Logarithms - Past Edexcel Exam Questions

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1.   **(Question 7 - C2 May 2018)**

(i) Find the value of y for which

$$1.01^{y-1} = 500.$$

Give your answer to 2 decimal places.   [2]

(ii) Given that
$$2\log_4(3x + 5) = \log_4(3x + 8) + 1, \quad x > -\frac{5}{3}$$

(a) show that
$$9x^2 + 18x - 7 = 0.$$

[4]

(b) Hence solve the equation

$$2\log_4(3x + 5) = \log_4(3x + 8) + 1, \quad x > -\frac{5}{3}$$

[2]

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2.   **(Question 7 - C2 May 2017)**

(i)
$$2\log(x + a) = \log\left(16a^6\right), \quad \text{where } a \text{ is a positive constant.}$$

Find x in terms of a, giving your answer in its simplest form.   [3]

(ii)
$$\log_3(9y + b) - \log_3(2y - b) = 2, \quad \text{where } b \text{ is a positive constant.}$$

Find y in terms of b, giving your answer in its simplest form.   [4]

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3. **(Question 8 - C2 May 2016)**

(i) Given that
$$\log_3(3b+1) - \log_3(a-2) = -1, \quad a > 2$$

express b in terms of a. [3]

(ii) Solve the equation
$$2^{2x+5} - 7\left(2^x\right) = 0$$

giving your answer to 2 decimal places. [4]

(Solutions based entirely on graphical or numerical methods are not acceptable)

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4. **(Question 7 - C2 May 2015)**

(i) Use logarithms to solve the equation $8^{2x+1} = 24$, giving your answer to 3 decimal places. [3]

(ii) Find the values of y such that

$$\log_2(11y - 3) - \log_2 3 - 2\log_2 y = 1, \quad y > \frac{3}{11}$$

[6]

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5. **(Question 8 - C2 May 2014)**

(a) Sketch the graph of
$$y = 3^x, \quad x \in \mathbb{R}$$

showing the coordinates of any points at which the graph crosses the axes. [2]

(b) Use algebra to solve the equation

$$3^{2x} - 9\left(3^x\right) + 18 = 0$$

giving your answers to 2 decimal places where appropriate. [5]

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6. **(Question 7 - C2 May 2013)**

(i) Find the exact value of x for which

$$\log_2(2x) = \log_2(5x + 4) - 3$$

[4]

(ii) Given that
$$\log_a y + 3\log_a 2 = 5,$$

express y in terms of a.
Give your answer in its simplest form. [3]

7. **(Question 6 - C2 January 2013)**

Given that
$$2\log_2(x + 15) - \log_2 x = 6,$$

(a) show that $x^2 - 34x + 225 = 0$. [5]

(b) Hence, or otherwise, solve the equation

$$2\log_2(x + 15) - \log_2 x = 6$$

[2]

8. **(Question 2 - C2 May 2012)**

Find the values of x such that

$$2\log_3 x - \log_3(x - 2) = 2$$

[5]

9. **(Question 4 - C2 January 2012)**

Given that $y = 3x^2$,

(a) show that $\log_3 y = 1 + 2\log_3 x$. [3]

(b) Hence, or otherwise, solve the equation [3]

$$1 + 2\log_3 x = \log_3(28x - 9).$$

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10. **(Question 3 - C2 May 2011)**

Find, giving your answer to 3 significant figures where appropriate, the value of x for which

(a) $5^x = 10$, [2]

(b) $\log_3(x - 2) = -1$. [2]

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11. **(Question 8 - C2 January 2011)**

(a) Sketch the graph of $y = 7^x$, $x \in \mathbb{R}$, showing the coordinates of any points at which the graph crosses the axes. [2]

(b) Solve the equation
$$7^{2x} - 4\left(7^x\right) + 3 = 0,$$

giving your answers to 2 decimal places where appropriate. [6]

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12. **(Question 7 - C2 June 2010)**

(a) Given that
$$2\log_3(x - 5) - \log_3(2x - 13) = 1,$$

show that $x^2 - 16x + 64 = 0$. [5]

(b) Hence, or otherwise, solve $2\log_3(x - 5) - \log_3(2x - 13) = 1$. [2]

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13. **(Question 5 - C2 January 2010)**

