CAT QUANTITATIVE APTITUDE

Logarithms — Practice Questions

20 Practice Questions with Detailed Solutions | CAT Quantitative Aptitude

This set covers all key Logarithm sub-topics tested in CAT: basic evaluation, log laws (product, quotient, power), change of base, logarithmic equations, telescoping products, characteristic & number of digits, and quadratic-in-log traps. Difficulty spans Easy (E), Medium (M) and Hard (H).

Key Formulas

LOG LAWS & IDENTITIES

Formula / Concept	Expression
Definition	$\log_b(x) = y \Leftrightarrow b^y = x$
Product rule	$\log(ab) = \log a + \log b$
Quotient rule	$\log(a/b) = \log a - \log b$
Power rule	$\log(a^n) = n \cdot \log a$
Change of base	$\log_b(a) = \log_c(a) / \log_c(b)$
Reciprocal identity	$\log_a(b) \cdot \log_b(a) = 1$
Base = argument	$\log_b(b) = 1$; $\log_b(1) = 0$
Number of digits in N	$\text{Digits} = \text{floor}(\log10\ N) + 1$
Common values (used in this set)	$\log 2 = 0.3010$, $\log 3 = 0.4771$, $\log 5 = 0.6990$

Difficulty Legend

QUESTION DISTRIBUTION

Level	Questions	Q Numbers	Border Colour
Easy	4	Q1 – Q4	Green
Medium	11	Q5 – Q15	Orange
Hard	5	Q16 – Q20	Red

Practice Questions

EASY

Q1 – Q4

Q1. Basic Evaluation — EASY

Evaluate: $\log_2(32)$

(A) 4
(B) 5
(C) 6
(D) 3

Q2. Power Rule — EASY

If log 2 = 0.3010, find log 8.

(A) 0.6020
(B) 0.9030
(C) 1.2040
(D) 0.4515

Q3. Change of Base — EASY

Evaluate: $\log_4(64)$, i.e. log to the base 4 of 64.

(A) 2
(B) 3
(C) 4
(D) 3.5

Q4. Solve for Base — EASY

If $\log_x(81) = 4$, find x.

(A) 3
(B) 9
(C) 27
(D) 81

MEDIUM

Q5 – Q15

Q5. Log Equation — MEDIUM

Solve for x: $\log_2(x) + \log_2(x-2) = 3$

(A) x = 4
(B) x = 2
(C) x = 6
(D) x = 8

Q6. Product Rule Application MEDIUM

If log 2 = 0.3010 and log 3 = 0.4771, find log 12.

(A) 1.079
(B) 0.954
(C) 1.204
(D) 0.778

Q7. Change of Base Equation MEDIUM

Solve for x: $\log_3(x) + \log_9(x) = 3$

(A) x = 3
(B) x = 6
(C) x = 9
(D) x = 27

Q8. Product of Logs MEDIUM

Evaluate: $\log_5(125) \times \log_3(9)$

(A) 5
(B) 6
(C) 8
(D) 9

Q9. Number of Digits MEDIUM

Using log 5 = 0.6990, find the number of digits in 5^{15}.

(A) 10
(B) 11
(C) 12
(D) 9

Q10. Nested Logarithm MEDIUM

Solve for x: $\log_3(\log_2(x)) = 1$

(A) x = 6
(B) x = 8
(C) x = 9
(D) x = 16

Q11. Sum-to-Product Equation MEDIUM

Solve for x (x > 1): log(x−1) + log(x+1) = log 3

(A) x = 1.5
(B) x = 2
(C) x = 2.5
(D) x = 3

Q12. Chained Base Change MEDIUM

If $\log_a(b) = 3$ and $\log_b(c) = 4$, find $\log_a(c)$.

(A) 7
(B) 12
(C) 1
(D) 81

Q13. Telescoping Product MEDIUM

Evaluate: $\log_2 3 \times \log_3 4 \times \log_4 5 \times \log_5 8$

(A) 2
(B) 3
(C) 4
(D) 5

Q14. Equal Powers Relation MEDIUM

If $3^x = 5^y = 15^z = k$ (k > 1), which relation between x, y and z always holds?

(A) z = x + y
(B) 1/z = 1/x + 1/y
(C) z = xy
(D) 1/z = 1/x − 1/y

Q15. Quotient Rule Equation MEDIUM

Solve for x (x > 0): $\log(x^2) - \log(x) = 1$

(A) x = 1
(B) x = 10
(C) x = 100
(D) x = 0.1

HARD

Q16 – Q20

Q16. Multi-base Combination HARD

Solve for x: $\log_2(x) + \log_4(x) + \log_8(x) = 11$

(A) x = 32
(B) x = 64
(C) x = 128
(D) x = 256

Q17. Large Exponent Digit Count HARD

Using log 2 = 0.3010, find the number of digits in 2^{64}.

(A) 19
(B) 20
(C) 21
(D) 18

Q18. Quadratic-in-Log Trap HARD

If $(\log_3 x)^2 - \log_3(x^3) = 4$, find the product of all possible values of x.

(A) 9
(B) 27
(C) 81
(D) 243

Q19. Algebraic Log Manipulation HARD

If $\log_a(ab) = x$, express $\log_b(ab)$ in terms of x.

(A) x / (x−1)
(B) (x−1) / x
(C) x − 1
(D) 1 / (x−1)

Q20. Reciprocal Log Trap HARD

If $\log_5(x) + \log_x(5) = 5/2$, find a possible value of x.

