**CAMBRIDGE INTERNATIONAL EXAMINATIONS**

Cambridge International General Certificate of Secondary Education

# MARK SCHEME for the October/November 2014 series

## 0581 MATHEMATICS

**0581/43** Paper 4 (Extended), maximum raw mark 130

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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 |
| nfww | not from wrong working |
| soi | seen or implied |

| Qu. | | | Answers | Mark | Part Marks |
|---|---|---|---|---|---|
| 1 | (a) | (i) | 5.37[1...] | 2 | **M1** for $[AD^2 =] 2.6^2 + 4.7^2$ oe or better |
| | | (ii) | 54.1 or 54.11 to 54.12 | 3 | **M2** for tan $[BCD =] \dfrac{4.7}{(17-11-2.6)}$ oe <br> or <br> **B1** for 3.4 seen |
| | | (iii) | 65.8 | 2 | **M1** for $\dfrac{11+17}{2} \times 4.7$ oe |
| | (b) | | 263.2 or 263 | 3FT | **FT** *their* **(a)(iii)** $\times$ 4 correctly evaluated <br> **M2** for *their* **(a)(iii)** $\times \left(\dfrac{9.4}{4.7}\right)^2$ oe <br> or <br> **M1** for [scale factor =] $\left(\dfrac{9.4}{4.7}\right)^2$ or $\left(\dfrac{4.7}{9.4}\right)^2$ soi |
| 2 | (a) | (i) | $\dfrac{920}{8} \times 7$ [=805] oe | 1 | $\dfrac{2990}{26} \times 7$ [= 805] |
| | | (ii) | 30.8 or 30.76 to 30.77 | 2 | **M1** for $\dfrac{8}{(11+8+7)}$ [$\times$ 100] |
| | (b) | | 1211 final answer | 5 | **B4** for 13 926.5[0] [area A total sales] <br> or <br> **B3** for 11 040 [area B] **and** 10 867.50 [area C] or 21 907.5 [area B + area C] <br> or <br> **B2** for 11 040 [area B] **or** 10 867.50 [area C] <br> or <br> **M1** for 736 [B tickets] and **M1** for 483 [C tickets] <br><br> After 0 scored <br> **SC2** for answer of 1196 <br> or <br> **SC1** for 13 754 (A total sales) |

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| | (c) | | 37 720 | 3 | **M2** for $\dfrac{35834}{0.95}$ oe <br> or <br> **M1** for 35834 associated with 95[%] |
| 3 | (a) | (i) | 52 <br> Angles in **same segment** | 1 <br> 1dep | Accept same arc, same side of same chord |
| | | (ii) | 104 <br> **Angle** at **centre** is **twice** angle at **circumference** | 1 <br> 1 | Accept double, $2 \times$ but not middle, edge |
| | | (iii) | 34 <br> Angle between **tangent** and **radius** **= 90°** | 1 <br> 1 | Accept right angle, perpendicular |
| | (b) | (i) | 7.65 to 7.651 | 4 | **M2** for $8.9^2 + 7^2 - 2 \times 8.9 \times 7 \times \cos 56$ <br> or <br> **M1** for correct implicit formula <br> and <br> **A1** for 58.5 to 58.6 |
| | | (ii) | 49.3 or 49.33 to 49.34… | 3 | **M2** for $[\sin BEC =] \dfrac{7\sin 56}{their \textbf{ (b)(i)}}$ oe <br> or <br> **M1** for $\dfrac{\sin 56}{their \textbf{ (b)(i)}} = \dfrac{\sin BEC}{7}$ oe |
| 4 | (a) | (i) | Ariven with comparable form for both shown or difference between the two fractions shown | 1 | Accept probabilities changed to decimals or percentages (to 2sf or better) |
| | | (ii) | $\dfrac{6}{15}$ oe | 2 | **M1** for $\dfrac{3}{5} \times \dfrac{2}{3}$ |
| | | (iii) | $\dfrac{7}{15}$ oe | 3 | **M2** for $\dfrac{3}{5} \times \dfrac{1}{3} + \dfrac{2}{5} \times \dfrac{2}{3}$ oe $1 - their \textbf{ (a)(ii)} - \dfrac{2}{5} \times \dfrac{1}{3}$ <br> or <br> **M1** for $\dfrac{3}{5} \times \dfrac{1}{3}$ or $\dfrac{2}{5} \times \dfrac{2}{3}$ seen |
| | (b) | (i) | Completes tree diagram correctly | 3 | **B2** for 5 values correct <br> or <br> **B1** for 1 value correct |
| | | (ii) | $\dfrac{126}{350}$ oe $\left[\dfrac{9}{25}\right]$ | 2 | **M1** for $\dfrac{3}{5} \times \dfrac{6}{7} \times \dfrac{7}{10}$ |

