This work is devoted to comparing two integral bases for the integral cohomology of the Hilbert scheme of points in the projective plane. Let $X$ be a smooth complex projective surface. One of the more interesting moduli spaces parameterizing objects associated with $X$ is the Hilbert scheme of points, which parameterizes all 0-dimensional closed subschemes of length $n$ in $X$. W. Wang, Z. Qin and W.P. Li used Heisenberg algebra operators to construct an integral basis of the integral cohomology of the Hilbert scheme of points in $X$ whenever $X$ is a smooth projective surface with vanishing odd Betti numbers. On the other hand, a work by G. Ellingsrud and S.A. Stromme gives a cellular decomposition of the Hilbert scheme of points on the projective plane. From this work, we have a second integral basis for the integral cohomology of the Hilbert scheme of points in $X$ when $X$ is the projective plane. We compare the elements of these two bases and ultimately give the upper triangular transition matrix from one basis to the other.