AQA, Edexcel, OCR, MEI

A Level

A Level Mathematics

C2 Logarithms

Name:

M M E

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Total Marks: /57

C2 - Logarithms
MEI, OCR, AQA, Edexcel

1. Simplify the following expressions:

   (a) $\log_{10} a + \log_{10} a$. [1]

   (b) $\log_{10} a + \log_{10} b$. [1]

   (c) $\log_{10} 1 + \log_{10} 10$. [2]

   (d) $\log_{10} a^3 + 7 \log_{10} a$. [2]

   (e) $\log_{10} \frac{x^3}{y} - 3 \log_{10} x$. [2]

   (f) $\log_{10}(x^2 - 5x + 6) - \log_{10}(x - 3)$. [2]

2. Evaluate the following expressions:

   (a) $\log_2 8$. [1]

   (b) $\log_6 6$. [1]

   (c) $\log_{100} 1$. [1]

   (d) $\log_{10} 1000$. [1]

3. Solve the following equations. Give your answer to two decimal places where necessary:

   (a) $2^x = 4$. [1]

   (b) $3^x = 30$. [3]

   (c) $2^x = 0.2$. [3]

   (d) $2^{x+3} = 5^{3x}$. [4]

   (e) $4^{x-1} = 7^{2x}$. [4]

   (f) $a^{2x-1} = b^{3x}$, Give your answer in terms of a and b. [4]

4. Sketch the following functions, clearly indicating the points of any intersections with the axes:

   (a) $y = 2^x$. [2]

   (b) $y = 3^x + 1$ [2]

   (c) $y = 3^{-x} + 2$. [2]

   (d) $y = -3^x$. [2]

5. The equation $\log_{10} y = 2 \log_{10} x + \log_{10} 20$ gives the equation of a straight line with gradient 2 and intercept $\log_{10} 20$ when $\log_{10} y$ and $\log_{10} x$ are used for the axes variables. Find the equation relating x and y. [4]

6. Suppose that you invest £100 into a bond that pays 2% interest each year. That is, at the end of each year the value of the bond increases by 2% of its total value at that point in time. Let the value of the bond at the end of year n be B_n, where n is an integer. At the end of year one the bond is worth $100 \times 1.02 =$£102. Its value at the end of year two is $102 \times 1.02 =$£104.04. Hence $B_1 = 102$ and $B_2 = 104.04$.

   (a) Calculate B_3, the value of the bond at time 3. [2]

   (b) Write down an expression for the value of the bond B_n at the end of year n. [2]

   (c) At what integer value of n will the bond be worth *more* than £150? *Hint: solve* $B_n > 150$ *using your expression found in part b).* [4]

   (d) The value of the bond may also be expressed as $B_n = 100 \times 10^{kn}$ for some undetermined constant k. Find the value of k. [4]