A bacteria culture starts with 1,000 bacteria and doubles in size every 2 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 2 for t and 2000 for y (since the population doubles in 2 hours): $2000 = 1000b^2$, divide both sides by 1000 to get $2 = b^2$. Raise both sides to the $1/2$ power to get

$$2^{1/2} = (b^2)^{1/2}, \text{ so } b = 2^{1/2}.$$

Thus, the function is $y = 1000\left(2^{1/2}\right)^t$, or

$$y = 1000\left(2^{t/2}\right).$$

Remember that unless WebAssign specifically tells you to round your answer, you should leave it as an exact value (so you can't use a decimal approximation for $2^{1/2}$ in this problem). See the FAQ titled "I know my answer is correct…" for more information about that.

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:

$$y = 1000\left(2^{48/2}\right) = 1000(2^{24}) = 16{,}777{,}216{,}000.$$

There will be about 16,777,216,000 bacteria after 2 days.