

## **Oxford Revise | Edexcel A Level Maths | Answers**

- Method (M) marks are awarded for showing you know a method and have attempted to apply it.
- Accuracy (A) marks should only be awarded if the relevant M marks have been awarded.
- Unconditional accuracy (B) marks are awarded independently of M marks. They do not rely on method.
- The abbreviation **o.e.** means 'or equivalent (and appropriate)'.

Please note that:

- efficient use of advanced calculators is expected
- inexact numerical answers should be given to three significant figures unless the question states otherwise; values from statistical tables should be quoted in full
- when a value of g is required, it is taken as  $g = 9.8 \text{ m s}^{-2}$  unless stated otherwise in the question.

## **Chapter 17 Logarithms**

Question	Answer	Extra information	Marks
17.1 (a)	4	Correct answer	B1
17.1 (b)	$\log_2 12 \text{ or } \frac{\ln 12}{\ln 2}$	Also accept log <sub>10</sub> in place of ln	B1
17.1 (c)	$\log(5^2) + \log(2^3)$	Use of power rule	M1
	$= \log (5^2 \times 2^3)$	Use of multiplication rule	M1
	$=\log 200$	Correct result	A1
	Total		5 marks



Question	Answer	Extra information	Marks
	$x + 1 = \log_6 130$	Use of log <sub>6</sub> as inverse	M1
17.2	$x = \log_6 130 - 1$		
	= 1.717 (3 d.p.)	Correct solution	A1
	Total		2 marks
17.3	$\log\left(x^2\right) - \log\left(\sqrt{y}\right)$	Use of division rule	M1
	$= 2\log x - \frac{1}{2}\log y$	Correct expression	A1
	Total		2 marks



Question	Answer	Extra information	Marks
17.4 (a) (b) (c)	x = -1	B1 for each correct shape. B1 for each correct position. Correct asymptotes labelled Correct intersection points labelled	B1B1 B1B1 B1B1
	Total		6 marks



Question	Answer	Extra information	Marks
	$\log_4\left(\frac{x+3}{x}\right) = 3$	Use of division rule	M1
17 5	$\frac{x+3}{x} = 64$		
17.5	x + 3 = 64x		
	63x = 3	Attempting to solve	M1
	Hence $x = \frac{1}{21}$	Correct <i>x</i>	A1
	Total		3 marks
	$(3x+1)\log 4 = (x+2)\log 3$	Taking logs of both sides	M1
	$3x\log 4 - x\log 3 = 2\log 3 - \log 4$		
17.6	Hence $x = \frac{2\log 3 - \log 4}{3\log 4 - \log 3}$	Making x the subject	M1
	= 0.265 (3 d.p.)	Correct value	A1
	Total		3 marks
17.7	$(e^x - 3)(e^x - 4) = 0$	Identifying quadratic in $e^x$ and attempting to solve	M1
	$e^x = 3 \text{ or } e^x = 4$	Both values for $e^x$	M1
	Hence $x = \ln 3$ or $x = \ln 4$	Both values for <i>x</i>	A1
	Total		3 marks



Question	Answer	Extra information	Marks
17.8 (2)	$\frac{x^2 + 5x + 6}{x^2 + 2x} = \frac{(x+2)(x+3)}{x(x+2)}$	Attempting to factorise	M1
17.0 (a)	$=\frac{x+3}{x}$	Correct simplification	A1
	$\log_2\left(\frac{x+3}{x}\right) = 3$	Use of their (a) to simplify the log	M1
17.8 (b)	$\frac{x+3}{x} = 8 \Longrightarrow x+3 = 8x$	Attempting to solve	M1
	Hence $x = \frac{3}{7}$	Correct <i>x</i>	A1
	Total		5 marks
	$n \log 2 > 321 \log 100$	Taking logs of both sides	M1
17.9	$n > \frac{321\log 100}{\log 2}$	Forming inequality in <i>n</i>	M1
	n > 2132.677		
	Hence the smallest integer value of <i>n</i> is 2133	Correct <i>n</i>	A1
	Total		3 marks
	$\log{(x-5)^2} = \log{(x+15)}$	Use of power law and removing logs	M1
17 10 (a)	$\Rightarrow (x-5)^2 = x+15$		
17.10 (a)	$x^2 - 10x + 25 = x + 15$	Expanding	M1
	$x^2 - 11x + 10 = 0$	Correct equation	A1



