two of these figures:<br>127.35, 86.55, 127.25, 86.45 seen<br>If zero scored, <b>SC2</b> for upper bound 427.8 or<br>lower bound 427.4 provided nfw |
| 16 |     | 65.4 or 65.37 to 65.4                                                               | 4           | <b>M3</b> for $\cos = \frac{5}{12}$ or $\frac{\sqrt{3^2 + 4^2}}{12}$ oe<br>or <b>M1</b> for $\sqrt{3^2 + 4^2}$<br>and <b>M1</b> for clearly identifying angle <i>GAC</i>                                                                            |
| 17 | (a) |  | 2           | <b>B1</b> for 2 of the 4 regions correct                                                                                                                                                                                                            |
|    | (b) | 7 8 10                                                                              | 1FT         |                                                                                                                                                                                                                                                     |
|    | (c) | 1                                                                                   | 1FT         |                                                                                                                                                                                                                                                     |
| 18 | (a) | $\begin{pmatrix} 33 & 16 \\ 32 & 17 \end{pmatrix}$                                  | 2           | <b>B1</b> for one column or row correct                                                                                                                                                                                                             |
|    | (b) | $\frac{1}{7} \begin{pmatrix} 3 & -2 \\ -4 & 5 \end{pmatrix}$ oe                     | 2           | <b>B1</b> for $\frac{1}{7} \begin{pmatrix} a & b \\ c & d \end{pmatrix}$ seen or $k \begin{pmatrix} 3 & -2 \\ -4 & 5 \end{pmatrix}$ seen                                                                                                            |
| 19 |     | $3x + 4y = 10.8$<br>$5x + 2y = 14.50$<br><br>2.6[0]<br>0.75                         | 1<br>1<br>3 | <b>M1 FT</b> for correctly eliminating one variable<br><b>A1</b> for 2.6<br><b>A1</b> for 0.75<br>If <b>M0</b> then or <b>SC1</b> for correct substitution<br>and correct evaluation to find the other value                                        |

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|    |     |                                                    |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|----|-----|----------------------------------------------------|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 20 | (a) | 34                                                 | 1           | <b>B1</b> for 24 or 40 seen                                                                                                                                                                                                                                                                                                                                                                                                                       |
|    | (b) | 16                                                 | 2           |                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|    | (c) | 30                                                 | 1           |                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|    | (d) | 120                                                | 1           |                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 21 |     | 62.3 or 62.26 to 62.272                            | 5           | <p><b>M1</b> for <math>\frac{2}{3} \times 2\pi \times 6</math></p> <p>and <b>M2</b> for <math>(\frac{2}{3} + \frac{1}{3}) \times 2\pi \times 4</math> oe</p> <p>or <b>M1</b> for <math>\frac{2}{3} \times 2\pi \times 4</math> or <math>\frac{1}{3} \times 2\pi \times 4</math></p> <p>and <b>M1</b> for <math>2 \times (2 + 4) + k\pi, k \neq 0</math></p>                                                                                       |
| 22 | (a) | Triangle at (2,-1) (2,1) (1,-2)                    | 2           | <b>B1</b> for translation by $\begin{pmatrix} k \\ -4 \end{pmatrix}$ or $\begin{pmatrix} 3 \\ k \end{pmatrix}$                                                                                                                                                                                                                                                                                                                                    |
|    | (b) | Rotation<br>[centre] ( 1, 0 )<br>180° or half turn | 1<br>1<br>1 | <b>OR</b> enlargement<br>[centre] ( 1, 0 )<br>[scale factor] -1                                                                                                                                                                                                                                                                                                                                                                                   |
|    | (c) | Triangle at (2,3) (4,2) (2,5)                      | 3           | <p><b>B2</b> for 2 correct vertices plotted</p> <p><b>or</b> If no/wrong plots allow <b>SC2</b> for 3 correct coordinates shown in working or <b>SC1</b> for any 2 correct coordinates shown or a triangle of the correct size and orientation but wrong position</p> <p>or <b>M1</b> for <math>\begin{pmatrix} -2 &amp; 0 \\ 0 &amp; 1 \end{pmatrix} \begin{pmatrix} -1 &amp; -1 &amp; -2 \\ 3 &amp; 5 &amp; 2 \end{pmatrix}</math> oe shown</p> |