

# Logarithms

## MCQ Test, Set 09

Time: 30 minutes

Maximum marks: 25

Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_

- There are 25 questions. Each has exactly one correct answer: choose A, B, C or D.
- Each correct answer carries 1 mark. There is no negative marking.
- The key sheet and worked solutions are at the end of this test.

1. The logarithm of 2048 to the base 2 is

- A. 11                      B.  $\frac{1}{11}$                       C. 1024                      D. -11

2. If  $17^x = 289$ , then  $x =$ 

- A. -2                      B.  $\frac{1}{2}$                       C. 17                      D. 2

3. With base 3, which of these is not defined?

- A.  $\log_3 0$                       B.  $\log_3 1$                       C.  $\log_3 \frac{1}{3}$                       D.  $\log_3 3$

4. The logarithmic form of  $32^{\frac{2}{5}} = 4$  is

- A.  $32 = \log_{\frac{2}{5}} 4$                       B.  $4 = \log_{32} \frac{2}{5}$   
C.  $\frac{2}{5} = \log_4 32$                       D.  $\frac{2}{5} = \log_{32} 4$

5. The exponential form of  $\log_3 6561 = 8$  is

- A.  $6561 = 8^3$                       B.  $6561 = 3^8$                       C.  $3 = 6561^8$                       D.  $6561 = 3 \times 8$

6.  $\log_{0.25} 1 + \log_{0.25} 0.25 =$ 

- A. 0.25                      B. 2                      C. 1                      D. 0

7.  $\log_5 375 - \log_5 3 =$ 

- A.  $\log_5 372$                       B. 3  
C. 125                      D.  $\log_5 375 \div \log_5 3$

8.  $\log_2 56 - \log_2 8 =$ 

- A.  $\log_2 56 \div \log_2 8$                       B.  $\log_2 448$   
C.  $\log_2 7$                       D.  $\log_2 48$

9.  $\log_{25} 3125 =$ 

- A.  $\frac{5}{2}$                       B. 3                      C. 125                      D.  $\frac{2}{5}$

10.  $\log_7 4^6 =$ 

- A.  $4 \log_7 6$                       B.  $\log_7 24$                       C.  $6 \log_7 4$                       D.  $(\log_7 4)^6$

11.  $\log_{21} 5 \cdot \log_5 21 =$   
**A.** 105                      **B.** 1                      **C.** 0                      **D.**  $\frac{5}{21}$
- 
12.  $\log_9 32 \cdot \log_6 9 \cdot \log_4 6 =$   
**A.**  $-\frac{5}{2}$                       **B.**  $\frac{5}{2}$                       **C.**  $\frac{7}{2}$                       **D.**  $\frac{2}{5}$
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13.  $\frac{\log_{10} 512}{\log_{10} 8} =$   
**A.** 64                      **B.**  $\log_{10} 64$                       **C.**  $\frac{1}{3}$                       **D.** 3
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14.  $4^{\log_4 1.5} + 9^{\log_9 0.5} =$   
**A.** 1                      **B.** 2                      **C.** 13                      **D.**  $\frac{3}{4}$
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15.  $6^{\log_7 10} =$   
**A.**  $6^{\log_{10} 7}$                       **B.**  $7^{\log_{10} 6}$                       **C.**  $10^{\log_7 6}$                       **D.**  $10^{\log_6 7}$
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16. If  $\log_{13} \sqrt{x} = \log_{13} 12$ , then  $x =$   
**A.** 1728                      **B.** 12                      **C.** 24                      **D.** 144
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17. If  $\log_{10}(x - 3) = 2$ , then  $x =$   
**A.** 23                      **B.** 3                      **C.** 97                      **D.** 103
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18. If  $\log_7 x + \log_7(x - 48) = 2$ , then  
**A.**  $x = 49$                       **B.**  $x = 49$  (or)  $x = -1$                       **C.**  $x = 1$                       **D.**  $x = -1$
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19.  $\log_{49} 343 + \log_{343} 49 =$   
**A.**  $\frac{5}{6}$                       **B.** 0                      **C.**  $\frac{13}{6}$                       **D.**  $\frac{3}{2}$
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20.  $\frac{1}{\log_p pqr} + \frac{1}{\log_q pqr} + \frac{1}{\log_r pqr} =$   
**A.** 1                      **B.**  $\log_{pqr} 3$                       **C.** 3                      **D.** 0
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21.  $\log_{b^3} a^2 \cdot \log_{a^4} b^3 =$   
**A.**  $\frac{1}{2}$                       **B.** 2                      **C.**  $\frac{3}{4}$                       **D.**  $\frac{2}{3}$
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22.  $10^{\log_{100} 81} =$   
**A.** 81                      **B.**  $\frac{81}{2}$                       **C.** 3                      **D.** 9
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23. If  $\log \frac{x-y}{5} = \frac{1}{2}(\log x + \log y)$ , then  $x^2 + y^2 =$   
**A.**  $27xy$                       **B.**  $25xy$                       **C.**  $23xy$                       **D.**  $5xy$
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24. If  $\log_{\frac{1}{x}} 16 = 4$ , then  
**A.**  $x = \frac{1}{2}$  (or)  $x = -\frac{1}{2}$                       **B.**  $x = \frac{1}{2}$   
**C.**  $x = 2$                       **D.**  $x = -\frac{1}{2}$
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25. Which point lies on the graph of  $y = \log_2 x$ ?  
**A.** (3, 8)                      **B.** (2, 0)                      **C.** (8, 3)                      **D.** (0, 1)
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## Key sheet

