$$b^{\log_b x} = x$$

$10^{\log a} = a$ $10^{\log b} = b$ $10^{\log ab} = ab$

1.	$10^{\log ab} = ab$	Given
2.	$= (10^{\log a})(10^{\log b})$	Substitution
3.	$= 10^{\log a + \log b}$	Mult Rule Exp.
4.	$\therefore \rightarrow \log ab = \log a + \log b$	Transitive Property

log ab = log a + log

Therefore, we can say, *to find the logarithm of a product of positive numbers, you add the logarithms of the numbers.*

That follows our rules of exponents, when you multiply numbers with the same base, you add the exponents.

$10^{\log a} = a$ $10^{\log b} = b$ $10^{\log a/b} = a/b$

Again, using the three equalities that are a direct application of $b^{\log_b x}$ = x, let's look at what we can develop for division.

1.	$10^{\log a/b} = a/b$	**Given**
2.	$= \dfrac{10^{\log a}}{10^{\log b}}$	**Substitution**
3.	$= 10^{\log a - \log b}$	**Div Rule Exp.**
4.	$10^{\log a/b} = 10^{\log a - \log b}$	**- Transitive Prop.**

$\log a/b = \log a - \log b$ **- Exp Equation**

Knowing that $a = 10^{\log a}$. If each side is raised to the power of n, we have

1.	$a = 10^{\log a}$	Given
2.	$a^n = (10^{\log a})^n$	Exponent Power Rule
3.	$= 10^{n \log a}$	Exp. Raise Power to Power
4.	$(10^{\log a})^n = 10^{n \log a}$	Substitution
5.	$\log a^n = n \log a$	Definition

Sometimes it is helpful to change the base of a logarithm such as $\log_b n$ to a logarithm in another base.

Let $x = \log_b n$

$b^x = n$ - **Def of log**

$\log_a b^x = \log_a n$ - **log of both sides**

$x\log_a b = \log_a n$ - **Power rule – logs**

$x = \dfrac{\log_a n}{\log_a b}$ - **Div Prop. Equality**

$\log_b n = \dfrac{\log_a n}{\log_a b}$ - **Substitution**

So, we can see to change the base of a logarithm, we have

$$\log_b n = \frac{\log_a n}{\log_a b}$$