

LOGARITHMS

Study Materials: Key Concepts, Practice Questions, Answers

Mathema
Contest

Logarithms -Study guide and Practice Questions



Name: _____

Key Concepts

1. Definition of a Logarithm

- A logarithm is the inverse of an exponential function.
 - If $b^y = x$, then $\log_b(x) = y$
 - Here, b is the base, x is the argument, and y is the exponent.
 - **Common Logarithms:** Base 10 ($\log_{10}$)
 - **Natural Logarithms:** Base e ($\ln$), where $e \approx 2.718$.

2. Properties of Logarithms

- **Product Rule:** $\log_b(xy) = \log_b(x) + \log_b(y)$.
- **Quotient Rule:** $\log_b\left(\frac{x}{y}\right) = \log_b(x) - \log_b(y)$.
- **Power Rule:** $\log_b(x^k) = k\log_b(x)$.
- **Change of Base Formula:** $\log_b(x) = \frac{\log_c(x)}{\log_c(b)}$ for any positive base c .

3. Common Bases

- **Base 10:** $\log(x)$ or $\log_{10}(x)$
- **Base e :** $\ln(x)$ (natural logarithm).

4. Solving Logarithmic Equations

- To solve equations involving logarithms, you can often use the properties of logarithms to combine or simplify terms.
- You can also rewrite the logarithmic equation in its exponential form to solve for the variable.

5. Applications of Logarithms

Logarithms -Study guide and Practice Questions



- Logarithms are used in many fields such as science, engineering, and finance for dealing with exponential growth or decay, measuring sound intensity (decibels), and solving equations involving exponential functions.

Practice Questions

1. Definition of a Logarithm

- Write the logarithmic equation for $1000 = 10^3$.

2. Properties of Logarithms

- Simplify $\log_2(8 \cdot 32)$.

3. Change of Base Formula

- Evaluate $\log_2(50)$ using the change of base formula.

4. Solving Logarithmic Equations

- Solve $\log_3(x) + \log_3(2) = 4$

Answers

1. Definition of a Logarithm

- $\log_{10}(1000) = 3$

2. Properties of Logarithms

Logarithms -Study guide and Practice Questions



- 8

3. Change of Base Formula

- ≈ 5.65

4. Solving Logarithmic Equations

- 40.5