# IPMAT / JIPMAT / IIM-B — PYQ Practice Sheet

Modern Math: Logarithms

*BMSAT Kozhikode 2025 | Logarithms | Easy*

**Q1.** If $y > 0$, $\log_y(x) = 4$ and $\log_{10y}(25x) = 2$, what is $y$?

(a) None of these

(b) 4

(c) 5

(d) 10

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**Q2.** Simplify:

$$\frac{1}{\log_8 x} - \frac{1}{\log_7 x} + \frac{1}{\log_6 x} - \frac{1}{\log_5 x} + \frac{1}{\log_4 x} - \frac{1}{\log_3 x} + \frac{1}{\log_2 x}$$

(a) $\log_8\left(\frac{16x}{35}\right)$

(b) $\log_2\left(\frac{5x}{2}\right)$

(c) $\log_x\left(\frac{128}{35}\right)$

(d) $\log_x\left(\frac{1}{40320}\right)$

*IPMAT Indore 2019 | Logarithms | Medium*

**Q3.** Suppose $a, b, c > 1$. Find:

$$\frac{1}{1+\log_{a^2} b(c/a)} + \frac{1}{1+\log_{b^2} c(a/b)} + \frac{1}{1+\log_{c^2} a(b/c)}$$

*[Integer Type — write your answer]*

*IPMAT Indore 2019 | Logarithms | Hard*

**Q4.** $x, y, z > 0$ with $x^{12} = y^{16} = z^{24}$. If $3\log_y x$, $4\log_z y$, $n\log_x z$ are in A.P., find $n$.

*[Integer Type — write your answer]*

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**Q5.** The inequality $\log_2\left(\frac{3x-1}{2-x}\right) < 1$ holds for

(a) $x \in \left(\frac{1}{3}, 1\right)$

(b) $x \in \left(\frac{1}{3}, 2\right)$

(c) $x \in \left(0, \frac{1}{3}\right) \cup (1, 2)$

(d) $x \in (-\infty, 1)$

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**Q6.** Find $(\log_3 30)^{-1} + (\log_4 900)^{-1} + (\log_5 30)^{-1}$.

(a) 0.5

(b) 30

(c) 2

(d) 1

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**Q7.** $\log_a f(x) < \log_a g(x)$ implies that

(a) $f(x) > g(x) > 0$ for $0 < a < 1$, and $g(x) > f(x) > 0$ for $a > 1$

(b) $g(x) > f(x) > 0$ for $0 < a < 1$, and $f(x) > g(x) > 0$ for $a > 1$

(c) $f(x) > g(x) > 0$ for all $a > 0$

(d) $g(x) > f(x) > 0$ for all $a > 0$

*IPMAT Indore 2020 | Logarithms | Medium*

**Q8.** Find $(0.04)^{\log_{\sqrt{5}}\left(\frac{1}{4}+\frac{1}{8}+\frac{1}{16}+\cdots\right)}$.

*[Integer Type — write your answer]*

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**Q9.** If $\log_5(\log_8(x^2-1))=0$, a possible value of $x$ is

(a) $2\sqrt{2}$ (b) $\sqrt{2}$

(c) 2 (d) 3

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**Q10.** If $\log_2[\log_3(\log_4 a)]=\log_3[\log_4(\log_2 b)]=\log_4[\log_2(\log_3 c)]=0$, find $a+b+c$.

(a) 105 (b) 71

(c) 89 (d) 37

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**Q11.** If $\log_{x^2} y+\log_{y^2} x=1$ and $y=x^2-30$, find $x^2+y^2$.

*[Integer Type — write your answer]*

*IPMAT Indore 2022 | Logarithms | Medium*

**Q12.** Find all real $x$ for which $\log_{27} 8 \le \log_3 x < 9^{1/\log_2 3}$.

(a) $[2, 81)$

(b) $(2, 27)$

(c) $[2, 81]$

(d) $(2, 27]$

*IPMAT Indore 2023 | Logarithms | Easy*

**Q13.** Find the product of roots of $\log_2 2^{(\log_2 x)^2} - 5\log_2 x + 6 = 0$.

*[Integer Type — write your answer]*

*IPMAT Indore 2023 | Logarithms | Medium*

**Q14.** Let $a, b, c > 1$, $n \neq 1$. Given $\log_n(\log_2 a) = 1$, $\log_n(\log_2 b) = 2$, $\log_n(\log_2 c) = 3$. Which is true?

