Simplifying values associated with $a^{\log_a b}$ and log a (b^n)

This concept is easy to master after a bit of practice. You can simply look at how we can evaluate and simplify all values within a mathematical expression or equation.

First off, let's start by looking at:
$A^{\log_a b}$

We can rewrite this as:
loga (a^loga b) = loga(b)

What we did here is we are trying to prove that we can simplify this expression to just "b". By definition, a logarithm is simply expressed as: loga(a^x) = x. To do this, we take the log of a on both sides and by doing so, we are able to see a pattern emerge.

We end up with loga b = loga b from this.

Let's first off start with an expression that we can see fits the parameter we desire.
$\log_2 (4^x)$

First off, what we do is we can simply use the logarithm law of logb a^x = xlogb a. This is where we move the exponent out the front as we do generally with logs
.: x log2 (4)

Now we simplify what we can by replacing $\log_2 4$ with 2, as 2^2 is 4 and logarithms are best defined as being exponents. Hence we get the following result after the simplification process
.: x * 2

And we can simply write this as being:
2x

Now, attempt to simplify these expressions as best as you can and solve where possible!

$2^{\log_2 16}$

$4^{\log 4\ 64}$

$7^{\log 7\ 49}$

$\text{Log}_5\ 125^x$

$\text{Log}_9\ 81^y$

$10^{\log_{10} 100}$

$9^{\log_9 81}$