

January 2005
6663 Core Mathematics C1
Mark Scheme

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

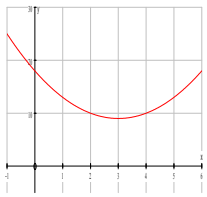
6. (a)		Reflection in x -axis, cutting x -axis twice. B1
	2 and 4 labelled (or (2, 0) and (4, 0) seen)	B1
	Image of $P(3, 2)$	B1 (3)
(b)		Stretch parallel to x -axis M1
	1 and 2 labelled (or (1, 0) and (2, 0) seen)	A1
	Image of $P(1\frac{1}{2}, -2)$	A1 (3)
		6

7. (a)	$\frac{5-x}{x} = \frac{5}{x} - \frac{x}{x} \left(= \frac{5}{x} - 1 \right) (= 5x^{-1} - 1)$	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

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 $x = \dots$	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 $c = \dots$, $c = 3$ ($y = 3x^3 - 3x^2 + x + 3$)	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 $x = \dots$ M1
$$x = \frac{6 \pm \sqrt{36 - (4 \times -23)}}{2}$$
 (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)