

Iterative Methods Mark Scheme		
1(a)	2.6	[1]
1(b)	x_5 second decimal place is above 5 so the answer is rounded up to 2.6. The solutions are approaching 2.6 with the increases getting smaller.	[1]
2	$x_0 = 0.5$ $x_1 = 1.587$	[1] Correct to 3.dp
	$x_2 = -0.704$	[1] Correct to 3.dp
	$x_3 = 2.066$	[1] Correct to 3.dp
3(a)	$x_0 = -3$ $x_1 = -3 - \frac{2}{-3^2} = -3.22$	[1] mark for substitution of -3 into the equation (to get $x_1 = -3.22$)
	$x_2 = -3 - \frac{2}{-3.22^2} = -3.19$	[1] mark for substitution of -3.22 into the equation (to get $x_2 = -3.19$) and -3.19 into the equation (to get $x_3 = -3.20$)
	$x_3 = -3 - \frac{2}{-3.19^2} = -3.20$	[1] mark for -3.22 AND -3.19 AND -3.20
3(b)	$x_{n+1} = -3 - \frac{2}{x_n^2}$ is the iterative form of $x^3 + 3x^2 + 2 = 0$	[1] mark for the connection between the iterative form and the equation
	So x_1, x_2 and x_3 are estimations of the solution $x^3 + 3x^2 + 2 = 0$	[1] mark for statement about the link. Key word is estimation/estimate .
4(a)	$x_{n+1} = \sqrt{10 - x_n}$	[1]
4(b)	$x_{n+1} = \sqrt[3]{5x_n - 1}$	[1]
4(c)	$x_{n+1} = \sqrt[3]{10x_n^2 + 30}$	[1]

Turn over ►

5(a)	$x_{n+1} = \sqrt[3]{\frac{4 - 6x_n}{3}}$	[1] Attempt of formula with correct notation								
	$x_{n+1} = \sqrt[3]{\frac{4 - 6x_n}{3}}$	[1] Correct answer								
5(b)	<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th style="background-color: #cccccc;">x</th> <th style="background-color: #cccccc;">$x_{n+1} = \sqrt[3]{\frac{4 - 6x_n}{3}}$</th> </tr> </thead> <tbody> <tr> <td>x_1</td> <td>1.101</td> </tr> <tr> <td>x_2</td> <td>-0.953</td> </tr> <tr> <td>x_3</td> <td>1.480</td> </tr> </tbody> </table>	x	$x_{n+1} = \sqrt[3]{\frac{4 - 6x_n}{3}}$	x_1	1.101	x_2	-0.953	x_3	1.480	[1] x_1 [1] x_2 [1] x_3
x	$x_{n+1} = \sqrt[3]{\frac{4 - 6x_n}{3}}$									
x_1	1.101									
x_2	-0.953									
x_3	1.480									
6	Monday = 50 Tuesday = $50 \times 0.98 = 49$	[1] mark for a correct method to find the volume on Tuesday. e.g. 50×0.98								
	Monday = 50 Tuesday = $50 \times 0.98 = 49$ Wednesday = $49 \times 0.98 = 48.02$ Thursday = $48.02 \times 0.98 = 47.0596$ Friday = $47.0596 \times 0.98 = 46.118408$	[1] mark for a complete iterative process								
	Friday = 46 litres	[1] mark for answer of 46								
7(a)	Volume of the cube = x^3 Volume of the cuboid = $1(x)(x + 10) = x^2 + 10x$ Equating the volumes $\rightarrow (x^3) = (x^2 + 10x) + 20$	[1] mark for either x^3 OR $1(x)(x + 10)$ OR $x^2 + 10x$								
	Rearranging the formula $\rightarrow x^3 - x^2 - 10x = 20$	[1] mark for correct working leading to $x^3 - x^2 - 10x = 20$								

Turn over ►

7(b)

x	$x^3 - x^2 - 10x$	Comment
4	8	Too small
5	50	Too large
4.5	25.875	Too large
4.4	21.824	Too large
4.3	18.017	Too small
4.35	19.890	Too small

[1] mark for a trial of either 4 or 5

[1] mark for a trial between
 $4 \leq x \leq 5$

[1] mark for a trial between
 $4.3 \leq x \leq 4.3$

[1] mark for $x = 4.4$

**Note: No working scores no marks
even if the answer is correct.**

END