Pearson Edexcel AS Mathematics 8MA0

Unit Test 8 Exponentials and Logarithms

Time allowed: 50 minutes

School:

Name:

Teacher:

Question	Points	Score
1	9	
2	6	
3	4	
4	5	
5	8	
6	6	
7	12	
Total:	50	

How I can achieve better:

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1. The graph of $y = ab^x$ passes through the points $(2, 400)$ and $(5, 50)$.

   (a) Find the values of the constants a and b.   [5]

   (b) Given that $ab^x < k$, for some constant $k > 0$, show that $x > \dfrac{\log\left(\frac{1600}{k}\right)}{\log(2)}$ where log means log   [4]
   to any valid base.

   Total: 9

2.   [6]

$$\log_{11}(2x - 1) = 1 - \log_{11}(x + 4).$$

Find the value of x showing detailed reasoning.

3. (a) Sketch the graph of $y = 8^x$ stating the coordinates of any points where the graph crosses   [2]

   the coordinate axes.

   (b) i. Describe fully the transformation which transforms the graph $y = 8^x$ to the graph   [1]

   $y = 8^{x-1}$.

   ii. Describe the transformation which transforms the graph $y = 8^{x-1}$ to the graph $y =$ [1]

   $8^{x-1} + 5$.

   Total: 4

4. Solve algebraically, showing each step of your working, the equation   [5]

$$\left(8^{x-1}\right)^2 - 18\left(8^{x-1}\right) + 32 = 0.$$

5. (a) Sketch the graph for $y = \log_9(x + a), a > 0$ for $x > -a$ labelling any asymptotes and points   [6]

    of intersection with the x-axis or y-axis. Leave your answers in terms of a where necessary.

    (b) For $x > -a$, describe, with a reason, the relationship between the graphs of $y = \log_9(x+a)^2$ [2]

    and $y = \log_9(x + a)$.

<div align="right">Total: 8</div>

6. The population, P, of bacteria in an experiement can be modelled by the formula $P = 100e^{0.4t}$, where t is the time in hours after the experiment began.

   (a) Use the model to estimate the population of bacteria 7 hours after the experiment began.   [2]

   (b) Interpret the meaning of the constant 100 in the model.   [1]

   (c) How many whole hours after the experiment began does the population of bacteria first exceed 1 million, according to the model?   [3]

   Total: 6

7. The value of a car, V in £, is modelled by the equation $V = ab^t$, where a and b are constants and t is the number of years since the car was purchased. The line l shown below illustrates the linear relationship between t and $\log_4(V)$ for $t \geq 0$. The line l meets the vertical axis at $(0, \log_4(40000))$ as shown. The gradient of l is $-\frac{1}{10}$.
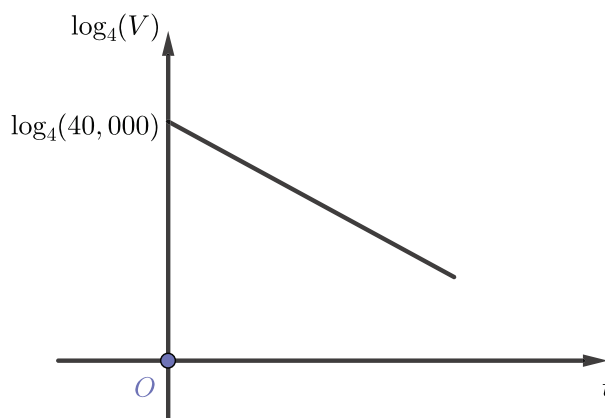
(a) Write down an equation for l. [2]

(b) Find, in exact form, the values of a and b. [4]

(c) With reference to the model, interpret the values of the constant a and b. [2]

(d) Find the value of the car after 7 years. [1]

(e) After how many years is the value of the car less than £10,000? [2]

(f) State a limitation of the model. [1]

Total: 12

(Q7 continued)