Novel Formulas for Coefficients in Expansion of $\left(1 + x + x^2 + 3x^3 + x^4 + x^5 + x^6 + x^7\right)^n$

1) First Formula

$$T(n,k) = \sum_{i=0}^{k} \sum_{j=2i}^{k} \sum_{q=3i}^{k} \sum_{r=4i}^{k} \sum_{p=5i}^{k} \sum_{d=6i}^{k} \frac{3^{q-2r+p}\, n!}{(n+d-k)!\ (k+p-2d)!\ (d+r-2p)!\ (q+p-2r)!\ (j+r-2q)!\ (i+q-2j)!\ (j-2i)!\ i!}$$

$$for\ k\ =\ 0..7n,\ where\ n\ is\ nonnegative\ integer\ and$$

$$\frac{3^{q-2r+p}\, n!}{(n+d-k)!\ (k+p-2d)!\ (d+r-2p)!\ (q+p-2r)!\ (j+r-2q)!\ (i+q-2j)!\ (j-2i)!\ i!} = 0$$

$for\ (n+d-k) < 0\ or\ (k+p-2d) < 0\ or\ (d+r-2p) < 0\ or\ (q+p-2r) < 0\ or\ (j+r-2q) < 0\quad (i+q-2j) < 0\ or\ (j-2i) < 0$

2) Second Formula

$$T_{n,k} = T_{n-1,k} + T_{n-1,k-1} + T_{n-1,k-2} + 3\,T_{n-1,k-3} + T_{n-1,k-4} + T_{n-1,k-5} + T_{n-1,k-6} + T_{n-1,k-7}$$

$$for\ k\ =\ 0..7n,$$

$$T_{0,0} = 1\ and\ T_{n,k} = 0\ for\ n\ or\ k\ <\ 0.$$

REFERENCE:
Shara Lalo and Zagros Lalo, Polynomial Expansion Theorems and Number Triangles, Zana Publishing, 2018, ISBN: 978-1-9995914-0-3