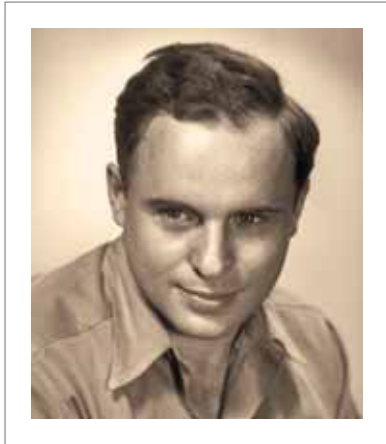


**EXAMPLE 2** Using a Spreadsheet



Philip Morrison (1915–2005) was a professor of physics at MIT and a member of the Manhattan Project. His works include the film *Powers of Ten* (1977) and the 1987 PBS television series *The Ring of Truth*.

The following excerpt is from *The Ring of Truth: An Inquiry into How We Know What We Know* by Philip and Phylis Morrison.

“Chef Mark kneaded high-gluten white flour carefully along with the other ingredients of noodle dough in correct proportion: three cups of flour, half as much water, one-quarter teaspoon each of salt and baking soda. He vigorously swung and stretched the lump of dough out into a heavy single strand the length of his full two-arm span. Then he folded that long thick strand in half, and pulled the dough out again into its original length, so that two thinner strands now passed from one hand to the other. Repeat, repeat, repeat . . .

**CHEF MARK:** Hello, everybody. I am the chef of the Dragon House in Wildwood, New Jersey. Today I will make the kind of noodles called *so*. Make the dough strong and smooth, keep the dough smooth and strong, and you will have noodles on the table.

Fold one time: the dough becomes two noodles. Two times, it becomes four noodles. Three, four times . . . ten, eleven, now twelve doublings, or four thousand and ninety-six noodles.”

Use a spreadsheet to illustrate the number of dragon’s beard noodles in each folding.

**SOLUTION**

The number of noodles doubles with each folding. This means that the rate of growth is 100%.

$$A = 1(1 + 1)^n$$

Initial number of noodles

Number of foldings

Entering this formula into a spreadsheet produces the table shown.

	A	B
1	<b>Foldings, <math>n</math></b>	<b>Number of Noodles</b>
2	0	1
3	1	2
4	2	4
5	3	8
6	4	16
7	5	32
8	6	64
9	7	128
10	8	256
11	9	512
12	10	1024
13	11	2048
14	12	4096
15		

**✓ Checkpoint**

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Analyze the following statement, taken from the Morrisons’ book. Is the claim true? Use a spreadsheet to justify your answer.

“The tantalizing nature of the doubling process is that the subdivision is so rapid. Some forty-six doublings would make noodles of true atomic fineness, in principle. But note that such an incredible feat would produce not a mere few miles of dragon’s beard, but noodles long enough to stretch to Pluto and beyond!”

