Exponential and logarithmic equations: 10 practice questions

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Name: _____ Date: _____

Attempt all questions and show your working. Suggested time: 15 to 20 minutes.

In this test, log x with no base written means $\log_{10} x$. You may use the change of base rule $\log_a x = (\log x)/(\log a)$ with a calculator.

Section A: Consolidating (Questions 1-4)

Question 1

Solve each equation.

(a) $2^x = 64$

(b) 5^(x - 1) = 125

Question 2

Solve $4^x = 8$ by writing both sides as powers of 2.

Question 3

(a) Write $3^4 = 81$ in logarithmic form.

(b) Write $\log_2 32 = 5$ in index form.

Question 4

Evaluate.

(a) $\log_2 16$

(b) log 1000

(c) $\log_5 1/25$

Section B: Standard (Questions 5-10)

Question 5

Solve each equation. Give the exact answer as a logarithm, then the answer correct to 3 decimal places.

(a) $2^x = 20$

(b) $3^x = 50$

(c) $10^x = 7$

Question 6

Solve each equation, giving answers correct to 3 decimal places.

(a) $5 \times 2^x = 60$

(b) $3^{2x} = 40$

(c) 4^(x - 1) = 30

Question 7

Solve each equation, giving exact answers.

(a) $\log_3 x = 4$

(b) $\log_x 125 = 3$

(c) $\log_2 (3x + 1) = 4$

(d) log (x - 4) = 2

Question 8

(a) Copy and complete the table for $y = 2^x$.

x	-2	-1	0	1	2	3
$y = 2^x$						

(b) Use your table to copy and complete this table for $y = \log_2 x$.

x	¼	½	1	2	4	8
$y = \log_2 x$						

(c) Describe how the graph of $y = \log_2 x$ is related to the graph of $y = 2^x$.

(d) State the domain of $y = \log_2 x$ and the equation of its asymptote.

Question 9

(a) Simplify $\log_5 (5^x)$.

(b) Simplify 3^($\log_3$ 7).

(c) Find the rule for the inverse of $y = 3^x - 2$.

Question 10

Let $f(x) = 2^x + 1$ and $g(x) = \log_2 (x - 1)$.

(a) For $y = f(x)$, state the equation of the asymptote, the y-intercept and the range.

(b) For $y = g(x)$, state the equation of the asymptote, the x-intercept and the domain.

(c) Show that g is the inverse of f by swapping x and y in $y = 2^x + 1$ and making y the subject.

(d) The point (3, 9) lies on the graph of $y = f(x)$. Write down a point on the graph of $y = g(x)$.

Exponential and logarithmic equations: answers

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Question 1

Answer: (a) $x = 6$ (b) $x = 4$ ($x - 1 = 3$)

Question 2

Answer: $x = 3/2$ ($2^{2x} = 2^3$; also accept 1.5)

Question 3

Answer: (a) $\log_3 81 = 4$ (b) $2^5 = 32$

Question 4

Answer: (a) 4 (b) 3 (c) -2

Question 5

Answer: (a) $x = \log_2 20 \approx 4.322$ (b) $x = \log_3 50 \approx 3.561$ (c) $x = \log 7 \approx 0.845$ (exact forms such as (log 20)/(log 2) are also accepted)

Question 6

Answer: (a) $x \approx 3.585$ ($2^x = 12$) (b) $x \approx 1.679$ ($2x = \log_3 40$) (c) $x \approx 3.453$ ($x - 1 = \log_4 30$)

Question 7

Answer: (a) $x = 81$ (b) $x = 5$ (c) $x = 5$ ($3x + 1 = 16$) (d) $x = 104$ ($x - 4 = 100$)

Question 8

Answer: (a) ¼, ½, 1, 2, 4, 8 (b) -2, -1, 0, 1, 2, 3 (c) They are reflections of each other in the line $y = x$ (the x and y values swap), because the functions are inverses (d) domain $x > 0$; asymptote $x = 0$ (the y-axis)

Question 9

Answer: (a) x (b) 7 (c) $y = \log_3 (x + 2)$ (from $x = 3^y - 2$)

Question 10

Answer: (a) asymptote $y = 1$, y-intercept (0, 2), range $y > 1$ (b) asymptote $x = 1$, x-intercept (2, 0), domain $x > 1$ (c) $x = 2^y + 1$, so $2^y = x - 1$, so $y = \log_2 (x - 1)$ (d) (9, 3)