(a) Find the positive value of x such that

$$\log_x 64 = 2.$$

[2]

(b) Solve for x

$$\log_2 (11 - 6x) = 2 \log_2 (x - 1) + 3$$

[6]

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14. **(Question 8 - C2 June 2009)**

(a) Find the value of y such that

$$\log_2 y = -3$$

[2]

(b) Find the values of x such that

$$\frac{\log_2 32 + \log_2 16}{\log_2 x} = \log_2 x$$

[5]

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15. **(Question 4 - C2 January 2009)**

Given that $0 < x < 4$ and

$$\log_5(4 - x) - 2 \log_5 x = 1,$$

find the value of x. [6]

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16. **(Question 4 - C2 June 2008)**

(a) Find, to 3 significant figures, the value of x for which $5^x = 7$. [2]

(b) Solve the equation

$$5^{2x} - 12 \left(5^x\right) + 35 = 0$$

[4]

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17. **(Question 5 - C2 January 2008)**

Given that a and b are positive constants, solve the simultaneous questions

$$a = 3b,$$
$$\log_3 a + \log_3 b = 2$$

Give your answers as exact numbers. [6]

18. **(Question 6 - C2 May 2007)**

(a) Find, to 3 significant figures, the value of x for which $8^x = 0.8$. [2]

(b) Solve the equation
$$2\log_3 x - \log_3 7x = 1$$

[4]

19. **(Question 4 - C2 January 2007)**

Solve the equation
$$5^x = 17,$$

giving your answer to 3 significant figures. [3]

20. **(Question 3 - C2 May 2006)**

(a) Write down the value of $\log_6(36)$. [1]

(b) Express $2\log_a(3) + \log_a(11)$ as a single logarithm to the base a. [3]
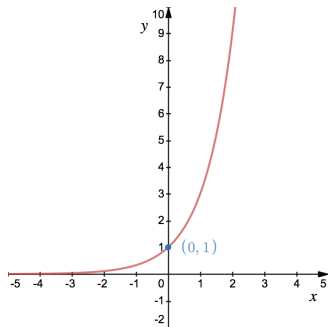
21. **(Question 2 - C2 June 2005)**

Solve

(a) $5^x = 8$, giving your answer to 3 significant figures, [3]

(b) $\log_2(x+1) - \log_2(x) = \log_2(7)$. [3]

Solutions

1. (i) 625.56

   (ii) (a) -

       (b) $x = \frac{1}{3}$

2. (i) $x = 4a^3 - a$

   (ii) $y = \frac{10}{9}b$

3. (i) $b = \frac{a-5}{9}$

   (ii) $x = -2.19$

4. (i) $x = 0.264$

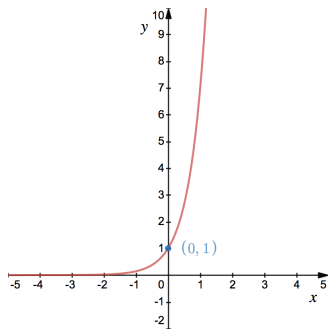   (ii) $y = \frac{1}{3}, \frac{3}{2}$

5. (a) See Figure below.

   (b) $x = 1, x = 1.63$

6. (a) $x = \frac{4}{11}$

   (b) $y = \frac{a^5}{8}$

7. (a) -

   (b) $x = 9$, $x = 25$

8. $x = 3$, $x = 6$

9. (a) -

   (b) $x = \frac{1}{3}$, $x = 9$

10. (a) $x = 1.43$

    (b) $x = \frac{7}{3}$

11. (a) See Figure below.

    (b) $x = 0$, $x = 0.56$

12. (a) -

    (b) $x = 8$

13. (a) $x = 8$

    (b) $x = \frac{3}{2}$

14. (a) $y = \frac{1}{8}$

    (b) $x = \frac{1}{8}, 8$

15. $x = \frac{4}{5}$

16. (a) 1.21

    (b) $x = 1$, $x = 1.21$

17. $a = 3\sqrt{3}$, $b = \sqrt{3}$

18. (a) -0.107

    (b) $x = 21$

19. $x = 1.76$

20. (a) 2

    (b) $\log_a 99$

21. (a) $x = 1.29$

    (b) $x = \frac{1}{6}$