

MARK SCHEME for the May/June 2014 series

4024 MATHEMATICS (SYLLABUS D)

4024/21

Paper 2, maximum raw mark 100

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.

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| Question | Answers | Mark | Part marks |
|----------|--|------|---|
| 1 | (a) $\frac{8-x}{(x-4)^2}$ | 2 | M1 for $\frac{x-2(x-4)}{(x-4)^2}$ or better |
| | (b) $x = 2.5$ o.e., $y = -3$ | 3 | B2 for one correct with supporting working Or B1 for pair of values satisfying one equation |
| | (c) $x = 6$ or -1 | 3 | M1 for $x^2 - 5x - 6 = 0$ M1 for $(x-6)(x+1) = 0$ Or M2 for $\frac{5 \pm \sqrt{49}}{2}$ Or M1 for 5 and 2 correct or $\sqrt{49}$ |
| | (d) $\frac{y+3}{2y+5}$ final answer | 3 | M1 for $(y+3)(y-3)$ seen M1 for $(2y+5)(y-3)$ seen |
| 2 | (a) (i) 0 or none | 1 | All correct |
| | (ii) 7, 8, 11, 13, 14 | 1 | |
| | (iii) $\frac{3}{11}$ or 0.27 or better | 1 | |
| | (iv) 5 | 1 | |
| | (b) (i) 3 | 1 | |
| | (ii) 11 | 1 | |
| | (iii) 18 | 1 | |

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| 3 | (a) (i) | 37.5[%] | 2 | M1 for $5.5 \div (240 \div 60)$ soi by 1.37 Or B1 for either 150 seen and 90 seen |
| | (ii) | 73.5[0] | 2 | M1 for $45 \times 5.5 + (60 - 45) \times 5.5 \times 0.8$ oe Or B1 for 247.5 seen or for 66 seen |
| | (iii) | 208.7[0] | 2 | M1 for $240 \div 1.15$ oe |
| | (iv) | 2837.5[0] | 2 | M1 for $2500 \times 0.045 \times 3$ oe soi by 337.5 |
| | (b) (i) | 160 | 1 | |
| | (ii) | 1.21875 to 1.22 | 2 | M1 for $0.78 \div 0.64$ |
| 4 | (a) (i) | 24° | 1 | |
| | (ii) | 18° | 1 | |
| | (iii) | 42° | 1 | |
| | (iv) | 108° | 1 | |
| | (b) (i) | 14.56 to 14.6 | 2 | M1 for $\cos 72 = \frac{4.5}{AD}$ |
| | (ii) | 13.3 to 13.304... | 2 | M1 for $\frac{DE}{\sin 66} = \frac{4.5}{\sin 18}$ Or for 'their (b)(i)' $\times \cos$ ('their (a)(i)') |
| 5 | (a) (i) | $n + 6, n + 7$ | 1 | |
| | (ii) | $(n + 1)(n + 6) - n(n + 7)$ $= n^2 + 7n + 6 - n^2 - 7n = 6$ | 2 | M1 for $(n + 1)(n + 6) - n(n + 7)$ or reversed Or B1 for $n^2 + 7n + 6$ |
| | (b) (i) | $5n + 50$ or $5(n + 10)$ | 2 | M1 for $[n], n + 9, n + 10, n + 11, n + 20$ seen |
| | (ii) | 56, 65, 66, 67, 76 completed in cross | 2 | M1 for $n = 56$ Or for 66 in centre of cross |

