# MARK SCHEME for the October/November 2010 question paper

# for the guidance of teachers

## 4024 MATHEMATICS (SYLLABUS D)

**4024/12**          Paper 1, maximum raw mark 80

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**Abbreviations**

| | |
|---|---|
| cao | correct answer only |
| cso | correct solution only |
| dep | dependent |
| ft | follow through after error |
| isw | ignore subsequent working |
| oe | or equivalent |
| SC | Special Case |
| www | without wrong working |
| art | anything rounding to |
| soi | seen or implied |

| 1 | (a) | $\frac{17}{21}$ oe | 1 | |
|---|-----|-----|---|---|
|   | (b) | $\frac{5}{12}$ cao | 1 | |
| 2 | (a) | 70 | 1 | |
|   | (b) | 4.05 | 1 | |
| 3 | (a) | $7.06 \times 10^{-5}$ cao | 1 | |
|   | (b) | 150 | 1 | |
| 4 | (a) | 7 | 1 | |
|   | (b) | 6 | 1 | |
| 5 | (a) | 1.65 | 1 | |
|   | (b) | 2 : 25 | 1 | |
| 6 | (a) | $(2t - 3)(2t + 3)$ | 1 | |
|   | (b) | $(3x - 1)(x + 2)$ | 1 | |
| 7 | | 18 | 2 | or **B1** for "$k$" = 2, or for $\frac{y}{50} = \frac{3^2}{5^2}$ oe |
| 8 | | $(\pm)\sqrt{\frac{y-3}{2}}$ oe e.g. $(\pm)\left(\frac{y-3}{2}\right)^{\frac{1}{2}}$ <br><br> (sq. root symbol must extend below the fraction line) | 2 | or **C1** for $\frac{\sqrt{y-3}}{2}$ or for $\sqrt{\frac{y+3}{2}}$ <br> or for $\sqrt{\frac{3-y}{2}}$ or for $\sqrt{y-3/2}$ <br> oe for all |
| 9 | (a) | $(\pm)$ 5 cao | 1 | |
|   | (b) (i) | 6 | 1 | |
|   | (ii) | (1.5, 0) | 1 | |

| 10 | (a) | $\frac{4}{5}$, or 0.8, only | 1 | |
|---|---|---|---|---|
| | (b) | $25x^6$ cao | 1 | |
| | (c) | $\frac{4}{n^8}$ | 1 | |
| 11 | (a) | 8 | 1 | |
| | (b) | {5, 6, 7, 8, 9} | 1 | |
| | (c) | $\frac{3}{10}$ or 0.3 | 1 | |
| 12 | (a) | $3\frac{1}{2}$, or $\frac{7}{2}$, or 3.5, only | 1 | |
| | (b) | $12 - 2x$ or **any** equivalent | 2 | or **C1** for $12 - 2$ "$y$" or **any** equivalent<br>or **C1** for $6 - 2x$, or for any incorrect linear combination of 12 and $2x$ (but not 2"$y$") |
| 13 | (a) | Irrational | 1 | |
| | (b) | $(AB^2 =) AC^2 - 5^2$ or $(AB =) \sqrt{AC^2 - 5^2}$ or $AC^2 = AB^2 + 5^2$. $AC$ must be "their" $\sqrt{89}$ | M1 | |
| | | $(\pm)\ 8$ | A1 | |
| 14 | | $x = 9$, $y = 6$ both | 3 | or **C2** for one answer correct;<br>or **C1** for a pair of values that fits either equation, provided that this pair has been obtained by the method of substitution, equal coeffs., or matrices/determinants and **not** by trial and error. |
| 15 | (a) | 16 (.0)(0) | 1 | |
| | (b) | 75 (.0)(0) www | 2 | or **M1** for $\frac{60}{0.8}$ oe, e.g. $\frac{3k \times 100}{4k}$ |
| 16 | (a) | $\begin{pmatrix} -1 & -2 \\ 0 & -2 \end{pmatrix}$ | 1 | |
| | (b) | $\begin{pmatrix} 0 & -1 \\ -\frac{1}{3} & -\frac{2}{3} \end{pmatrix}$ oe e.g. $-\frac{1}{3}\begin{pmatrix} 0 & 3 \\ 1 & 2 \end{pmatrix}$ | 2 | or **B1** for det **A** = –3<br>or for $k\begin{pmatrix} 0 & 3 \\ 1 & 2 \end{pmatrix}$ or for $-\frac{1}{3}\begin{pmatrix} .. & .. \\ .. & .. \end{pmatrix}$ |
| 17 | (a) | $\begin{pmatrix} 490 \\ 520 \end{pmatrix}$ | 2 | or **C1** for a 2 × 1 matrix with one element correct; or for (490  520) |
| | (b) | The cost, (in cents), of each bunch. oe | 1 | Indep. of **(a)** |
| 18 | (a) | 14.7(0) cao | 1 | |
| | (b) | 30 | 2 | or **B1** for 170 seen in working or in Ans. Space |