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|              |              |              |              |              |
|--------------|--------------|--------------|--------------|--------------|
| <b>1. A</b>  | <b>2. D</b>  | <b>3. A</b>  | <b>4. D</b>  | <b>5. B</b>  |
| <b>6. C</b>  | <b>7. B</b>  | <b>8. C</b>  | <b>9. A</b>  | <b>10. C</b> |
| <b>11. B</b> | <b>12. B</b> | <b>13. D</b> | <b>14. B</b> | <b>15. C</b> |
| <b>16. D</b> | <b>17. D</b> | <b>18. A</b> | <b>19. C</b> | <b>20. A</b> |
| <b>21. A</b> | <b>22. D</b> | <b>23. A</b> | <b>24. B</b> | <b>25. C</b> |

## Solutions

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1. The logarithm of 2048 to the base 2 is

$$2^{11} = 2048$$

$$\therefore \log_2 2048 = 11$$

**Ans: (A) 11**

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2. If  $17^x = 289$ , then  $x =$

$$17^2 = 289$$

$$\therefore \log_{17} 289 = 2$$

**Ans: (D) 2**

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3. With base 3, which of these is not defined?

The number must be positive:  $N > 0$ .

$3^x$  is never 0, so  $\log_3 0$  is not defined.

**Ans: (A)  $\log_3 0$**

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4. The logarithmic form of  $32^{\frac{2}{5}} = 4$  is

$$a^x = N \Leftrightarrow x = \log_a N$$

The power  $\frac{2}{5}$  is the logarithm of 4 to the base 32.

**Ans: (D)  $\frac{2}{5} = \log_{32} 4$**

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5. The exponential form of  $\log_3 6561 = 8$  is

$$\log_a N = x \Leftrightarrow N = a^x$$

So  $6561 = 3^8$ .

**Ans: (B)  $6561 = 3^8$**

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6.  $\log_{0.25} 1 + \log_{0.25} 0.25 =$

$$\log_{0.25} 1 = 0, \log_{0.25} 0.25 = 1$$

$$= 0 + 1 = 1$$

**Ans: (C) 1**

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7.  $\log_5 375 - \log_5 3 =$

$$= \log_5 \frac{375}{3} = \log_5 125$$

$$= 3 \text{ since } 5^3 = 125$$

**Ans: (B) 3**

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8.  $\log_2 56 - \log_2 8 =$

$$\log_a m - \log_a n = \log_a \frac{m}{n}$$

$$= \log_2 7$$

**Ans: (C)  $\log_2 7$**

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9.  $\log_{25} 3125 =$   
 $= \log_{5^2} 5^5 = \frac{5}{2} \log_5 5$   
 $= \frac{5}{2}$   
**Ans: (A)  $\frac{5}{2}$**

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10.  $\log_7 4^6 =$   
 $\log_b a^m = m \log_b a$   
 $\therefore \log_7 4^6 = 6 \log_7 4$   
**Ans: (C)  $6 \log_7 4$**

