Exercise 5C

Find the exact value of x, showing your working:

1 $\log_2 8 = x$ **2** $\log_3 27 = x$ **3** $\log_x 125 = 3$
4 $\log_x 36 = 0.5$ **5** $\log_2 x = 4$ **6** $\log_4 64 = x$
7 $\log_5 125 = x$ **8** $\log_x 9 = -2$ **9** $\log_5 x = -1$
10 $\log_9 x = 3\frac{1}{2}$

Find the value of:

11 $\log_3 81$ **12** $\log_4 256$ **13** $\log_3 3$
14 $\log_3 \frac{1}{9}$ **15** $\log_7 343$ **16** $\log_{64} 4$
17 $-\log_2(\frac{1}{8})$ **18** $\log_5(\frac{1}{125})$ **19** $\log_8 2$
20 $\log_{27} 3$

Calculate, to 3 significant figures, the value of:

21 $\log_4 9$ **22** $\log_5 22$ **23** $\log_6 3$
24 $\log_8 5$ **25** $\log_9 11$

Simplify:

26 $\log_3 7 + \log_3 2$ **27** $\lg 15 - \lg 5$
28 $\ln 5 + \ln 6 - \ln 10$ **29** $2\ln 8 - \ln 5 + 2\ln 10$
30 $2\log_a 3 - 3\log_a 2 + 4\log_a 1$ **31** $3\log_a 4 - \log_a 2 - 3\log_a 6$
32 $2\log_a 7 - 2\log_a a + 2\log_a 3$ **33** $\log_a 5 + \frac{1}{2}\log_a 16 - \log_a 2$
34 $5\log_a a + \frac{1}{3}\log_a 27 + \log_a 2$ **35** $\frac{1}{4}\log_a 81 + 3\log_a(\frac{1}{4}) - 2\log_a(\frac{3}{4})$

Express in terms of $\log_a x$, $\log_a y$ and $\log_a z$:

36 $\log_a\left(\frac{xy}{z}\right)$ **37** $\log_a\left(\frac{x^2y}{z^3}\right)$ **38** $\log_a xy^2z^3$

39 $\log_a \sqrt{(xy^2z)}$ **40** $\log_a \frac{xy}{\sqrt{z^3}}$

Exercise 5D

Solve the equations:

1 $2^x = 7$ **2** $3^x = 19$ **3** $4^x = 11$
4 $5^x = 9$ **5** $7^x = 151$ **6** $4^{-x} = 0.125$
7 $3^{x+1} = 23$ **8** $5^{3x+2} = 43$ **9** $2^{x+1} = 3^x$
10 $5^{x+3} = 3^{x-2}$ **11** $6^{2x-1} = 9^{x+3}$ **12** $4^{3x+2} = 7^{x-3}$

13 $2^{2x} - 5(2^x) + 6 = 0$ **14** $2(3^{2x}) - 9(3^x) + 4 = 0$
15 $3(4^{2x}) + 11(4^x) = 4$ **16** $3^{2x+1} = 3^x + 24$
17 $2^{2x+1} = 5(2^x) + 3$ **18** $4^{2x} + 48 = 4^{x+2}$
19 $2e^x + 2e^{-x} = 5$ **20** $25^x = 5^{x+1} - 6$

21 Find the values of x for which

$$\log_3 x - 2\log_x 3 = 1$$ [E]

22 Solve the equation

$$\log_3(2 - 3x) = \log_9(6x^2 - 19x + 2)$$ [E]

23 Find the possible values of x for which

$$2^{2x+1} = 3(2^x) - 1$$ [E]

24 If $xy = 64$ and $\log_x y + \log_y x = \frac{5}{2}$, find x and y. [E]

25 Prove that if $a^x = b^y = (ab)^{xy}$, then

$$x + y = 1$$ [E]

Exercise 5A

1	(a)	3.2	(b)	1.2	(c)	9.8	(d)	0.57
2	(a)	24	(b)	0.64	(c)	4.2		
3	(a)	0.74	(b)	6.7	(c)	15	(d)	1.9
	(e)	2.8						

Exercise 5B

1	(a)	−0.92	(b)	−0.22	(c)	0.53
	(d)	1.19	(e)	1.55	(f)	0.37
	(g)	0.55	(h)	6.05		

2 (b) and (c) are translations of (a) in the direction of Oy.

Exercise 5C

1	3	**2**	3	**3**	5	**4**	1296
5	16	**6**	3	**7**	3	**8**	$\frac{1}{3}$
9	$\frac{1}{5}$	**10**	2187	**11**	4	**12**	4
13	1	**14**	−2	**15**	3	**16**	$\frac{1}{3}$
17	3	**18**	−3	**19**	$\frac{1}{3}$	**20**	$\frac{1}{3}$
21	1.58	**22**	1.92	**23**	0.613	**24**	0.774

25 1.09 **26** $\log_3 14$ **27** $\lg 3$

28 $\ln 3$ **29** $\ln 1280$ **30** $\log_a \frac{9}{8}$

31 $\log_a \frac{4}{27}$ **32** $\log_a 441 - 2$

33 $\log_a 10$ **34** $5 + \log_a 6$ **35** $-\log_a 12$

36 $\log_a x + \log_a y - \log_a z$

37 $2\log_a x + \log_a y - 3\log_a z$

38 $\log_a x + 2\log_a y + 3\log_a z$

39 $\frac{1}{2}\log_a x + \log_a y + \frac{1}{2}\log_a z$

40 $\log_a x + \log_a y - \frac{3}{2}\log_a z$

Exercise 5D

1	2.81	**2**	2.68	**3**	1.73	**4**	1.37
5	2.58	**6**	1.5	**7**	1.85	**8**	0.112
9	1.71	**10**	−13.8	**11**	6.05	**12**	−3.89

13 1 or 1.58 **14** −0.631 or 1.26

15 −0.792 **16** 1 **17** 1.58

18 1 or 1.79 **19** ±0.693

20 0.431 or 0.683 **21** 9

22 $-\frac{1}{3}$ or −2 **23** 0 or −1

24 (4, 16) or (16, 4)