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P vs NP

Since the beginning of time, man has had problems. So much so that he invented computers to solve them for him. However, there are even problems computers can't solve. First described by mathematician and computer scientist Steven Cook in his famous paper, "The Complexity Theorem Proving Procedures" (Fortnow), the P vs. NP problem has eluded computer scientists for decades. The problem itself describes a very simple concept; as computing power increases through the years, will it be able to solve all of humanity's problems To answer this question, computer scientists have all problems into two distinct categories. The first category P, includes problems that can be easily solved and verified in a certain amount of time (Hosch) . P Problems include multiplication, or a basic sort algorithm (Guzman). NP problems are harder to solve, and harder to verify (Hosch). Their solutions are usually guessed and brute forced. Alan Turning describes it best, "'there exist well-defined problems that cannot be solved by well-defined methods'" (Goldreich 70) . Some problems include chess, vehicle routing, and protein folding (Guzman).

In order to answer the original question, there must exist a proof that shows that all NP problems are actually P problems. But, in doing so, what would that accomplish? For one, it would mean all problems will have some secret backdoor algorithm that will solve it with one-hundred percent accuracy. This would mean that whenever people had to drive to work or school, there wouldn't be any traffic. As there would exist an algorithm that would efficiently route a vehicle to its desired destination. This is only possible because vehicle routing is closely

related to the famous Traveling Salesman Problem (Hosch). Micheal Sipser, a the head of the MIT Department of Mathematics (Hardesty), "'[If P = NP, then it would be] A major application is in the cryptography area,' Sipser says, where the security of cryptographic codes is often ensured by the complexity of a computational task. The RSA cryptographic scheme, which is commonly used for secure Internet transactions — and was invented at MIT" (Hardesty). P vs. NP also has applications in protein folding. A process where a computer calculates the behavior of a protein given the composition. A faster and more efficient algorithm would mean better healthcare and treatment.

The amount of benefits P vs NP would have on humanity are immeasurable. Many scientists and mathematicians saw the potential of P vs. NP, and its many applications in various fields of science. One of them, Stephen Smale listed P vs. NP as one of the most influential problems of the twenty-first century (Hosch). This later influenced the Clay Mathematics Institute to publish P vs. NP as a Millennium Prize Problem (Fortnow). If a solution was found, it would grant the individual who's discovered it a reward of one million dollars. However, the solution to P vs. NP would not only create another overnight millionaire, but it would change human life forever. It would increase quality of life, convenience, and overall happiness to the fullest. P vs. NP is not simply just another math problem, but it is the problem to end all problems.