(a) $(b-a)^n = c - b$

(b) $a^n + b^n = c^n$

(c) $a + b = c$

(d) $(a^n + b)^n = ac$

*IPMAT Indore 2023 | Logarithms | Hard*

**Q15.** If $\log_{(\cos x)}(\sin x) + \log_{(\sin x)}(\cos x) = 2$, find $x$.

(a) $n\pi + \frac{\pi}{4},\ n \in \mathbb{Z}$

(b) $2n\pi + \frac{\pi}{4},\ n \in \mathbb{Z}$

(c) $\frac{n\pi}{4},\ n \in \mathbb{Z}$

(d) $\frac{n\pi}{4} + \frac{\pi}{4},\ n \in \mathbb{Z}$

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**Q16.** If $4^{\log_2 x} - 4x + 9^{\log_3 y} - 16y + 68 = 0$, find $y - x$.

*[Integer Type — write your answer]*

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**Q17.** Let $a = \dfrac{(\log_7 4)(\log_7 5 - \log_7 2)}{\log_7 25\,(\log_7 8 - \log_7 4)}$. Find $5^a$.

(a) 8

(b) 5/2

(c) 5

(d) 7/2

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**Q18.** If $\log_4 x = a$ and $\log_{25} x = b$, find $\log_x 10$.

(a) $\frac{a+b}{2}$

(b) $\frac{a-b}{2ab}$

(c) $\frac{a+b}{2ab}$

(d) $\frac{a+b}{2(a-b)}$

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**Q19.** $2^{2024}$ and $5^{2024}$ are written out in full consecutively. Total digits =

(a) 1987

(b) 2025

(c) 2065

(d) 2000



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**Q20.** $\log_3(x^2-1), \log_3(2x^2+1), \log_3(6x^2+3)$ are first three terms of an A.P.

Find the sum of the next three terms.

*[Integer Type — write your answer]*

*IPMAT Indore 2025 | Logarithms | Medium*

**Q21.** If $y = a + b\log_e x$, which is true?

(a) $\frac{1}{y-a}$ is proportional to $x^b$

(b) $y - a$ is proportional to $x^b$

(c) $e^y$ is proportional to $x^b$

(d) $\log_e y$ is proportional to $x$

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**Q22.** If $\log_{25}[5\log_3(1+\log_3(1+2\log_2 x))] = \frac{1}{2}$, find $x$.

(a) 4

(b) 16

(c) 2

(d) 8

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**Q23.** All $x$ satisfying $\log_{(x+\frac{1}{x})}\left[\log_2\left(\frac{x-1}{x+2}\right)\right] > 0$ form the set

(a) $(2, 5)$

(b) $(-5, -2)$

(c) $(5, \infty)$

(d) Null set

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**Q24.** If $\log_{18} 24 = p$, find $\log_{96} 108$.

(a) $\frac{p+2}{7p-3}$

(b) $\frac{p+7}{9p-2}$

(c) $\frac{3p+3}{3p+2}$

(d) $\frac{3p+2}{3p+1}$

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**Q25.** Approximate value of $2\log_3(3n) - \log_3(n^2+1)$ for large $n$:

(a) 2

(b) 3

(c) $2 - \log_3 2$

(d) 1

**Answer Key**

| | | | | |
|---|---|---|---|---|
| Q1: (a) | Q2: (c) | Q3: 3 | Q4: 16 | Q5: (a) |
| Q6: (d) | Q7: (a) | Q8: 16 | Q9: (d) | Q10: (c) |
| Q11: 72 | Q12: (a) | Q13: 32 | Q14: (d) | Q15: (b) |
| Q16: 6 | Q17: (b) | Q18: (c) | Q19: (b) | Q20: 15 |
| Q21: (c) | Q22: (b) | Q23: (d) | Q24: (b) | Q25: (a) |