# January 2005
# 6663 Core Mathematics C1
# Mark Scheme

| Question number | Scheme | Marks | |
|---|---|---|---|
| 1. | (a) 4 (or ± 4) | B1 | |
| | (b) $16^{-\frac{3}{2}} = \frac{1}{16^{\frac{3}{2}}}$ and any attempt to find $16^{\frac{3}{2}}$ | M1 | |
| | $\frac{1}{64}$ (or exact equivalent, e.g. 0.015625) (or $\pm\frac{1}{64}$) | A1 | (3) |
| | | | **3** |
| 2. | (i) (a) $15x^2 + 7$ | M1 A1 A1 | (3) |
| | (i) (b) $30x$ | B1ft | (1) |
| | (ii) $x + 2x^{\frac{3}{2}} + x^{-1} + C$ A1: $x + C$, A1: $+2x^{\frac{3}{2}}$, A1: $+x^{-1}$ | M1 A1 A1 A1 | (4) |
| | | | **8** |
| 3. | Attempt to use discriminant $b^2 - 4ac$ Should have no $x$'s | M1 | |
| | (Need not be equated to zero) (Could be within the quadratic formula) | | |
| | $144 - 4 \times k \times k = 0$ or $\sqrt{144 - 4 \times k \times k} = 0$ | A1 | |
| | Attempt to solve for $k$ (Could be an inequality) | M1 | |
| | $k = 6$ | A1 | (4) |
| | | | **4** |
| 4. | $x^2 + 2(2 - x) = 12$ or $(2 - y)^2 + 2y = 12$ (Eqn. in $x$ or $y$ only) | M1 | |
| | $x^2 - 2x - 8 = 0$ or $y^2 - 2y - 8 = 0$ (Correct 3 term version) | A1 | |
| | (Allow, e.g. $x^2 - 2x = 8$) | | |
| | $(x - 4)(x + 2) = 0$ $x = \ldots$ or $(y - 4)(y + 2) = 0$ $y = \ldots$ | M1 | |
| | $x = 4$, $x = -2$ or $y = 4$, $y = -2$ | A1 | |
| | $y = -2$, $y = 4$ or $x = -2$, $x = 4$ (M: attempt one, A: both) | M1 A1ft | (6) |
| | | | **6** |

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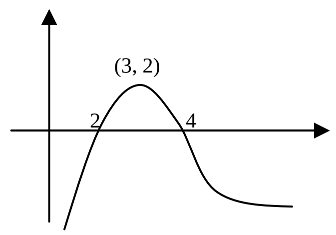
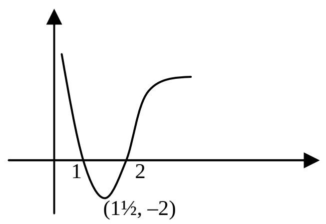
| 5. | (a) | –3, –1, 1 | B1: One correct | B1 B1 | (2) |
| | (b) | 2 | (ft only if terms in (a) are in arithmetic progression) | B1ft | (1) |
| | (c) | Sum = $\frac{1}{2}n\{2(-3)+(n-1)(2)\}$ or $\frac{1}{2}n\{(-3)+(2n-5)\}$ | | M1 A1ft | |
| | | $=\frac{1}{2}n\{2n-8\}=n(n-4)$ (Not just $n^2-4n$) | (*) | A1 | (3) |
| | | | | | **6** |
| 6. | (a) |  | Reflection in $x$-axis, cutting $x$-axis twice. | B1 | |
| | | | 2 and 4 labelled (or (2, 0) and (4, 0) seen) | B1 | |
| | | | Image of $P$ (3, 2) | B1 | (3) |
| | (b) |  | Stretch parallel to $x$-axis | M1 | |
| | | | 1 and 2 labelled (or (1, 0) and (2, 0) seen) | A1 | |
| | | | Image of $P$ (1½, –2) | A1 | (3) |
| | | | | | **6** |
| 7. | (a) | $\frac{5-x}{x}=\frac{5}{x}-\frac{x}{x}\left(=\frac{5}{x}-1\right)\left(=5x^{-1}-1\right)$ | | M1 | |
| | | $\frac{dy}{dx}=8x,-5x^{-2}$ | | M1 A1, A1 | |
| | | When $x = 1$, $\frac{dy}{dx}=3$ | (*) | A1 cso | (5) |
| | (b) | At $P$, $y = 8$ | | B1 | |
| | | Equation of tangent: $y-8=3(x-1)$ | $(y=3x+5)$ (or equiv.) | M1 A1ft | (3) |
| | (c) | Where $y = 0$, $x=-\frac{5}{3}$ $(= k)$ | (or exact equiv.) | M1 A1 | (2) |
| | | | | | **10** |

