Computer Programming

Prof. Deepak B Phatak
Prof. Supratik Chakraborty
Department of Computer Science and Engineering
IIT Bombay

Session: Computational Procedure

Recap

IIT Bombay

- We have seen
  - Written procedures for complex activities
  - Procedures must first be understood, then executed

Overview of This Lecture

- A Computational Procedure
- How a ‘Program’ would be executed by a Computer

A Computational Procedure

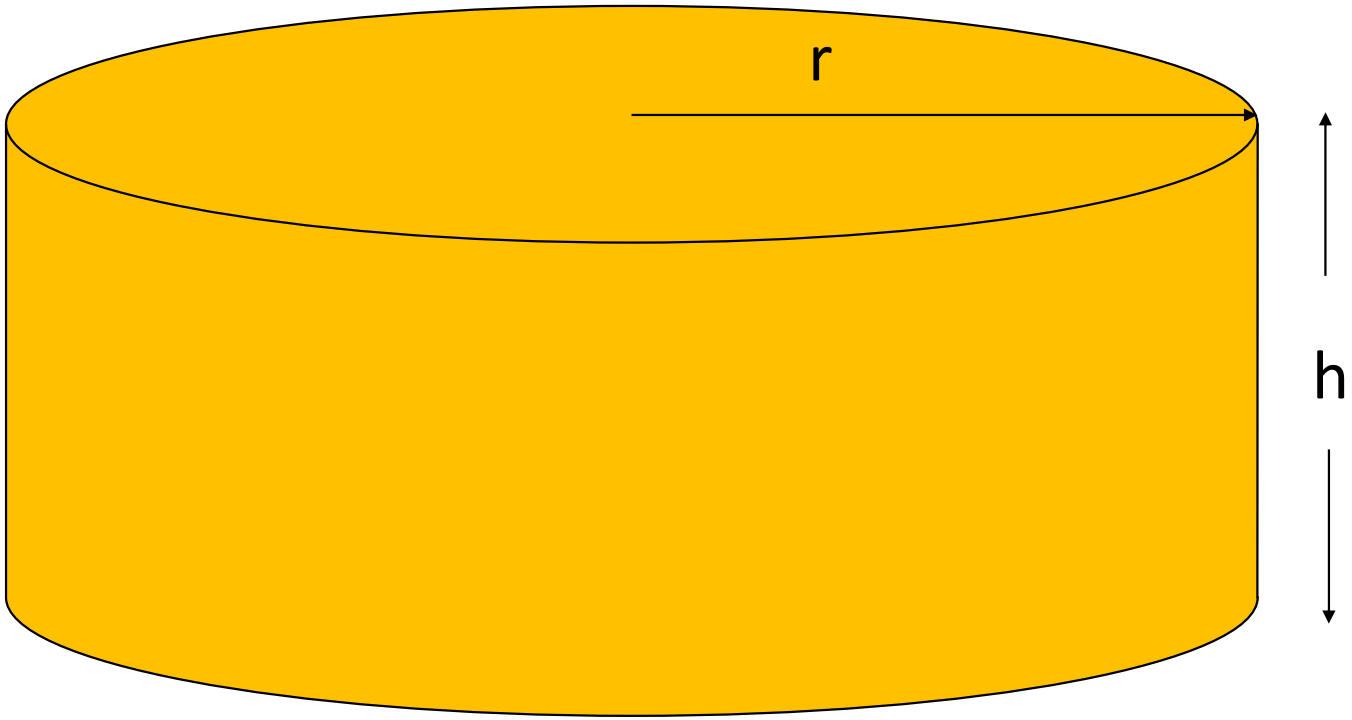
IIT Bombay

Problem

- A tank has been erected in our yard to store water
- We want to paint it, to prevent rusting
- Given the painting charges in Rs. per sq. meter, what will be the cost of painting the entire tank, along with its top cover?

Calculating the Surface Area

IIT Bombay



Calculating Surface Area …

IIT Bombay

- Surface area of a tank to be painted
  - (radius r and height h)

    = area of the outer surface

    + area of the top circular cover
- Area of surface = $2\pi rh$
- Area of circular cover = πr^2

Procedure for Computing Painting Cost

IIT Bombay

- Get from me, value of painting price P in Rs per sq. meter
- Get from me, values of radius R, and height H
- Calculate area A

$$A = 2\pi RH + \pi R^2$$

- Calculate cost C

$$C = PA$$

Procedure

IIT Bombay

- Get from me, value of painting price P in Rs per sq. meter
- Get from me, values of radius R, and height H
- Calculate area A

$$A = 2\pi RH + \pi R^2$$

- Calculate cost C

$$C = PA$$

- Give me the value of C

Programs

IIT Bombay

- We write procedures to be executed by a computer
- Such procedures are called ‘Programs’
- A computer is capable of doing the following:
  - First ‘read’ the entire program and ‘Understand’ all instructions (‘Translation’ or ‘Compilation’)
  - Carry out instructions of the program, one by one, in the stipulated order (‘Execution’)

Live experience with a hypothetical 'program'

- Next slide shows a test program. Instructions in that program can be easily carried out by a human

- Compile and execute that program.
- Try to work as correctly, and as quickly, as a computer can!!
- How fast can you be?

Good luck

Compile and Execute this program

1. Raise one of your hands
2. Put down your raised hand
3. Close your eyes and count loudly up to 10
4. Loudly say ‘Ha Ha Ha’
5. Write the value of Pi (π) correct to 3 decimal places
6. Speak loudly the name of your mother tongue
7. Clap three times
8. While executing this program, ignore all earlier instructions and just raise both hands

Capabilities of a Computer

IIT Bombay

- Ability to handle numerical values
  - 257, -78, 4.675, etc.
  - Large and small values (1.4E18, 0.356E-9)
- Ability to carry out numerical operations
  - Add (‘+’), Subtract (‘-’),
  - Multiply (‘*’), divide (‘/’), ...

Capabilities of a Computer …

- Ability to collect values from as input, and to give back to us the calculated results, as output
- Ability to store these values temporarily
  - Notion of a ‘memory’ location
  - Ability to refer to locations by symbolic names

Summary

IIT Bombay

- Computer Programs are usually computational procedures
- These will generally Involve
  - Collecting some input values from the user
  - Performing calculations and getting some ‘result’ values
  - Giving back the result values as output