(A) 25
(B) 10
(C) 15
(D) 20

Answer Key

Q1–Q4
Q5–Q8
Q9–Q12
Q13–Q16
Q17–Q20

Q1
(B)

Q5
(A)

Q9
(B)

Q13
(B)

Q17
(B)

Q2
(B)

Q6
(A)

Q10
(B)

Q14
(B)

Q18
(B)

Q3
(B)

Q7
(C)

Q11
(B)

Q15
(B)

Q19
(A)

Q4
(A)

Q8
(B)

Q12
(B)

Q16
(B)

Q20
(A)

Solutions & Explanations

Q1. Answer: (B) 5

$\log_2(32) = \log_2(2^5) = 5$, since $2^5 = 32$.

Q2. Answer: (B) 0.9030

$\log 8 = \log(2^3) = 3 \times \log 2 = 3 \times 0.3010 = 0.9030$.

Q3. Answer: (B) 3

$4^3 = 64$, so $\log_4(64) = 3$.

Q4. Answer: (A) 3

$x^4 = 81$. Since $3^4 = 81$, $x = 3$.

Q5. Answer: (A) x = 4

$\log_2[x(x-2)] = 3 \Rightarrow x(x-2) = 8 \Rightarrow x^2-2x-8 = 0 \Rightarrow (x-4)(x+2) = 0$. Since $x-2 > 0$ is required, $x = 4$.

Q6. Answer: (A) 1.079

$\log 12 = \log(4 \times 3) = 2\log 2 + \log 3 = 2(0.3010) + 0.4771 = 0.6020 + 0.4771 = 1.0791$.

Q7. Answer: (C) x = 9

$\log_9(x) = \log_3(x)/2$ (base-9 to base-3 conversion). So $\log_3(x) + \log_3(x)/2 = 3 \Rightarrow (3/2)\log_3(x) = 3 \Rightarrow \log_3(x) = 2 \Rightarrow x = 9$.

Q8. Answer: (B) 6

$\log_5(125) = 3$ (since $5^3=125$). $\log_3(9) = 2$ (since $3^2=9$). Product $= 3 \times 2 = 6$.

Q9. Answer: (B) 11

$\log(5^{15}) = 15 \times 0.6990 = 10.485$. Digits = floor(10.485) + 1 = 11.

Q10. Answer: (B) x = 8

$\log_3(\log_2 x) = 1 \Rightarrow \log_2 x = 3^1 = 3 \Rightarrow x = 2^3 = 8$.

Q11. Answer: (B) x = 2

$\log[(x-1)(x+1)] = \log 3 \Rightarrow x^2-1 = 3 \Rightarrow x^2 = 4 \Rightarrow x = 2$ (positive root, since $x > 1$ required).

Q12. Answer: (B) 12

$\log_a(c) = \log_a(b) \times \log_b(c) = 3 \times 4 = 12$ (chain rule for base changes).

Q13. Answer: (B) 3

The chain telescopes: $\log_2 3 \times \log_3 4 = \log_2 4 = 2$. Then $2 \times \log_4 5 = \log_2 5$. Then $\log_2 5 \times \log_5 8 = \log_2 8 = 3$.

Q14. Answer: (B) 1/z = 1/x + 1/y

Taking log of k: $x \log 3 = y \log 5 = z \log 15 = \log k$. So $\log 3 = \log k/x$, $\log 5 = \log k/y$, $\log 15 = \log k/z$. Since $\log 15 = \log 3 + \log 5$: $\log k/z = \log k/x + \log k/y \Rightarrow 1/z = 1/x + 1/y$.

Q15. Answer: (B) x = 10

$\log(x^2) - \log(x) = \log(x^2/x) = \log(x) = 1 \Rightarrow x = 10$.

Q16. Answer: (B) x = 64

Convert all to base 2: $\log_4 x = \log_2 x/2$, $\log_8 x = \log_2 x/3$. Sum $= \log_2 x(1 + 1/2 + 1/3) = \log_2 x \times 11/6 = 11 \Rightarrow \log_2 x = 6 \Rightarrow x = 64$.

Q17. Answer: (B) 20

$\log(2^{64}) = 64 \times 0.3010 = 19.264$. Digits = floor(19.264) + 1 = 20.

Q18. Answer: (B) 27

Let $y = \log_3 x$. Equation: $y^2 - 3y - 4 = 0 \Rightarrow (y-4)(y+1) = 0 \Rightarrow y = 4$ or $y = -1$. So $x = 3^4 = 81$ or $x = 3^{-1} = 1/3$. Product $= 81 \times (1/3) = 27$.

Q19. Answer: (A) x/(x−1)

$\log_a(ab) = \log_a a + \log_a b = 1 + \log_a b = x \Rightarrow \log_a b = x-1$. Then $\log_b(ab) = \log_b a + 1 = 1/\log_a b + 1 = 1/(x-1) + 1 = x/(x-1)$.

Q20. Answer: (A) 25

Let $y = \log_5 x$. Since $\log_x 5 = 1/y$, equation becomes $y + 1/y = 5/2 \Rightarrow 2y^2-5y+2 = 0 \Rightarrow (2y-1)(y-2) = 0 \Rightarrow y = 2$ or $y = 1/2$. $y=2$ gives $x = 5^2 = 25$ (a clean value); $y=1/2$ gives $x = \sqrt{5}$ (irrational).

> **Note:** This practice set is intended for concept revision and self-assessment only. Question style and numbers are illustrative and may differ from the exact pattern, difficulty, or wording of actual CAT question papers.