
MATHEMATICS (SYLLABUS D)

4024/12

Paper 1

October/November 2017

MARK SCHEME

Maximum Mark: 80

Published

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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 |

| Question | Answer | Marks | Partial Marks |
|----------|--|-------|--|
| 1(a) | $\frac{9}{35}$ | 1 | |
| 1(b) | 200 | 1 | |
| 2(a) | 7, 8, 5 all three | 1 | |
| 2(b) | 18 × their (min. frequency) FT provided min. frequency < 20 | 1 | |
| 3 | $\frac{1}{2}$ oe nfw | 2 | B1 for “k” = $\frac{30}{6}$ oe if $y = \frac{k}{x}$ used or FT M1 for $y = (\text{their } k) / 10$ when $y = “k” / x$ used or M1 for $\frac{1}{6} \times 30 = y \times 10$ |
| 4(a) | $\frac{1}{8}$; or 0.125 | 1 | |
| 4(b) | 4x | 1 | |
| 5(a) | 68 | 1 | |
| 5(b) | 14 33; or 2.33 p.m. | 1 | |
| 6(a) | 3.84 | 1 | |
| 6(b) | 4 | 1 | |
| 7(a) | 78° | 1 | |
| 7(b) | 70° | 1 | |
| 8(a) | 0 | 1 | |
| 8(b) | 1.5 | 1 | |
| 9(a) | 7.5 | 1 | |
| 9(b) | 3 nfw | 1 | |

| Question | Answer | Marks | Partial Marks |
|-----------|--|-----------|---|
| 10 | Two or three of 40, 6, 3000 | M1 | |
| | Final answer 0.08 cao nfw | A1 | C1 for 0.08 without any working. |
| 11 | 14 years 6 months nfw | 2 | M1 for $(3 \times (14 \text{ years } 3 \text{ months}) + 15 \text{ years } 3 \text{ months})$ oe |
| 12(a) | 25 | 1 | |
| 12(b) | $\frac{1}{5}$; or 0.2 | 1 | |
| 13(a) | 40 | 1 | |
| 13(b) | rectangle: base 40 to 50; frequency density (height) 3 | 1 | |
| | rectangle: base 50 to 80; frequency density (height) 1 | 1 | |
| 14 | -2 and -1 | 3 | B1 for $(-5x \dots (-)k$; or $(-1 \dots (-)\frac{5}{k}x$ (i.e. collecting x terms, where \dots represents any inequality symbol, or $=$) and $k = 12, 4, 3, 1$ or 48 . Or equiv., with zero on one side and both terms on the other. B1 for $x > -2.4$; or for $-2.4 < x$ If 0 scored, then C1 for one correct solution or for $x = -\frac{12}{5}$ oe in the answer space. |
| 15(a) | 5 | 1 | |
| 15(b) | 72, 70, 38 all three | 2 | C1 for 72 and 70; or for three angles totalling 180° . |
| 16(a) | 3.6×10^8 | 1 | |
| 16(b)(i) | 4.5×10^{-6} | 1 | |
| 16(b)(ii) | $(\pm) 3 \times 10^{-8}$ | 1 | |
| 17(a) | 77 | 1 | |
| 17(b) | 20 | 2 | M1 for a wholly correct method, such as $\frac{15000 - 12000}{15000} \times 100$ |
| 18(a) | 236 | 2 | M1 for $2 \times 5 \times 11 + 2 \times 5 \times 6 + 11 \times 6$ oe or C1 for 302 |
| 18(b) | 30 | 1 | |

