Version : 1.0

ASSESSMENT and QUALIFICATIONS ALLIANCE

Free Standing Mathematics Qualification

Working with Algebraic and Graphical Techniques
6991/2

Mark Scheme

2005 examination – June series

Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting ensures that the mark scheme covers the candidates' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for the standardisation meeting each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting they are required to refer these to the Principal Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of candidates' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Free-Standing Mathematics Qualification

Advanced Level: Working with Algebraic & Graphical Techniques (6991/2)

June 2005

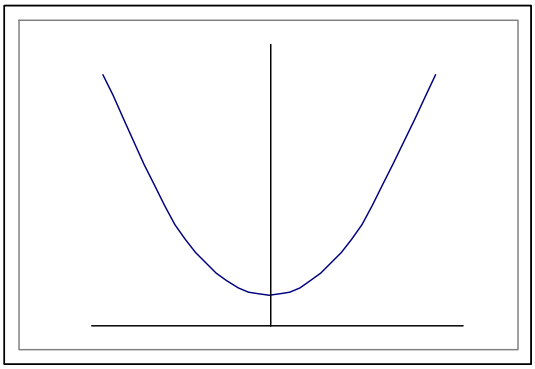
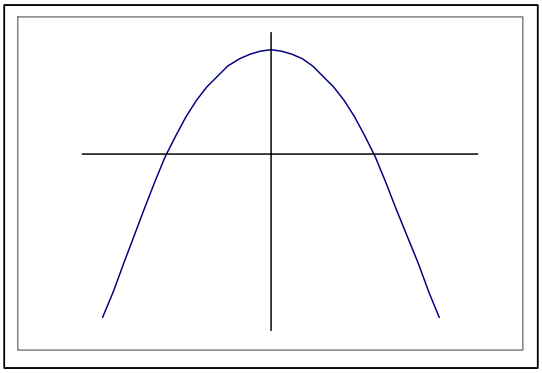
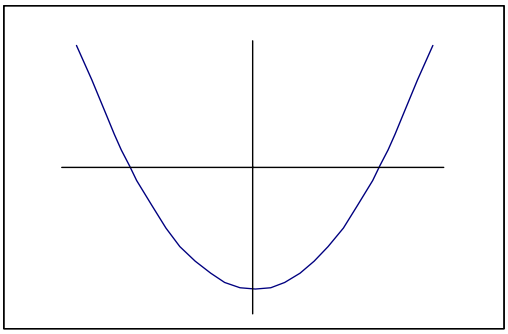
Question 1

(a)	7 correct plots (0,0) (5,250) (10,400) (15,450) (20,400) (25,250) (30,0)	B3	5 correct B2
	to ½ square accuracy		4 correct B1
	smooth correct curve	B1	
(b)(i)	$450m^2$	B1	
(ii)	15m	B1	
(c)	attempt to find both sides	M1	
	60	A1	
(d)	$q = 15$	B1	
	$p - 2q^2 = 0$	M1	oe
	$p = 450$	A1	
(e)	q gives x value for max	B1	
	p gives max area	B1	
	TOTAL	**13**	

Question 2

(a)	9 correct plots (0,7) (±5, 7.26) (±10, 8.09) (±15, 9.7) (±20, 12.5) to ½ sq. accuracy	B3	B2 for 6 correct B1 for 4 correct
	smooth correct curve	B1	
(b)	7m	B1ft	or ft provided U-shaped curve
(c)	$x = \pm 20$	M1	
	12.5 ft their curve provided U-shaped	A1ft	
	TOTAL	**7**	

Question 3

	correct curvature and correct crossing of vertical axis and all 3 graphs must be symmetrical about y- axis. No curve to go through (0,0). $y = P + Qx^2$  $y = P - Qx^2$  $y = Qx^2 - P$  $Y = P + Qx^2$ is best	B1 B1 B1 B1	
	TOTAL	**4**	

Question 4

(a)(i)	$\ln T = \ln (Ae^{-kx})$	M1	
	$\ln T = \ln A - kx$	A1	
(ii)	4.50, 4.25, 4.00, 3.75, 3.50, 3.25, 3.00	B2	–1 if use log B1 for 4 correct
(iii)	correct plots to ½ sq. accuracy	B2	B1 for 4 correct
	line through points	B1	line of best fit
(iv)	A = 88 to 92	B1	
	k = gradient and attempt seen	M1	
	k = 0.045 to 0.055	A1	
(b)(i)	initial temperature	B1	highest possible temp.
(ii)	sub x = 10	M1	
	52.1 ˚C	A1	
(iii)	$30/95 = e^{-0.06x}$	M1	
	$\ln (30/95) = -0.06x$	M1	$\ln 30 = \ln 95 - 0.06x$
	19 to 19.5 mins	A1	$\ln 30 - \ln 95 = -0.06x$
(iv)	x gets large T tends to 0 ˚C	B1	
	TOTAL	**17**	

Question 5

(a)(i)	h = 18 hours	B1	
	t = 180 days	B1	
(ii)	68.5 to 72.5	B1	
	287.5 to 291.5	B1	
(b)(i)	tangent drawn at t = 120	M1	
	0.07 to 0.11	A1	
(ii)	rate of change of hours of daylight	B1	oe
	hours per day	B1	
(c)	132±2 or 228±2	M1	
	96±3	A1	
(d)	10.4 to 10.45	B1	
	(10.6 – their 10.45) / 10.6 × 100	M1	
	1.4% to 1.9%	A1	allow ±
(e)	t(x) translate +90°	B1	
	stretch parallel to h(y) axis		
	scale factor 6	B1	
	h(y) translate +12	B1	
(f)	amplitude 6	B1	
	period 360	B1	
(g)	A = 5	B1	
	TOTAL	**19**	
	TOTAL FOR PAPER	**60**	