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The study of college mathematics requires students to use variables to represent quantitative relationships. Research has shown that students who have a well-developed concept of variable are more likely to be successful in calculus (Authors, 2005). In this study, 300 undergraduates, enrolled in developmental or college algebra courses, completed a written test in which they used and interpreted variables. Test problems differed in terms of type of task (write an expression, interpret an expression, write an equation, compute a value) and type of variable (first letter of referent vs. generic x or y). Success rates were quite low, with some significant differences in type of task. Students were most successful computing numerical values, but had difficulty writing the corresponding algebraic equations that described those computations. Success rates did not differ for type of variable. This research provides information about undergraduate algebra students' uses and interpretations of variables to represent quantitative relationships in equations or expressions and describes some common difficulties. To inform instruction, the testing instrument can be used in the classroom to assess students' uses and interpretations of variables and to identify areas of difficulty. (Received July 28, 2011)