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Hassan Sedaghat*, Department of Mathematics, Virginia Commonwealth University, Box 842014, Richmond, VA 23284-2014. *Reducing orders of difference equations: What, how and why.*

Reducing the order of a difference equation may uncover important structural aspects of the equation and provide valuable information about the behaviors of its solutions. We discuss what the main idea is, how to carry it out and why we may need to do it. We show how to decompose, or factor, a difference equation of order two or greater into two difference equations of lower orders in such a way that one of the two lower order equations is independent of the other. This procedure applies to various different types of equations, including all linear difference equations. In the linear case, the method casts new light on familiar concepts such as eigenvalues and the role of the homogeneous part. (Received July 20, 2010)