| Question | Scheme | Marks |
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| 8. | (a) | $p = 15$, $q = -3$ | B1 B1 | (2) |
| | (b) | Grad. of line *ADC*: $m = -\frac{5}{7}$, Grad. of perp. line $= -\frac{1}{m}$ $\left(= \frac{7}{5}\right)$ | B1, M1 | |
| | | Equation of *l*: $y - 2 = \frac{7}{5}(x - 8)$ | M1 A1ft | |
| | | $7x - 5y - 46 = 0$ (Allow rearrangements, e.g. $5y = 7x - 46$) | A1 | (5) |
| | (c) | Substitute $y = 7$ into equation of *l* and find $x = \ldots$ | M1 | |
| | | $\frac{81}{7}$ or $11\frac{4}{7}$ (or exact equiv.) | A1 | (2) |
| | | | | **9** |
| 9. | (a) | Evaluate gradient at $x = 1$ to get 4, Grad. of normal $= -\frac{1}{m}$ $\left(= -\frac{1}{4}\right)$ | B1, M1 | |
| | | Equation of normal: $y - 4 = -\frac{1}{4}(x - 1)$ ($4y = -x + 17$) | M1 A1 | (4) |
| | (b) | $(3x-1)^2 = 9x^2 - 6x + 1$ (May be seen elsewhere) | B1 | |
| | | Integrate: $\frac{9x^3}{3} - \frac{6x^2}{2} + x$ $(+C)$ | M1 A1ft | |
| | | Substitute (1, 4) to find $c = \ldots$, $c = 3$ ($y = 3x^3 - 3x^2 + x + 3$) | M1, A1cso | (5) |
| | (c) | Gradient of given line is –2 | B1 | |
| | | Gradient of (tangent to) *C* is ≥ 0 (allow >0), so can never equal –2. | B1 | (2) |
| | | | | **11** |

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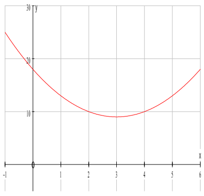
| 10. | (a) | $x^2 - 6x + 18 = (x-3)^2, \ +9$ | B1, M1 A1 | (3) |
| | (b) |  “U”-shaped parabola | M1 | |
| | | Vertex in correct quadrant | A1ft | |
| | | *P*: (0, 18) (or 18 on *y*-axis) | B1 | |
| | | *Q*: (3, 9) | B1ft | (4) |
| | (c) | $x^2 - 6x + 18 = 41$ or $(x-3)^2 + 9 = 41$ | M1 | |
| | | Attempt to solve 3 term quadratic $x = \ldots$ | M1 | |
| | | $x = \dfrac{6 \pm \sqrt{36 - (4 \times -23)}}{2}$ (or equiv.) | A1 | |
| | | $\sqrt{128} = \sqrt{64} \times \sqrt{2}$ (or surd manipulation $\sqrt{2a} = \sqrt{2}\sqrt{a}$ ) | M1 | |
| | | $3 + 4\sqrt{2}$ | A1 | (5) |
| | | | | **12** |