(i). $\sum_{i=1}^{n} i^2 = \frac{n(n+1)(2n+1)}{6}$

Proof. Suppose $n = 1$, we have $1^2 = \frac{1(1+1)(2+1)}{6}$

Assume that for some positive integer k, $\sum_{i=0}^{k} i = \frac{k(k+1)(2k+1)}{6}$

$$\begin{aligned}
\sum_{i=0}^{k+1} i^2 = \sum_{i=0}^{k} i^2 + (k+1)^2 &= \frac{k(k+1)(2k+1)}{6} + (k+1)^2 \\
&= (k+1)\left[\frac{k(2k+1)+6(k+1)}{6}\right] = (k+1)\left[\frac{2k^3+7k+6}{6}\right] \\
&= \frac{(k+1)(k+2)(2k+3)}{6},
\end{aligned}$$

giving us the desired result. By the Principle of Mathematical Induction,

$$\sum_{i=1}^{n} i^2 = \frac{n(n+1)(2n+1)}{6}$$

$\square$