| 19 | (a) | $p = 1$, $q = 0$ | 1 | |
|---|---|---|---|---|
| | (b) | (i) $\dfrac{5}{7}$ | 1 | |
| | | (ii) $\dfrac{2}{7}$ or ft $1$ – their (i) <br><br> or ft $(\dfrac{1}{7} + \dfrac{1}{7} \times$ their $p)$ | 1ft | ft depends on $0 <$ Ans. $< 1$ |
| 20 | (a) | $3x > 7$ oe <br> $4x + 4y < 35$ oe | 1 <br> 1 | or **C1** for $3x \dots 7$ **and** $4x + 4y \dots 35$ (oe) <br> with incorrect inequalities for … . |
| | (b) | $(5, 3)$ | 1 | |
| 21 | (a) | $53.35°$ | 1 | |
| | (b) | $65.15°$ | 2 | or **C1** for $64.65$; or $65.1$; or $64.05$ |
| 22 | (a) | (i) 16 000 cao <br> (ii) 0.0030 cao | 1 <br> 1 | |
| | (b) | 50 cao | 2 | Give 0 for multiplication using either original number. <br> or **C1** for figs. 5, or 6; 45; or 48 |
| 23 | (a) | $123°$ | 1 | |
| | (b) | $57°$ | 1 | |
| | (c) | $33°$ | 1 | |
| | (d) | $66°$ | 1 | |
| 24 | (a) | $3\mathbf{p} + \mathbf{q}$ oe | 1 | |
| | (b) | (i) Trapezium <br> (ii) $\mathbf{p} + k\mathbf{q}$ oe | 1 <br> 1 | |
| | | (iii) $\dfrac{1}{3}$ | 1 | |
| 25 | (a) | 30 | 2 | or **B1** for $10u$ or $½ \times 20 \times u$ clearly seen |
| | (b) | 90 | 2 | or **C1** for 30 (if as the further time from 60) <br> or **M1** for <br> $100 - \dfrac{1}{4} \times 40$, or for $60 + \dfrac{3}{4} \times 40$ |
| 26 | (a) | $-\dfrac{4}{5}$, or $-0.8$, only | 1 | |
| | (b) | 16 | 3 | or **M1** for $\dfrac{AC}{\sin b} = \dfrac{10}{\sin a}$ soi <br><br> and **M1** for $AC = \dfrac{10 \times \frac{24}{25}}{\frac{3}{5}}$ oe |

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| 27 | **(a)** | 3 | 1 | |
|----|---------|---|---|---|
|    | **(b)** | 80 | 1 | |
|    | **(c)** | $7\frac{1}{2}$  oe | 3 | or **B1** for $\dfrac{A}{360} \times 2 \times \pi \times r$ with $A = 40$ or 120, **and** $\pi = \pi$ or 3 or 3.14 or $\dfrac{22}{7}$ etc and **M1** for adding the appropriate radii ($6r$ or $2r$) to their arc(s) **and** equating to the appropriate wire length (60 or 20) ($8r = 60$, oe (e.g. $\dfrac{8}{3}r = 20$), gets **B1** and **M1**) |