

Student ID No.										Name	
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1 Find each of the following values.

a) $\log_2 32 =$

b) $\log_{25} 5 =$

c) $\log_2 \frac{1}{4} =$

d) $\log_4 16 =$

e) $\log_5 5 =$

f) $\log_4 2 =$

g) $\log_3 \frac{1}{3} =$

h) $\log_8 \sqrt{2} =$

2 Solve each of the following equations for x .

a) $\log_2 x = 3$

b) $\log_4 x = -\frac{1}{2}$

c) $\log_3 x = 2$

d) $\log_{27} x = 3$

3 By the definition of logarithm, $\log_b M = m$ implies $M = b^m$, and $\log_b N = n$ implies $N = b^n$. Prove each of the following properties of logarithm by setting $M = b^m$ and $N = b^n$ and using the rules of exponents.

a) $\log_b(M \times N) = \log_b M + \log_b N$

b) $\log_b\left(\frac{M}{N}\right) = \log_b M - \log_b N$

c) $\log_b M^r = r \log_b M$

4 Let $p = \log_a 2$ and $q = \log_a 3$. Express each of the following in terms of p and q .

a) $\log_a 8 =$

b) $\log_a 18 =$

c) $\log_a 12 =$

d) $\log_a 1.5 =$

5 Simplify the following.

a) $\log_2 \frac{3}{4} - \log_2 \frac{3}{2} =$

b) $\frac{1}{2} \log_3 5 - \log_3 \frac{\sqrt{5}}{3} =$

c) $\log_2(3 + \sqrt{5}) + \log_2(3 - \sqrt{5}) =$

d) $3 \log_5 15 - \log_5 135 =$

6 Simplify the following.

a) $\frac{1}{3} \log_{10} 125 + \log_{10} \frac{3}{5} - \log_{10} 0.3 =$

b) $\log_a \frac{A}{B} + \log_a \frac{B}{C} + \log_a \frac{C}{A} =$

7 By the definition of logarithm, we have $a^{\log_a b} = b$. By taking the log base c of both sides of this, express $\log_a b$ in terms of $\log_c a$ and $\log_c b$. [The formula obtained is called *the change-of-base formula*.]

8 Assuming $\log_2 3 = m$, express $\log_4 6$ and $\log_3 2$ in terms of m .

a) $\log_4 6 =$

b) $\log_3 2 =$

9 Simplify the following using the change-of-base formula.

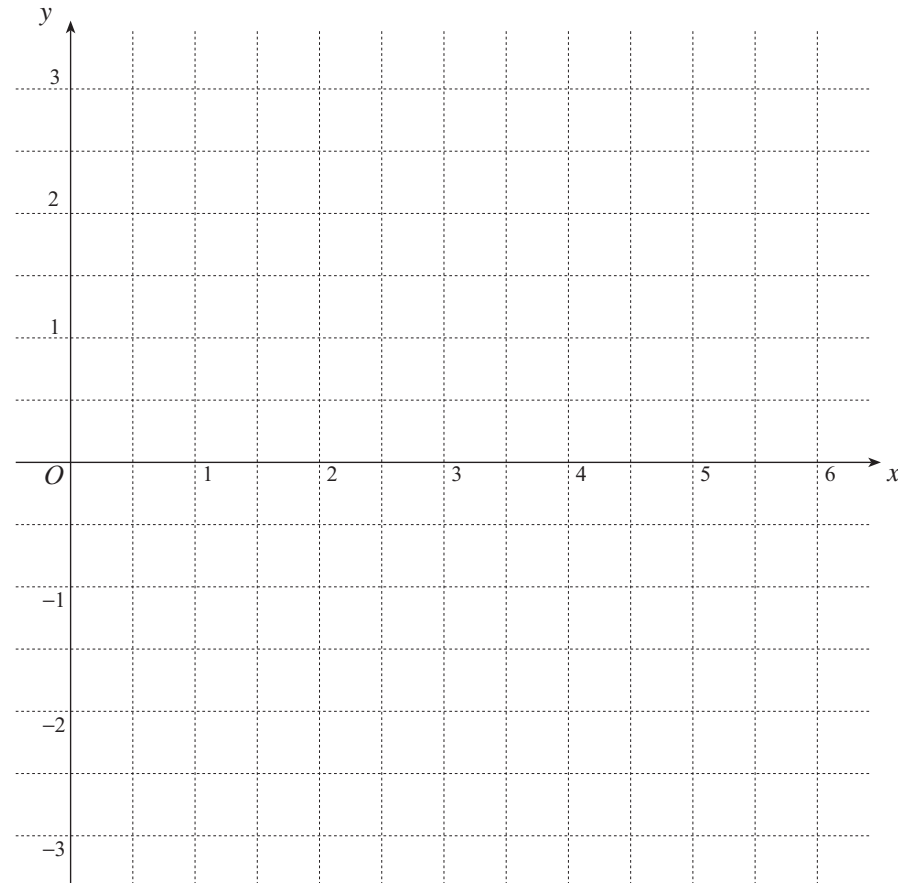
a) $\log_a b \cdot \log_b a =$

b) $\log_a b \cdot \log_b c \cdot \log_c a =$

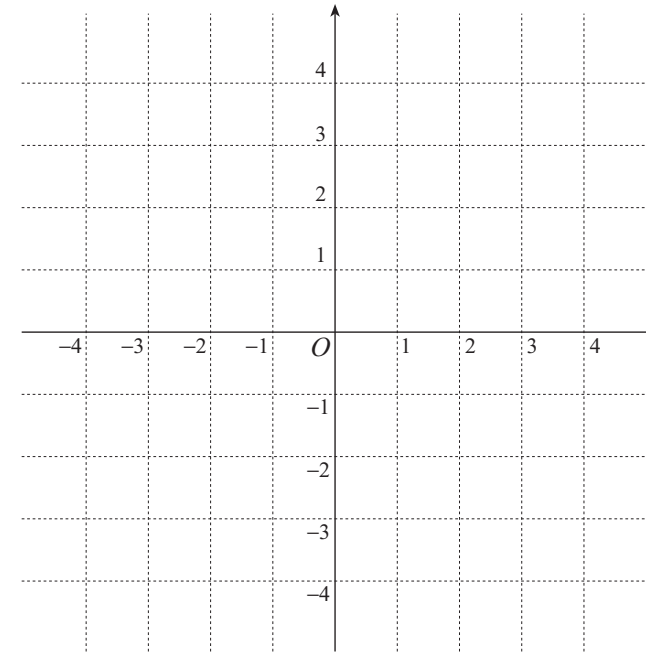
10 Fill in the blanks in the following table for the function $y = \log_2 x$ with decimals. Here, we assume $2^{0.5} = 1.414$.

x													
y	-3	-2.5	-2	-1.5	-1	-0.5	0	0.5	1	1.5	2	2.5	3

11 Using the table above, draw a graph of the exponential function $y = \log_2 x$ as carefully as possible.



12 Draw the graph of each of the functions $y = 3^x$, $y = 3^{-x}$, $y = \log_3 x$, and $y = -\log_3 x$.



13 How many digits is 2^{32} . Use the fact $\log_{10} 2 \approx 0.3010$.

14 Every time a ray of light passes through a certain glass, it loses 1/10 of its luminous intensity. How many times this glass is stacked will reduce light intensity to 1/3 or less of the original. Use $\log_{10} 3 \approx 0.4771$.