LOGARITHMS & EXPONENTIALS

AS Unit 1: Pure Mathematics A

WJEC past paper questions: 2010 – 2017

Total marks available 109 (approximately 2hour 10 minutes)

1. a) Given that $x > 0$, show that
$$\log_a x^n = n \log_a x.$$ (3)

b) Express $\frac{1}{2}\log_a 324 + \log_a 56 - 2\log_a 12$ in the form $\log_a b$, where b is a constant whose value is to be found. (4)

c) i) Rewrite the equation
$$3^x = 2^{x+1}$$
in the form $c^x = d$,
where the values of the constants c and d are to be found.

ii) Hence or otherwise, solve the equation
$$3^x = 2^{x+1},$$
giving your answer correct to two decimal places. (4)

(January 10)

2. a) Given that $x > 0$, show that
$$\log_a x^n = n \log_a x.$$ (3)

b) Solve the equation
$$6^{2y-1} = 4.$$
Show your working and give your answer correct to three decimal places. (3)

c) Given that $\log_a 4 = \frac{1}{2}$, find the value of a. (2)

(Summer 10)

3. Find all values of x satisfying the equation
$$\log_a(6x^2 + 11) - \log_a x = 2\log_a 5.$$ (5)

(January 11)

4. a) Given that $x > 0,\ y > 0$, show that

$$\log_a\left(\frac{x}{y}\right) = \log_a x - \log_a y.$$ (3)

b) Express

$$\frac{1}{2}\log_a x^8 - \log_a 4x + 3\log_a \frac{2}{x}$$

as a single logarithm in its simplest form. (4)

(Summer 11)

5. a) Given that $x > 0,\ y > 0$, show that

$$\log_a xy = \log_a x + \log_a y.$$ (3)

b) Solve the equation

$$2^{3-5x} = 12\ .$$

Show your working and give your answer correct to three decimal places. (3)

c) i) Express

$$\log_9(3x-1) + \log_9(x+4) - 2\log_9(x+1)$$

as a single logarithm.

ii) Hence solve the equation

$$\log_9(3x-1) + \log_9(x+4) - 2\log_9(x+1) = \frac{1}{2}.$$ (5)

(January 12)

6. a) Given that $x > 0$, show that

$$\log_a x^n = n\log_a x.$$ (3)

b) Solve the equation

$$9^{\frac{x}{2}-3} = 6\ .$$

Show your working and give your answer correct to three decimal places. (3)

c) Solve the equation

$$\log_a(x-2) + \log_a(4x+1) = 2\log_a(2x-3)\ .$$ (4)

(Summer 12)

7. a) Given that $x > 0, y > 0$, show that

$$\log_a \frac{x}{y} = \log_a x - \log_a y.$$ (3)

b) Solve the equation

$$6^{2x+5} = 7\,.$$

Show your working and give your answer correct to three decimal places. (3)

(January 13)

8. a) Given that $x > 0,\ y > 0$, show that

$$\log_a xy = \log_a x + \log_a y.$$ (3)

b) Solve the equation

$$5^{2-3x} = 8\,.$$

Show your working and give your answer correct to three decimal places. (3)

c) Solve the equation

$$\log_a 90x^2 - \log_a \left(\frac{5}{x}\right) = \frac{1}{2}\log_a 144x^8\,.$$ (4)

(Summer 13)

9. a) Given that $x > 0$, show that

$$\log_a x^n = n \log_a x.$$ (3)

b) Solve the equation

$$7^{5-4x} = 11\,.$$

Show your working and give your answer correct to three decimal places. (3)

c) Solve the equation $\log_8 x = \frac{-1}{3}$. (2)

(January 14)

10. a) Solve the equation $3^{\frac{5x}{4}-2} = 7\,.$

Show your working and give your answer correct to three decimal places. (3)

b) The positive numbers *a* and *b* are such that,

$$\log_a b = 5$$

i) Express b as a power of a.

ii) **Using your answer to part i)**, evaluate $\log_b a$. (3)

(Summer 14)

11. a) Given that $x > 0,\ y > 0$, show that

$$\log_a\left(\frac{x}{y}\right) = \log_a x - \log_a y.$$ (3)

b) Find all values of x satisfying the equation

$$\log_a(6x^2 + 9x + 2) - \log_a x = 4\log_a 2\,.$$ (5)

(Summer 15)

12. a) Given that $x > 0$, show that

$$\log_a x^n = n\log_a x\,.$$ (3)

b) Solve the equation

$$4^{3x+1} = 22\,.$$

Show your working and give your answer correct to three decimal places. (3)

c) Given that

$$\log_d z = 2\log_d 6 - \log_d 9 - 1\,,$$

express *z* in terms of *d*, giving your answer in a form **not** involving logarithms. (4)

(Summer 16)

13. a) Given that $x > 0,\ y > 0$, show that

$$\log_a\left(\frac{x}{y}\right) = \log_a x - \log_a y\,.$$ (3)

b) Express

$$\frac{1}{3}\log_b x^{15} - \log_b 27\,x + 4\log_b\frac{3}{x}$$

as a logarithm in its simplest form. (4)

c) Given that $\log_d 5 = \frac{1}{3}$, Find the value of *d*. (2)

(Summer 17)