**3.1.** This problem is simply a binomial distribution. To represent the number ‘n’ we would need 2­n bags. For example:

* Number 0 => 20 bags = 1 bag
* Number 1 => 21 bags = 2 bag
* Number 2 => 22 bags = 4 bag
* Number 3 => 23 bags = 8 bag
* Number 4 => 24 bags = 16 bag
* Number 5 => 25 bags = 32 bag
* Number 6 => 26 bags = 64 bag
* Number 7 => 27 bags = 128 bag
* Number 8 => 28 bags = 256 bag

**3.2.** The professor will need to carry 264 bags in his vehicle.

* If each bags weights 4 grams, then he will need to carry 264 \* 4g / 1000kg / 1000 = tons
* This is equal to 18446744073709551616 \* 4g / 1000kg / 1000 = tons
* The total number of tons is: 7.3786976294838206464 × 10^13 tons

**3.3.** To prove the number of bags needed to represent the number ‘n’ the formula I have derived is:

* The base case is:

We can see that this is simply the sum of the previous sets.

I have grouped the sets using parenthesis to denote each set starting with n=0. Finally we add a final 20.

* As can be seen from the pattern above the formula is equal to:
* As we can see, because this hold true for the base case (n=0), then it must be true for when n=n+1. As we see above, this continues to hold throughout.