Seems like you messed up with the logic. Basically, you are iterating the number thru division factors, and 4=2+2, 10=4(2+2)+3+3, 12=3+3+3+3... happen to follow such pattern.

However, the breakthru of this problem is not division factor but dividing 3.

If n%3=1: then ret=3^(k-1)\*4

If n%3=2: then ret=3^k\*2

If n%3=3: then ret=3^k, where k=n/3