For an Einstein solid, the multiplicity (number of states) is given by

$$\Omega(N,q) = \frac{(q+N-1)!}{q!(N-1)!}$$

where "N" is the number of oscillators and "q" is the number of energy quanta.

Let's look at concrete numbers for one atom ("Atom A") that has $N_A = 3$ and $q_A = 3$.

In [1]:
```
from scipy.special import factorial
```

In [2]:
```
N = 3
q = 6

omega = factorial(q+N, exact=True) \
        / (factorial(q, exact=True) * factorial(N-1, exact=True))
omega
```

Out[2]: 252.0

In [3]:
```
# Having all 6 energy quanta in one atom (N=3) is about 1/4 as likely
# as having the energy equally distributed with 3 quanta in each.
252 / (30*30)
```

Out[3]: 0.28