Solution: Suddku 1

(a) Similar to the tic-tac-toe formulation, define variable C_{ijd} as a binary variable representing whether cell (i,j) contains digit d. There are (for 2×2 suddku) 4 rows, 4 columns, and 4 digits, thus there are $4^3 = 64$ such variables.

(b) If there are 64 variables, then there are 2^{64} models. Observe that a model maps each variable to $\{0,1\}$. We thus have two choices per variable, i.e. $\underbrace{2 \cdot \ldots \cdot 2}_{64} = 2^{64}$ models.

(c) Suppose we had $n=2$ variables: $\{A,B\}$. A truth table over 2 varibles has four rows (models):

2 vars

A	B	
0	0	?
0	1	?
1	0	?
1	1	?

$2^2 = 4$ rows (models)

and there are $2^{2^2} = 16$ truth tables of this form, namely:

A	B	
0	0	0
0	1	0
1	0	0
1	1	0

A	B	
0	0	0
0	1	0
1	0	0
1	1	1

A	B	
0	0	0
0	1	0
1	0	1
1	1	0

A	B	
0	0	0
0	1	0
1	0	1
1	1	1

A	B	
0	0	0
0	1	1
1	0	0
1	1	0

A	B	
0	0	0
0	1	1
1	0	0
1	1	1

A	B	
0	0	0
0	1	1
1	0	1
1	1	0

A	B	
0	0	0
0	1	1
1	0	1
1	1	1

A	B	
0	0	1
0	1	0
1	0	0
1	1	0

A	B	
0	0	1
0	1	0
1	0	0
1	1	1

A	B	
0	0	1
0	1	0
1	0	1
1	1	0

A	B	
0	0	1
0	1	0
1	0	1
1	1	1

A	B	
0	0	1
0	1	1
1	0	0
1	1	0

A	B	
0	0	1
0	1	1
1	0	0
1	1	1

A	B	
0	0	1
0	1	1
1	0	1
1	1	0

A	B	
0	0	1
0	1	1
1	0	1
1	1	1

More generally, we can create 2^m truth tables over m models:

model 1	?	$\leftarrow$ 2 choices: 0 or 1
$\vdots$		
model m	?	$\leftarrow$ 2 choices: 0 or 1

2^m choices

Since there are $m = 2^n$ models over n variables, therefore there are 2^{2^n} truth tables over n variables.

For our variable set for (a), $n = 64$. Thus there are $2^{2^{64}}$ truth tables, which is approximately equal to "a lot", or "a whole bunch".