



# WORKING IT OUT

The music of most hit songs is pretty well known, but sometimes there are mysteries. One question that remained unanswered for over forty years is: What instrumentation and notes make up the opening chord of the Beatles' "A Hard Day's Night"? Mathematician Jason Brown—a big Beatles fan—recently solved the puzzle using his musical knowledge and discrete Fourier transforms, mathematical transformations that help decompose signals into their basic parts. These transformations simplify applications ranging from signal processing to multiplying large numbers, so that a researcher doesn't have to be "working like a dog" to get an answer.



Image by Teresa Levy.



The *Mathematical Moments* program promotes appreciation and understanding of the role mathematics plays in science, nature, technology, and human culture.