

Version



**Free-Standing Mathematics Qualification
June 2012**

Use of Mathematics (Pilot)

USE1

(Specification 9361)

Algebra

Final

Mark Scheme

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 events which all examiners participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for standardisation each examiner analyses a number of students' scripts: alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, examiners encounter unusual answers which have not been raised they are required to refer these to the Principal Examiner.

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Key to mark scheme abbreviations

M	mark is for method
m or dM	mark is dependent on one or more M marks and is for method
A	mark is dependent on M or m marks and is for accuracy
B	mark is independent of M or m marks and is for method and accuracy
E	mark is for explanation
✓ or ft or F	follow through from previous incorrect result
CAO	correct answer only
CSO	correct solution only
AWFW	anything which falls within
AWRT	anything which rounds to
ACF	any correct form
AG	answer given
SC	special case
OE	or equivalent
A2,1	2 or 1 (or 0) accuracy marks
-x EE	deduct x marks for each error
NMS	no method shown
PI	possibly implied
SCA	substantially correct approach
c	candidate
sf	significant figure(s)
dp	decimal place(s)

No Method Shown

Where the question specifically requires a particular method to be used, we must usually see evidence of use of this method for any marks to be awarded.

Where the answer can be reasonably obtained without showing working and it is very unlikely that the correct answer can be obtained by using an incorrect method, we must award **full marks**. However, the obvious penalty to candidates showing no working is that incorrect answers, however close, earn **no marks**.

Where a question asks the candidate to state or write down a result, no method need be shown for full marks.

Where the permitted calculator has functions which reasonably allow the solution of the question directly, the correct answer without working earns **full marks**, unless it is given to less than the degree of accuracy accepted in the mark scheme, when it gains **no marks**.

Otherwise we require evidence of a correct method for any marks to be awarded.

General Certificate of Education
Advanced Level – Algebra (USE1)
Answers and Marking Scheme – June 2012

Q	Solution	Marks	Total	Comments
1(a)	159 (lumens/m ²)	B1	1	159.1, 159.2
(b)	$100 = 2000 \div (4\pi d^2)$ 1.26 (m)	M1 A1	2	3sf or better
(c)	$\frac{1}{4}$ as bright or 39.7, 39.8	B1	1	oe only 25% as bright goes down by factor of 4
(d)	$2000 \div (4\pi 4^2)$ $3000 \div (4\pi d^2) = \text{their } 9.95$ 4.89 or 4.9 (m)	B1 M1 A1	1 3	9.95, 9.94 $3000 \div (4\pi d^2) = 2000 \div (4\pi 16)$ or $3000 \div d^2 = 2000 \div 16$ $\sqrt{24}$
Total			7	
2(a)	$\ln T = \ln A + \ln(d^k)$	B1	1	no incorrect statement
(b)	$\ln d$ 7.26, 8.41 $\ln T$ 9.28, 11.(0)	B1 B1	2	4 correct to more than 3sf scores B1
(c)	5 pairs of values plotted to $\frac{1}{2}$ square accuracy on ft line of best fit	B2ft B1ft	3	B1 4 correct pairs of plots on ft not freehand, no double lines or thick lines $> \frac{1}{2}$ square wide
(d)	Reading off for $\ln 228 = 5.43$ 601 to 736 (days)	M1 A1	2	
(e)	$\ln A = -1.2$ to -2.3 $A = 0.1$ to 0.3 $k =$ gradient and vertical/horizontal seen $k = 1.3$ to 1.7	M1 A1 M1 A1	4	Set up 2 simultaneous equations M2 If finds A then setting up equation for k is M1 and vice versa
Total			12	

3(a)	Correct intercept for $y = e^x$ at (0,1)	B1	4	Allow to touch x axis but no doubling back	
	Correct curvature for $y = e^x$ in top 2 quadrants	B1			
(b)	Correct intercept for $y = \ln x$ at (1,0)	B1		2	Allow to touch y axis but no doubling back
	Correct curvature for $y = \ln x$ in 1 st and 4 th quadrants	B1			
	Reflection (in) $y = x$	B1 B1			
Total			6		
4(a)(i)	134 (m)	B1	1	133.8, 133.9	
(ii)	5 (minutes)	B1	1		
(b)(i)	Tangent drawn to touch curve at $t = 10$ 8.25 to 12.5	M1 A1	2		
(ii)	m per minute	B1	1	oe not $\frac{m}{mins}$	
(iii)	Eg How fast the balloon is climbing (at $t = 10$) The speed of the balloon The balloon is rising at 10.4m each min Rate of change of height oe	B1	1	B0 for it ascends quickly in a short time. As time increases so height increases	
(c)	$H = 200$	B1	1	oe $Y = 200$ $y = 0x + 200$	
(d)(i)	170 or 171 or 170.5, 141 or 141.4, 118 or 117.6	B2	2	B1 for 2 correct to 3sf	
(ii)	9 correct plots joined by smooth curve to $\frac{1}{2}$ sq accuracy	B2 B1	3	B1 for 7 or 8 correct plots No double lines or thick lines $> \frac{1}{2}$ sq wide	
(iii)	2 distinct intervals 40 to (46 to 47) (52 to 54.5) to 60	B1 B1 B1	3		
Total			15		
TOTAL			40		