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11.  $\log_{21} 5 \cdot \log_5 21 =$   
 $\log_b a \cdot \log_a b = 1$   
 So the product is 1.  
**Ans: (B) 1**

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12.  $\log_9 32 \cdot \log_6 9 \cdot \log_4 6 =$   
 $\log_b a \cdot \log_c b \cdot \log_d c = \log_d a$   
 $= \log_4 32 = \frac{5}{2}$   
**Ans: (B)  $\frac{5}{2}$**

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13.  $\frac{\log_{10} 512}{\log_{10} 8} =$   
 $\frac{\log a}{\log b} = \log_b a$   
 $= \log_8 512 = 3$   
**Ans: (D) 3**

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14.  $4^{\log_4 1.5} + 9^{\log_9 0.5} =$   
 $a^{\log_a N} = N$   
 $= 1.5 + 0.5 = 2$   
**Ans: (B) 2**

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15.  $6^{\log_7 10} =$   
 $a^{\log_c b} = b^{\log_c a}$ : the base and the number inside the log change places.  
 $\therefore 6^{\log_7 10} = 10^{\log_7 6}$   
**Ans: (C)  $10^{\log_7 6}$**

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16. If  $\log_{13} \sqrt{x} = \log_{13} 12$ , then  $x =$   
 $\Rightarrow \sqrt{x} = 12$   
 $\Rightarrow x = 12^2 = 144$   
**Ans: (D) 144**

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17. If  $\log_{10}(x - 3) = 2$ , then  $x =$

$$\log_a N = x \Rightarrow N = a^x$$

$$x - 3 = 10^2 = 100$$

$$\Rightarrow x = 103$$

Ans: (D) 103

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18. If  $\log_7 x + \log_7(x - 48) = 2$ , then

$$\Rightarrow \log_7 x(x - 48) = 2$$

$$\Rightarrow x^2 - 48x = 7^2 = 49$$

$$\Rightarrow x^2 - 48x - 49 = 0$$

$$\Rightarrow (x + 1)(x - 49) = 0$$

$$\Rightarrow x = -1 \text{ (or) } x = 49$$

$x = -1$  is rejected: the log of a negative number is not defined.

$$\therefore x = 49$$

Ans: (A)  $x = 49$

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19.  $\log_{49} 343 + \log_{343} 49 =$

$$= \frac{3}{2} + \frac{2}{3} \text{ (writing both numbers as powers of 7)}$$

$$= \frac{13}{6}$$

Ans: (C)  $\frac{13}{6}$

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20.  $\frac{1}{\log_p pqr} + \frac{1}{\log_q pqr} + \frac{1}{\log_r pqr} =$

$$= \log_{pqr} p + \log_{pqr} q + \log_{pqr} r$$

$$= \log_{pqr} pqr = 1$$

Ans: (A) 1

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21.  $\log_{b^3} a^2 \cdot \log_{a^4} b^3 =$

$$= \frac{2}{3} \log_b a \cdot \frac{3}{4} \log_a b$$

$$= \frac{1}{2} \cdot \log_b a \log_a b = \frac{1}{2}(1) = \frac{1}{2}$$

Ans: (A)  $\frac{1}{2}$

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22.  $10^{\log_{100} 81} =$

$$\log_{100} 81 = \log_{10^2} 9^2 = \log_{10} 9$$

$$= 10^{\log_{10} 9} = 9$$

Ans: (D) 9

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23. If  $\log \frac{x-y}{5} = \frac{1}{2}(\log x + \log y)$ , then  $x^2 + y^2 =$

$$\frac{x-y}{5} = \sqrt{xy} \Rightarrow (x-y)^2 = 25xy$$

$$\Rightarrow x^2 - 2xy + y^2 = 25xy \Rightarrow x^2 + y^2 = 27xy$$

Ans: (A)  $27xy$

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**24.** If  $\log_{\frac{1}{x}} 16 = 4$ , then

$$16 = \left(\frac{1}{x}\right)^4 = x^{-4}$$

$\Rightarrow x = \frac{1}{2}$  (the negative value is rejected: the base must be positive)

**Ans: (B)**  $x = \frac{1}{2}$

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**25.** Which point lies on the graph of  $y = \log_2 x$ ?

$$x = 8 : y = \log_2 8 = 3$$

So  $(8, 3)$  is on the graph.

**Ans: (C)**  $(8, 3)$

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