

## 1. Basic Logarithm

**Q:** Find  $\log_2 8$ .

**Sol:**

*Ask: "2 to what power gives 8?"*

$$2^3 = 8, \text{ so } \log_2 8 = \boxed{3}.$$

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## 2. Log of 1

**Q:** Solve  $\log_5 1$ .

**Sol:**

*Any number to power 0 is 1.*

$$\text{So, } \log_5 1 = \boxed{0}.$$

### 3. Same Base & Number

**Q:** What is  $\log_7 7$ ?

**Sol:**

*"7 to what power gives 7?"*

$$7^1 = 7, \text{ so } \log_7 7 = \boxed{1}.$$

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### 4. Logarithm with Power

**Q:** Simplify  $\log_3 9^2$ .

**Sol:**

Step 1:  $\log_3 81$  (because  $\backslash(9^2 = 81\backslash)$ ).

Step 2:  $3^4 = 81$ , so answer is  $\boxed{4}$ .

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### 5. Adding Logs (Product Rule)

**Q:** Solve  $\log_2 4 + \log_2 8$ .

**Sol:**

$$\log_2(4 \times 8) = \log_2 32.$$

Now,  $2^5 = 32$ , so  $\boxed{5}$ .

## 6. Subtracting Logs (Quotient Rule)

**Q:** Simplify  $\log_{10} 1000 - \log_{10} 10$ .

**Sol:**

$$\log_{10} \left( \frac{1000}{10} \right) = \log_{10} 100.$$

$$10^2 = 100, \text{ so } \boxed{2}.$$

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## 7. Change of Base

**Q:** Find  $\log_4 16$  using base 2.

**Sol:**

$$\frac{\log_2 16}{\log_2 4} = \frac{4}{2} = \boxed{2}.$$

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## 8. Solving for x

**Q:** If  $\log_5 x = 3$ , find  $x$ .

**Sol:**

$$x = 5^3 = 125, \text{ so } \boxed{125}.$$

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## Quick Rules to Remember

1.  $\log_a b = x \rightarrow a^x = b.$

2.  $\log_a 1 = 0.$

3.  $\log_a a = 1.$

4.  $\log_a(xy) = \log_a x + \log_a y.$

5.  $\log_a \left( \frac{x}{y} \right) = \log_a x - \log_a y.$

**Tip:** Always rewrite logs in exponential form if stuck!