Introduction to Algorithms Lecture 1

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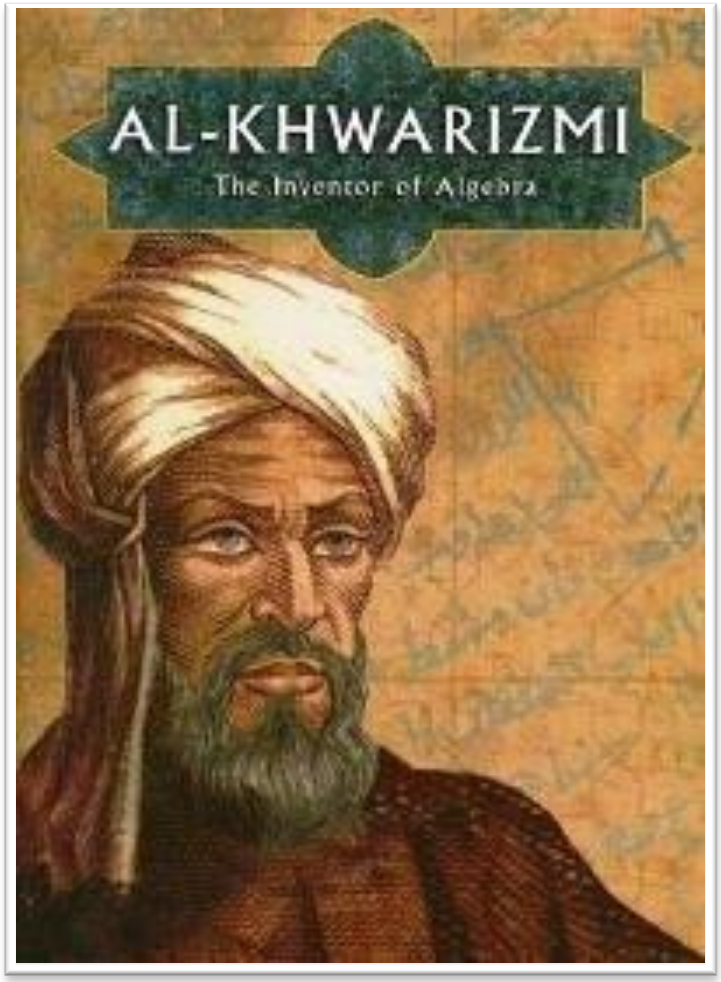
Algorithm (noun.)

- Word used by programmers when…
  they don’t want to explain what they did.



Gradation Policy

- Assignments will be checked by practice teacher on practice sessions or office hours.

- You can submit them for 100% in one week after lecture, or for 70% next week.

- To pass the course you have to submit at least 4 assignments

- Students with attendance less than 30% will get Fail.

Attendance (extra)	– 10%
Assignments	~ 30%
Quizzes	~ 20%
Midterm exam	– 20%
Final exam	– 30%

http://www.acmp.ru
http://www.codeforces.com
https://www.hackerrank.com

Some of the assignments will be given from above links.

You may spend your free time on this sites to improve skills.

Edmodo Group code: **bcbbrb**

Outline

- Loops
- Find divisors of N
- Perfect number
- Odd number of divisors
- Palindrome
- Sum of digits
- Numeral system
- Zero sequence

Loops

Loops Vocabulary

- Iteration
- Continuation condition
- Statement
- continue statement
- break statement

Find divisors of N

Find divisors of N

1. For i = 1 to N do
2. if N mod i = 0 then
3. output i

Perfect number

Perfect number – is equal to the sum of divisors excluding the number itself

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1.  For N = 1 to M do
2.     sum = 0
3.     For i = 1 to N div 2 do
4.       if N mod i = 0 then
5.             sum = sum + i
6.     if sum = N then
7.       output N + ” is perfect number”
```

Odd number of divisors

- How many numbers between 1 and 10000 have odd number of divisors.

Palindrome

Palindrome – text that is same if letters are in reverse order

1. S = “madam”
2. For i = length(S) downto 1 do
3. T = T + S[i]
4.
5. if S=T then
6. output “It is palindrome”
7. else
8. output “It is not palindrome”

Palindrome – better solution

1. S = “talgat”
2. H = true
3. n = length(S)
4. For i = 1 to n div 2 do
5. if S[i] ≠ S[n – i + 1] then
6. H = false
7. break
8. if H = true then
9. output “It is Palindrome”
10. else
11. output “It is not Palindrome”

Sum of digits

Sum of digits

1. S = “38164913”
2. sum = 0
3. For i = 1 to length(S) do
4. sum = sum + (S[i] – ‘0’)
5. output sum

Divisibility rules

- How to find that number, of length 10000 digits, is divisible by 7.

HomeWork

First question:

- Zero sequence
- S = “10011010011**0000**1010001”
- Find length of longest consecutive ‘0’ sequence.
- For this example is 4.

Second question:

- Katya selects two numbers X and Y less than 10^6.
- Then tells Vasya sum, and product of X and Y.
- Write a program to help Vasya find X and Y.