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Outline

1. Motivation

1.1. The Basic Problem That We Studied

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What Are Prime Numbers?

Definition: Prime number

A prime number is a number that has exactly two divisors.

Example:

- 2 is prime (two divisors: 1 and 2).
- 3 is prime (two divisors: 1 and 3).
- 4 is not prime (three divisors: 1, 2, and 4).

Theorem: Prime numbers

There is no largest prime number.

Proof:

1. Suppose *p* were the largest prime number.

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- 1. Suppose p were the largest prime number.
- 2. Let q be the product of the first p numbers.
- 3. Then q+1 is not divisible by any of them.
- 4. But q + 1 is greater than 1, thus divisible by some prime number not in the first p numbers.

The proof used reductio ad absurdum.

What's Still To Do?

- Answered Questions
 - How many primes are there?
- Open Questions
 - Is every even number the sum of two primes?

An Algorithm For Finding Prime Numbers.

FindPrimeNumbers

```
int main (void)
  std::vector<bool> is_prime (100, true);
  for (int i = 2; i < 100; i++)
  if (is_prime[i])
    std::cout << i << "_";
    for (int j = i; j < 100; is_prime [j] = false,
       j+=i);
    return 0;
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References I (1)

- [1] Noam Chomsky. Syntactic Structures. The Hague: Mouton, 1957.
- [2] William Labov. Sociolinguistic Patterns. Philadelphia: University of Pennsylvania Press, 1972.