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| | **(iii)** | $\dfrac{344}{350}$ oe | 3 | **M2** for $1-their\dfrac{2}{5}\times their\dfrac{1}{7}\times their\dfrac{3}{10}$ oe <br><br> or $\dfrac{3}{5}+\dfrac{2}{5}\times\dfrac{6}{7}+\dfrac{2}{5}\times\dfrac{1}{7}\times\dfrac{7}{10}$ <br><br> **M1** for $their\dfrac{2}{5}\times their\dfrac{1}{7}\times their\dfrac{3}{10}$ oe <br> or identifies the 7 routes <br> or attempt to add 7 probabilities with at least 5 correct <br> $\dfrac{9}{25}+\dfrac{27}{175}+\dfrac{3}{50}+\dfrac{9}{350}+\dfrac{6}{25}+\dfrac{18}{175}+\dfrac{1}{25}$ oe |
| **5 (a) (i)** | | $\begin{pmatrix} 0 & -4 \\ 4 & 0 \end{pmatrix}$ | 1 | |
| | **(ii)** | $\begin{pmatrix} -1 & 1 \\ 1 & -1 \end{pmatrix}$ | 1 | |
| | **(iii)** | $\begin{pmatrix} -1 & 0 \\ 0 & -1 \end{pmatrix}$ | 2 | **B1** for three correct elements |
| | **(iv)** | $\begin{pmatrix} -13 \\ 5 \end{pmatrix}$ | 2 | **B1** for either correct in this form |
| **(b)** | | $\begin{pmatrix} 1 & 2 \\ 0 & 1 \end{pmatrix}$ | 3 | **M1** for understanding to find the inverse of **Q** <br> **and M1** for det = 1 or for $k\begin{pmatrix} 1 & 2 \\ 0 & 1 \end{pmatrix}$ $k\neq0$ <br><br> Alternative <br> $\begin{pmatrix} 1 & -2 \\ 0 & 1 \end{pmatrix}\begin{pmatrix} a & b \\ c & d \end{pmatrix}=\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$ <br> Leading to $a - 2c = 1$ and $c = 0$ then $a = 1$ <br> and $b - 2d = 1$ and $d = 1$ then $b = 2$ <br> **M2** all four equations, **M1** for a pair of correct equations |
| **6 (a) (i)** | | $\dfrac{x^8}{3}$ final answer | 1 | |
| | **(ii)** | $15x^7y^3$ final answer | 2 | **M1** for 2 elements correct |
| | **(iii)** | $16x^8$ final answer | 2 | **M1** for $16x^k$ or $kx^8$ |

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| **(b)** | $\sqrt{([-]7)^2 - 4.3 - 12}$ or better and $p = [--]7$ and $r = 2(3)$ oe | **B1** **B1** | or for $\left(x - \dfrac{7}{6}\right)^2$ Must see $\dfrac{p + \sqrt{q}}{r}$ or $\dfrac{p - \sqrt{q}}{r}$ or both or for $\dfrac{7}{6} \pm \sqrt{4 + \left(\dfrac{7}{6}\right)^2}$ | |
| | 3.48, –1.15 cao | **B1B1** | After **B0**, **SC1** for answer 3.5 and –1.1 or 3.482… and –1.149 to –1.148 seen or for 3.48, –1.15 seen or for answer –3.48 and 1.15 | |
| **(c)** | $\dfrac{x+5}{x^2}$ or $\dfrac{1}{x} + \dfrac{5}{x^2}$ final answer nfww | **3** | **B1** for $(x+5)(x-5)$ and **B1** for $x^2(x-5)$ | |
| **7** **(a)** | $\dfrac{1}{2} \times 8 \times 8 \times \sin 56$ oe 26.52 to 26.53 | **M1** **A1** | or [½ × 2] 8sin28 × 8cos28 or [½ × 2] × 7.06… × 3.75… | |
| **(b)** **(i)** | 72.[0] or 71.87 to 72.0 | **3** | **M2** for $26.5/(\pi \times 6.5^2) \times 360$ oe or **M1** for $\dfrac{x}{360} \times \pi \times 6.5^2 = 26.5$ or better | |
| **(ii)** | 21.1 or 21.2 or 21.14 to 21.17 | **3** | **M2** for $\dfrac{their\ \mathbf{(b)(i)}}{360} \times \pi \times 2 \times 6.5 + 2 \times 6.5$ oe or **M1** for $\dfrac{their\ \mathbf{(b)(i)}}{360} \times \pi \times 2 \times 6.5$ oe or $\dfrac{their\ \mathbf{(a)}}{0.5 \times 6.5}$ | |
| **(c)** **(i)** | $\dfrac{30}{360} \times \pi \times r^2 - \dfrac{1}{2} \times r^2 \times \sin 30$ oe $\dfrac{1}{12} \times \pi \times r^2 - \dfrac{1}{4} \times r^2$ $\dfrac{1}{4} r^2 \left(\dfrac{1}{3}\pi - 1\right)$ | **M2** **A1** **A1** | **M1** for $\dfrac{30}{360} \times \pi \times r^2$ or $\dfrac{1}{2} \times r^2 \times \sin 30$ Dep on **M2 A1** and no errors seen | |
| **(ii)** | 20.6 or 20.7 or 20.55 to 20.71 | **3** | **M2** for $[r^2 =] \dfrac{5}{\frac{1}{4}\left(\frac{1}{3}\pi - 1\right)}$ or **M1** for one correct rearrangement step to $r$ from $\dfrac{1}{4} r^2 \left(\dfrac{1}{3}\pi - 1\right) = 5$ | |

