A bacteria culture starts with 1,000 bacteria and doubles in size every 3 hours. Find an exponential model for the size of the culture as a function of time \( t \) in hours.

Solution: Use the formula \( y = Ab^t \) (example 4 on p. 636 is similar). The starting amount of bacteria is 1000, so \( A = 1000 \). To find \( b \), plug in 3 for \( t \) and 2000 for \( y \) (since the population doubles in 3 hours): \( 2000 = 1000b^3 \), divide both sides by 1000 to get \( 2 = b^3 \). Raise both sides to the \( 1/3 \) power to get \( 2^{1/3} = (b^3)^{1/3} \), so \( b = 2^{1/3} \).

Thus, the function is \( y = 1000(2^{1/3})^t \), or
\[
y = 1000(2^{t/3}).
\]

Use the model to predict how many bacteria there will be after 2 days.

Solution: Time \( t \) is measured in hours in this problem, and 2 days is 48 hours. So, plug in 48 for \( t \):
\[
y = 1000(2^{48/3}) = 1000(2^{16}) = 65,536,000.
\]
There will be about 65,536,000 bacteria after 2 days.