A random walk on the three dimensional integer lattice is defined as follows. The walker starts at \((0,0,0)\). A standard six sided die is rolled six times. After each roll the walker moves to one of its six nearest neighbors, according to the following protocol: if the die rolls 1, 2, 3, 4, 5, or 6 dots the walker jumps one unit in the \(+x, −x, +y, −y, z, −z\) direction respectively. Find the probability that after the sixth roll the walker is back at its starting point \((0,0,0)\).