The Gröbner basis for powers of a general linear form in a monomial complete intersection

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In a polynomial ring over a field of characteristic zero, we study almost complete intersection ideals generated by powers of the variables and a power of the sum of the variables. Using a lower bound for the Hilbert series of the quotient rings defined by almost complete intersections, we obtain all reduced Gröbner of any such almost complete intersection ideal. Our method is mainly combinatorial in nature, as we focus on an analysis of the initial ideal. With any monomial in the vector space basis of an Artinian monomial complete intersection, we associate a lattice path, and introduce a reflection operation on these paths that allows for a crucial counting argument. In particular we obtain a new proof for the fact that Artinian monomial complete intersections have the strong Lefschetz property over fields of characteristic zero.