
MATHEMATICS (US)

0444/23

Paper 2 (Extended)

October/November 2016

MARK SCHEME

Maximum Mark: 70

Published

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.

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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 |

| Question | Answer | Mark | Part marks |
|----------|---|------|---|
| 1 | 36 | 1 | |
| 2 | n^7 | 1 | |
| 3 | B | 1 | |
| 4 (a) | 2.47×10^6 | 1 | |
| (b) | 7.9×10^{-3} | 1 | |
| 5 | $\frac{23}{30}$ cao | 2 | M1 for $\frac{3 \times 6 + [1 \times] 5}{5 \times 6}$ oe |
| 6 | Thursday | 2 | M1 for 5.4 found or at least two of: 3.8, 3.6 and 4 found |
| 7 | 0.4^2 0.22 $\left(\frac{1}{2}\right)^2$ $\sqrt{0.09}$ | 2 | M1 for decimal conversion 0.25 and 0.3 and 0.16 |
| 8 (a) | $\frac{1}{2}$ oe | 1 | |
| (b) | $\frac{3}{2}$ oe | 1 | |
| 9 | 5 | 2 | M1 for speed \times time |
| 10 | $8\sqrt{3}$ | 2 | B1 for $3\sqrt{3}$ or $5\sqrt{3}$ seen |
| 11 | 9600 | 2 | M1 for $20000 \times \left(1 - \frac{40}{100}\right) \times \left(1 - \frac{20}{100}\right)$ oe |
| 12 | 18 | 2 | M1 for $\left[\frac{1}{2} \times\right] \frac{4}{3} \times \pi \times 3^3$ |
| 13 | 120 | 1 | |
| | 4 | 1 | SC1 for answers reversed |

| Question | Answer | Mark | Part marks |
|----------|--|---------|---|
| 14 (a) | 30 | 1 | |
| (b) | 47.5 | 2 | M1 for 4.5×5 oe |
| 15 (a) | 68 | 1 | |
| (b) | 9 | 2 | M1 for $360 \div 40$ oe or $\frac{180(n-2)}{n} = 140$ oe |
| 16 | 0.5 oe nfw | 3 | M1 for $d = \frac{k}{(w+1)^2}$ or better M1 for $[d =] \frac{\text{their } k}{(9+1)^2}$ or M2 for $2(4+1)^2 = d(9+1)^2$ |
| 17 | $y = 2x$ oe | 3 | M1 for $\frac{1-3}{12-8}$ oe M1 for perpendicular gradient \times their $\frac{1-3}{12-8} = -1$ oe If M0 scored, SC1 for answer $y = kx$ $k \neq 2$ or 0 |
| 18 (a) | -16 | 1 | |
| (b) | 1 | 1 | |
| (c) | $2 - 3x$ final answer | 2 | M1 for $1 - (3x - 1)$ |
| (d) | $1 - x$ oe final answer | 1 | |
| 19 (a) | Correct tangent $2.1 \leq \text{grad} \leq 3.9$ | B1 2 | No daylight between tangent and curve at point of contact. Consider point of contact as midpoint between two vertices of daylight, the midpoint must be between $x = 0.8$ and $x = 1.2$ dep on B1 M1 for $\frac{\text{rise}}{\text{run}}$ also dep on any tangent drawn or close attempt at tangent at any point Must see correct or implied calculation from a drawn tangent |
| (b) | $(-2, 8)$ | 1 | |

| Question | Answer | Mark | Part marks |
|------------|---|------|---|
| 20 (a) | $[w =] \pm \frac{2}{3}$ | 2 | M1 for $w^2 = \frac{4}{9}$ soi by $\frac{2}{3}$ |
| (b) | $[y =] 32$ | 2 | M1 for $y = 4^{\frac{5}{2}}$ oe |
| 21 | 30 nfw | 3 | B2 for $\sin x = \frac{1}{2}$ or M1 for $\frac{1}{2} \times 12 \times 20 \sin x [= 60]$ |
| 22 | 1 3.5 1 | 4 | B3 for 2 correct B2 for 1 correct or M1 for 2, 7, [...] and 2 seen [FD's] |
| 23 | $\frac{7n}{2t+3m}$ final answer | 4 | M1 for $7n(6p-1)$ seen and M2 for $(2t+3m)(6p-1)$ seen or M1 for $2t(6p-1) + 3m(6p-1)$ or $6p(2t+3m) - 1(2t+3m)$ |
| 24 | $y \leq -\frac{3}{5}x + 6$ oe $x \geq 2$ oe $y > x$ oe final answers | 5 | SC4 for $y < -\frac{3}{5}x + 6, x > 2, y \geq x$ oe or B3 for $y \leq -\frac{3}{5}x + 6$ oe or B2 for $y = -\frac{3}{5}x + 6$ oe or B1 for gradient = $-\frac{3}{5}$ oe soi and B2 for $x \geq 2$ and $y > x$ oe or B1 for either $x \geq 2$ or $y > x$ oe or for $x = 2$ and $y = x$ with incorrect inequalities |
| 25 (a) (i) | 75 | 2 | M1 for angle $XAC = 90$ or $ABC = 90$ soi |
| (ii) | 150 | 1 | |
| (iii) | 75 | 1FT | FT their (a)(i) or their (a)(ii) $\div 2$ |
| (b) | 40 | 2 | M1 for $\frac{\text{angle}}{360} \times \pi \times 18 = [2\pi]$ oe |