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|---|---|---|---|---|---|
| **8** | **(a)** | **(i)** | $(1, 2)$ | **1+1** | |
| | | **(ii)** | $y = 3x - 1$ cao final answer | **3** | **M1** for gradient $= \dfrac{8 - -4}{3 - -1}$ oe <br> and **M1** for substituting $(3, 8)$ or $(-1, -4)$ into *their* $y = 3x + c$ or for finding $y$-intercept is $-1$ |
| | **(b)** | **(i)** | $(x + 5)(x - 2)$ isw solutions | **2** | **SC1** for $(x + a)(x + b)$ where $ab = -10$ or $a + b = 3$ |
| | | **(ii)** | $[a =]\quad -5$ <br> $[b =]\quad 2$ <br> $[c =]\quad -10$ | **3FT** | **B1FT** for each of *their* 5 and *their* $-2$ from **(b)(i)** and **B1** for c $= -10$ |
| | | **(iii)** | $x = -1.5$ | **1FT** | **FT** $x = (their\ (a + b))/2$ |
| | **(c)** | | Inverted parabola | **B1** | |
| | | | $x$-axis intercepts at $-2$ and 9 | **B2** | **B1** for each <br> After **B0** allow **SC1** for $(9 - x)(2 + x)$ oe |
| | | | $y$-axis intercept at 18 | **B1** | |
| | **(d)** | **(i)** | $p = 6$ <br> $q = 43$ | **3** | **B2** for $(x + 6)^2 - 43$ or $p = 6$ or $q = 43$ <br> or **M1** for $(x + 6)^2$ or $x^2 + px + px + p^2$ <br> and <br> **M1** for $-7 - (their\ 6)^2$ or $p^2 - q = -7$ or $2p = 12$ |
| | | **(ii)** | $-43$ | **1FT** | **FT** $-$ *their q* |
| **9** | **(a)** | **(i)** | 7 | **4** | **M2** for $\dfrac{16 \times 11 + 17 \times 10 + 18p + 19 \times 4 + 20 \times 8}{11 + 10 + 4 + 8 + p} = 17.7$ <br> or better <br> or <br> **M1** for sum of two correct products or better <br> or for [total =] $11 + 10 + 4 + 8 + p$ <br> and <br> **B1** for $582 + 18p = 17.7\ (33 + p)$ |
| | | **(ii)** | 17 | **1FT** | **STRICT FT** median for *their p* if integer |
| | **(b)** | **(i)** | 64 | **2** | **M1** for $\dfrac{320}{6.4} \times 1.28$ oe |
| | | **(ii)** | 40 | **2** | **M1** for $\dfrac{320}{480} \times 60$ oe |
| | | **(iii)** | 1.6[0] | **2FT** | FT *their* **(b)(i)** / *their* **(b)(ii)** evaluated correctly to 2dp <br><br> **M1** for *their* **(b)(i)** / *their* **(b)(ii)** or $\dfrac{480}{6.4} \times 1.28 \div 60$ |

| (c) | 9.9125 cao | 5 | **B4** for answer 9912.5<br><br>or<br><br>**M1** for 25 to 35 × 290 to 310 oe<br><br>and **B1** for 32.5 used and **B1** for 305 or 5 mins 5 secs used<br><br>and **M1** indep for any correct conversion seen m to km |
|---|---|---|---|
| 10 (a) (i) | 5$x$ + 14 final answer | 2 | **M1** for 5$x$ + $k$ or $kx$ + 14 |
| (ii) | 14.2 | 3 | **M1** for 5$x$ = 32 – 14 **FT** *their* expression in **(a)(i)**<br>**A1FT** for $x$ = 3.6 |
| (b) | 8$a$ – 3$b$ + 14 = 32.5 or better<br>5$a$ + 4$b$ + 13.5 = 39.75 or better<br><br>Equates coefficients of either $a$ or $b$<br><br>40$a$ – 15$b$ = 92.5<br>40$a$ + 32$b$ = 210<br>or<br>32$a$ – 12$b$ = 74<br>15$a$ + 12$b$ = 78.75<br><br>Adds or subtracts to eliminate<br>47$b$ = 117.5<br>47$a$ = 152.75<br><br>[$a$ =] 3.25<br><br>[$b$ =] 2.5 | **B1**<br>**B1**<br><br>**M1**<br><br><br><br><br><br><br><br><br><br>**M1**<br><br><br><br><br><br>**A1**<br><br><br>**A1** | 8$a$ – 3$b$ = 18.5<br>5$a$ + 4$b$ = 26.25<br><br>or rearranges one of *their* equations to make $a$ or $b$ the subject<br>e.g. $a = \dfrac{3b + 18.5}{8}$<br><br><br><br><br><br><br><br>**Dep** on previous method<br>or correctly substitutes into the second equation<br>e.g. $\dfrac{5(3b + 18.5)}{8} + 4b = 26.25$<br><br>After **M0** scored<br>**SC1** for 2 correct values with no working<br>or for two values that satisfy one of their original equations |