| Question | Answer | Marks | Partial Marks |
|-----------|---|-------|--|
| 19(a) | Probabilities 0.7 and 0.3 on the correct branches | 1 | |
| 19(b)(i) | 0.49 oe | 1 | |
| 19(b)(ii) | 0.42 oe | 1 | FT from their diagram, provided their diagram probabilities are less than 1, and $0 < \text{ans.} < 1$. |
| 20(a) | -2 | 1 | |
| 20(b) | $y = -2x + 4$ or FT $y = (\text{their(a)})x + 4$ or $y = (\text{their(a)})(x + 3) + 10$ | 1 | |
| 20(c) | (3, -2) | 2 | C1 for one correct coordinate |
| 21(a) | $\begin{pmatrix} 7 & 9 \\ -15 & -16 \end{pmatrix}$ | 2 | C1 for two or three correct elements, or for 3 or 4 elements of $\begin{pmatrix} 11 & -3 \\ -15 & -8 \end{pmatrix}$. |
| 21(b) | $-\frac{1}{7} \begin{pmatrix} -4 & -1 \\ 5 & 3 \end{pmatrix}$ oe, e.g. $\begin{pmatrix} \frac{4}{7} & \frac{1}{7} \\ -\frac{5}{7} & -\frac{3}{7} \end{pmatrix}$ | 2 | B1 for (det A =) -7 or B1 for $\begin{pmatrix} -4 & -1 \\ 5 & 3 \end{pmatrix}$ seen |
| 22(a) | $3a(3a - 2)$ | 1 | |
| 22(b) | $(2 - 5t)(2 + 5t)$ | 1 | |
| 22(c) | $(x + 3d)(2c - y)$ | 2 | B1 for one of the partial factorisations: $x(2c - y)$, $3d(2c - y)$, $2c(x + 3d)$, $-y(x + 3d)$, $y(x + 3d)$ |
| 23(a) | 97 to 99 inclusive | 1 | |
| 23(b) | Acceptable line | 1 | |
| 23(c) | Full circle, centre C, radius 5 cm | 1 | |
| 23(d) | 4.3 to 4.9 cm, dep. on two labelled intersections of an acceptable line and arc. | 1 | |
| 24(a) | 21 | 1 | |
| 24(b) | $\frac{18}{20}$ oe | 1 | |
| 24(c) | 420 | 2 | M1 for a correct, complete, method to find the area. e.g. $\frac{1}{2} \times (30 + 12) \times (60 - 40)$; $12 \times (60 - 40) + \frac{1}{2} \times (60 - 40) \times (30 - 12)$; $(60 - 40) \times 30 - \frac{1}{2} \times (60 - 40) \times (30 - 12)$ |

| Question | Answer | Marks | Partial Marks |
|-----------|---|-------|--|
| 25(a) | $7x + 5y > 35$ oe and $x < 4$ oe and $y < 5$ oe | 2 | C1 for two inequalities correct; or for $x \dots 4$ and $y \dots 5$ (with “...” \neq “<”). |
| 25(b) | 3 nfw | 2 | B1 for x -coord. of A is $\frac{10}{7}$ oe; or for eqn. of OA is $y = \frac{7}{2}x$ oe |
| 26(a) | 49, 19, 30 | 1 | |
| 26(b)(i) | $3n + 4$ oe and isw | 1 | |
| 26(b)(ii) | $(n + 2)^2$ oe | 1 | |
| 26(c) | $n^2 + n$; or $n(n + 1)$ | 2 | M1 for attempt at <i>their</i> (bii) – <i>their</i> (bi), provided both parts are different expressions in n , and the answer space also contains an expression in n , or is empty: or for a valid method. |
| 27(a) | 7 | 3 | M1 for $ \overline{OP} = \sqrt{(-3)^2 + (4)^2}$ B1 for $ \overline{PQ} = 2$ |
| 27(b)(i) | $\begin{pmatrix} -3 + 2k \\ 4 \end{pmatrix}$ oe | 1 | |
| 27(b)(ii) | $4\frac{1}{2}$ oe | 2 | B1 for expressing \overline{OM} as a multiple (by 4) of \overline{OT} or B1 for T is (6, 4); or for $\overline{OT} = \begin{pmatrix} 6 \\ 4 \end{pmatrix}$ |