



CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY

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Project Title Asymptotics of Character Sums	
Abstract Objectives/Goals In this project, we aim to prove certain properties about a particular function $c(n) = b_n r_\chi(n)$. This is where b_n is a Boolean function with b_n being 1 if $n = x^2 + y^2$ for some integers x and y or 0 otherwise and $r_\chi(n)$ is the sum of all of the Dirichlet characters of d , where d divides n . The function $c(n)$ sums the all of the χ values of the divisors of a certain number n if and only if n can be expressed as the sum of two squares. Therefore, the question we ask is the following: What are the asymptotics of the character sums of the function $c(n)$? Results In order to investigate this problem, we first represent the character sum of $c(n)$ as an asymptotic and prove that the asymptotic is roughly $L(1, \chi)$ with a small error term. Additionally, we compute a representation for the character sum $c(n)$ as an Euler product, and also find error bounds on the asymptotic for the character sum. Conclusions/Discussion We analyzed the asymptotic, or growth rate, of a very special function $c(n)$ which describes a very particular group of primes. In specific, our growth rate describes the group of primes which are dependent on two character values. Additionally, we found some error bounds on how accurate our asymptotic is.	
Summary Statement In this project, an asymptotic for a function $c(n)$ was found along with an error term using elementary number theory techniques.	
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