MATHSAURUS

AS Mathematics Exam Questions by Topic
Chapter 13a: Logarithms

These questions are taken from the Specimen Exam materials and the real 2018 papers for the new syllabus AS and A-level mathematics courses and arranged by chapter of the textbooks by Goldie et al (available here: `https://amzn.to/39umfr5` and `https://amzn.to/3hE8kBL`). There are a mixture of questions from OCR A, OCR B (MEI), Edexcel and AQA. Although the style of questions varies a little across the exam boards the content of the syllabus is almost identical so these are suitable for students preparing for any exam board.

Free problem sets for all other chapters, as well as video solutions, full past papers and other content for GCSE and A-level maths can be found at:

`https://mathsaurus.com/`

OCR B MEI AS 2018 Paper 2 Question 1:

1 Write down the value of

(*A*) $\log_a(a^4)$, **[1]**

(*B*) $\log_a\left(\frac{1}{a}\right)$. **[1]**

OCR B MEI AS Sample Paper 2 Question 2:

2 **(i)** Express $2\log_3 x + \log_3 a$ as a single logarithm. **[1]**

(ii) Given that $2\log_3 x + \log_3 a = 2$, express x in terms of a. **[3]**

AQA 2018 Paper 3 Question 7a:

7 (a) Given that $\log_a y = 2\log_a 7 + \log_a 4 + \frac{1}{2}$, find y in terms of a.

[4 marks]

7 (b) When asked to solve the equation

$$2\log_a x = \log_a 9 - \log_a 4$$

a student gives the following solution:

$$2\log_a x = \log_a 9 - \log_a 4$$

$$\Rightarrow 2\log_a x = \log_a \frac{9}{4}$$

$$\Rightarrow \log_a x^2 = \log_a \frac{9}{4}$$

$$\Rightarrow x^2 = \frac{9}{4}$$

$$\therefore x = \frac{3}{2} \text{ or } -\frac{3}{2}$$

Explain what is wrong with the student's solution.

[1 mark]

AQA AS Sample Paper 2 Question 3:

3 Find the value of $\log_a\left(a^3\right) + \log_a\left(\frac{1}{a}\right)$

[2 marks]

OCR A Sample Paper 1 Question 5:

5 **In this question you must show detailed reasoning.**

Use logarithms to solve the equation

$$3^{2x+1} = 4^{100},$$

giving your answer correct to 3 significant figures. **[4]**

Edexcel AS 2018 Paper 1 Question 5:

5. A student's attempt to solve the equation $2\log_2 x - \log_2 \sqrt{x} = 3$ is shown below.

$2\log_2 x - \log_2 \sqrt{x} = 3$	
$2\log_2 \left(\frac{x}{\sqrt{x}}\right) = 3$	using the subtraction law for logs
$2\log_2 \left(\sqrt{x}\right) = 3$	simplifying
$\log_2 x = 3$	using the power law for logs
$x = 3^2 = 9$	using the definition of a log

(a) Identify two errors made by this student, giving a brief explanation of each.

(2)

(b) Write out the correct solution.

(3)

Edexcel AS Sample Paper 1 Question 12:

12. A student was asked to give the exact solution to the equation

$$2^{2x+4} - 9(2^x) = 0$$

The student's attempt is shown below:

$2^{2x+4} - 9(2^x) = 0$

$2^{2x} + 2^4 - 9(2^x) = 0$

Let $2^x = y$

$y^2 - 9y + 8 = 0$

$(y - 8)(y - 1) = 0$

$y = 8$ or $y = 1$

So $x = 3$ or $x = 0$

(a) Identify the two errors made by the student.

(2)

(b) Find the exact solution to the equation.

(2)

OCR B MEI 2018 Paper 2 Question 5:

5 **(i)** (*A*) Sketch the graph of $y = 3^x$. **[1]**

(*B*) Give the coordinates of any intercepts. **[1]**

The curve $y = f(x)$ is the reflection of the curve $y = 3^x$ in the line $y = x$.

(ii) Find $f(x)$. **[1]**