We studied equilibrium conformations of linear and trivial-ring polymers in dilute solutions over the wide range of segment number $N$ of up to 2048 with Monte-Carlo simulation, and $N$ dependence of the radii of gyration, $R_g$, of chains were obtained. The polymer molecules were assumed to be composed of beads and bonds, and they were put in a face-centered cubic (FCC) lattice. The values of Flory’s critical exponent, $\nu$, for linear and trivial-ring polymers were estimated from the $N$ dependence of $R_g$, and the temperatures at which $\nu$ values reach 1/2 were obtained. Here we define those are $\Theta$-temperatures in this report. The simulation result shows that the $\Theta$-temperature for trivial-ring polymers is evidently lower than that of the linear polymers. Since $R_g$ of a trivial-ring polymer is smaller than that for a linear polymer at the same $N$ and temperature, the segment density for a trivial-ring polymer is increased by the topological effect and the repulsive force between segments of a trivial-ring polymer at the $\Theta$-temperature for a linear polymer is stronger. Thus, the origin of the $\Theta$-temperature depression for trivial-ring polymers is the repulsive force emphasized by the topological effect of rings. (Received November 25, 2011)