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| 6 | (a) (i) | 60.28 to 60.35 | 2 | M1 for $\pi \times 1.6^2 \times 7.5$ |
| | (ii) | (a) length 9.6, width 6.4 | 1 | Condone reversed |
| | | (b) 98.7 to 99.2 | 2 | M1 for 'their 9.6×6.4 ' $\times 7.5 - 6 \times$ 'their 60.3' Or B1 for 460.8, or 361.68 to 362.1 |
| | (b) (i) | 224.5[375] | 2 | M1 for 17.75 and 12.65 seen |
| | (ii) | No, frame could measure 17.5 cm by 12.5 cm | 1 | Accept statement involving lower bound of either length or width |
| 7 | (a) | -3.5, 5.5 | 2 | B1 for each |
| | (b) | 7 correct plots joined with smooth curve | 2 | P1 for at least 5 correct plots |
| | (c) | $x = -2.7$ to -2.6 , 0.3 to 0.4 , 2.2 to 2.3 | 2 | FT <i>their</i> curve B1 for 2 correct solutions |
| | (d) | Tangent drawn at $x = -2$ 2 to 3 | M1 A1 | On <i>their</i> curve |
| | (e) (i) | $y = 5 - 4x$ oe | 2 | M1 for $y = -4x + k$ or $y = mx + 5$ or $-4x + 5$ |
| | (ii) | $C = 1, D = -4$ | 2 | M1 for $\frac{x^3}{2} - 3x + 1 = 5 - 4x$ FT |

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| 8 | (a) | 32.25 or 32.75 | 3 | M1 for $(4 \times 5 + 12 \times 15 + 16 \times 25 + 20 \times 45 + 5 \times 55) [= 2580]$ M1 for $\div 80$ |
| | (b) | (i) | [4], 16, 32, 55, 75, 80 | 1 |
| | | (ii) | 6 correct plots joined with smooth curve using correct axes | 3 |
| | (iii) | (a) | 33 to 35 | 1 |
| | | (b) | 18 to 20 | 2 |
| (c) | | $\frac{1}{30}$ | 2 | M1 for $\frac{5}{25} \times \frac{4}{24}$ |
| 9 | (a) | 248.6 to 249 | 3 | M1 for $130^2 + 164^2 + or - [2] \times 130 \times 164 \times \cos 115$ And M1 for $AC^2 = 130^2 + 164^2 - 2 \times 130 \times 164 \times \cos 115$ |
| | (b) | 9660 or 9661.2(...) | 2 | M1 for $\frac{1}{2} \times 130 \times 164 \times \sin 115$ |
| | (c) | 7 | 2 | M1 for $\frac{their\ 9660 \times 3.25}{5000}$ or 6(.2) or 6.3 |
| | (d) | 43.49 to 43.5 | 2 | M1 for $130 \tan 18.5$ |
| | (e) | 148.6 to 149 | 3 | B1 for 65° or 25° seen M1 for $164 \times \sin '65'$ or $164 \times \cos '25'$ soi |

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|----|---------|---|-------------------|---|
| 10 | (a) (i) | 3.16 to 3.163 or $\sqrt{10}$ | 1 | |
| | (ii) | vector $\begin{pmatrix} 3 \\ -3 \end{pmatrix}$ drawn | 2 | B1 for two correct movement without arrow Or one correct movement with arrow |
| | (iii) | $a = 2, b = 3$ | 2 | B1 for each Or SC1 $a = -2$ and $b = -3$ |
| | (b) (i) | Enlargement Scale factor -2 Centre (3, 1) | B1 B1 B1 | B0 for question if second transformation mentioned |
| | (ii) | (a) (5, 4), (7, 4), (5, 6) (b) Stretch Factor 2 x -axis invariant | 2 B1 B1 | B1 for 2 correct |
| 11 | (a) | $\frac{100}{x}$ | 1 | |
| | (b) | $x^2 - 77x + 200 = 0$ derived w/w | 4 | B1 for $\frac{80}{x-5}$ seen M1 for $\frac{100}{x} + \frac{80}{x-5} = 2.5$ oe M1 for $100(x-5) + 80x = 2.5x(x-5)$ |
| | (c) | 74.31 and 2.69 final answer | 4 | B3 for one correct root seen or for 74 to 74.31 and 2.69 to 2.7 If in the form $\frac{p \pm (or + or -)\sqrt{q}}{r}$ B1 for $p = 77$ and $r = 2$ And B1 for $q = 5129$ or $\sqrt{q} = 71.6...$ |
| | (d) | 74.31, because 2.69 would give negative speed for second part | 1 | |
| | (e) | 11 | 2 | M1 for $\frac{100}{74.31} - \frac{80}{74.31-5}$ or 0.191 [hours] |