Question	Answer	Extra information	Marks
17.10 (b)(i)	x = 10  and  x = 1	Both values correct	B1
17.10 (b)(ii)	x = 1 is not valid since $1 - 5$ is negative	Correct answer and reason	B1
	Total		5 marks
17.11 (a)	Subtraction law and power law applied in the wrong order Rule for logs incorrect: $\log_b a = c \implies a = b^c$	Correct reason Correct reason	B1 B1
17.11 (b)	$log_{5}(x^{6}) - log_{5} x = 4$ $log_{5}(x^{5}) = 4$ $x^{5} = 5^{4}$ Hence $x = \sqrt[5]{625}$ = 3.6238	Use of correct order of log rules Use of correct inverse	M1 M1
	= 3.62 (3  s.f.)	Correct answer	Al
	Total		5 marks
17.12 (a)	$2x + 1 = \ln 3$ $x = \frac{\ln 3 - 1}{2}$	Taking logs of both sides Correct exact value	M1 A1
17.12 (b)	$\ln y = 2x + 1$ $x = \frac{\ln y - 1}{2}$ Hence f <sup>-1</sup> (x) = $\frac{\ln x - 1}{2}$	Attempting to rearrange Correct inverse function	

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Question	Answer	Extra information	Marks	
17.12 (c)	y (0, e) f(x) x = 0 y = 0 (e, 0) x $f^{-1}(x)$	B1 for each correct shape. B1 for each correct location. Intersection points and asymptotes should be clearly indicated	B1B1 B1B1	
17.12 (d)	<i>x</i> > 0	Correct inequality	B1	
	Total		9 marks	
17.13 (a)	25 °C	Correct temperature	B1	



Question	Answer	Extra information	Marks
	$4e^{-t} = 1.5$	Substituting $T = 22.5$	M1
17.13 (b)	$-t = \ln\left(\frac{1.5}{4}\right) = -0.980$	Attempting to rearrange	M1
	Hence $t = 0.98$ (2 d.p.)	Correct value of <i>t</i>	A1
17.13 (c)	The value of $4e^{-t}$ will never be negative.	Correct reason	B1
	Total		5 marks
17.14 (a)	£2400	Correct value	B1
	$3700 = 100e^{0.2t}$	Substituting $V = 6000$	M1
17.14 (b)	$0.2t = \ln 37$	Rearranging and attempting to solve	M1
	Hence $t = 18.05 = 18$ months	Correct number of months	A1
	Total		4 marks
17.15 (a)	34000	Correct value	B1
	$\frac{21}{34} = \mathrm{e}^{-4k}$	Attempting to find $k$ using their (a)	M1
17.15 (b)	$-4k = \ln\left(\frac{21}{34}\right)$	Rearranging and attempting to solve	M1
	Hence $k = 0.12$ (2 d.p.)	Correct value of k	A1
	Complete model: $V = 34000e^{-0.12t}$		



Question	Answer						Extra information	Marks	
	$34000e^{-0.12\times10} = 10240.60$							Using to model to predict the value when $t = 10$	M1
17 15 (c)	[or 10 193.65 using full exact answer to (a)]								
17.15 (C)	The model predicts a value that is lower than the actual value / does						Correct reason with reference to their answer	A1	
	not mak	not make an accurate prediction.							
	Total								6 marks
		0.000		1.050	1.154	1 050			
17.16 (a)	$\log x$	0.699	1	1.079	1.176	1.279		Both log <i>x</i> values	B1
	logy	1.210	1.601	1.704	1.830	1.963		Both log y values	B1
				•	•				







Question	Answer	Extra information	Marks
	$\frac{1.963 - 1.210}{1.279 - 0.699} = 1.29827$	Attempting to find gradient	M1
	Hence $n = 1.3$ (2 s.f.)	Correct <i>n</i>	A1
17.16 (d)	The <i>y</i> -intercept is 0.3	Their y-intercept in log equation	M1
	$\log a = 0.3 \implies a = 10^{0.3}$		
	a = 1.9952		
	= 2.0 (2  s.f.)	Correct a	A1
	Total		9 marks
17.17 (a)	-2 $O$ $2$ $x$	B1 for shape. Must be cusps, not curves. B1 for <i>x</i> -intercepts and <i>y</i> -intercept	B1 B1



Question	Answer	Extra information	Marks
	$x^2 - 4 = x + 3 \Longrightarrow x^2 - x - 7 = 0$	Attempting to solve 'positive' equation	M1
	$x = \frac{1 \pm \sqrt{29}}{2}$	Correct solutions	A1
17.17 (b)	$4 - x^2 = x + 3 \Longrightarrow x^2 + x - 1 = 0$	Attempting to solve 'negative' equation	M1
	$x = \frac{-1 \pm \sqrt{5}}{2}$	Correct solutions	A1
	Total		6 marks
17.18 (a)	$\frac{2\sin\theta\cos\theta}{1-(1-2\sin^2\theta)}$	Use of identity	M1
	$=\frac{2\sin\theta\cos\theta}{2\sin^2\theta}=\frac{\cos\theta}{\sin\theta}$	Attempting to simplify	M1
	$=\cot \theta$	Correct result	A1
17.18 (b)	$\cot x = 2$		
	$\tan x = \frac{1}{2}$	Use of given identity and writing in terms of tan	M1
	Hence $x = 0.46, 3.61$	Correct values of <i>x</i>	A1
	Total		5 marks