Chapter 2

Problem Solving using Computer

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Problem Solving Using Computer

Steps

1) **P**roblem Analysis
2) **D**esign
3) **C**oding
4) **C**ompilation & Execution
5) **D**ebugging & Testing
6) **D**ocumentation

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Selected Project Title

Select Project Title

1. Student Mgmt. System,
2. Employee Mgmt. System,
3. Library System,
4. eAttendance Mgmt. System,
5. Pharmacy Mgmt. System,
6. Blood Bank Mgmt. System,
7. Kitchen Recipie
8. Workers' Time Logger
9. Hospital Mgmt. System,
10. Hotel Reservation System,
11. Inventory Mgmt. System,
12. Canteen Billing System,
13. Task Reminder
14. Number Plate Registration System,
15. Tax Payment System,
16. eWallet,
17. Mini-Mart Billing System,
18. Tourist Entry Logger,
19. Feedback Mgmt. System,
20. Project Info. System,
21. Khwopa Quiz
22. Class Routine Mgmt. System
23. Bank Mgmt. System
24. Student Payroll System
25. Break-Game
26. Land Converter
27. Prescription Log
28. Tic-tac-toe
29. Bag Chal
30. Hostel Mgmt. System
31. Date Converter
32. Marksheet Generator
33. Hangman
34. Scientific Calculator
35. Telephone Directory
36. eVoting
37. Puzzle
38. Data Encryption/Decryption
39. Data Compression

Selected by BEL 2075

C-Project Title (BEL 2075 Batch)

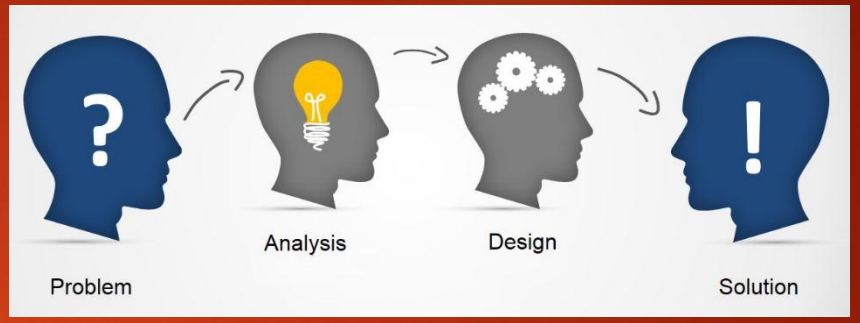
1. Student Mgmt. System,
2. Library System,
3. Kitchen Recipe
4. eWallet,
5. Khwopa Quiz,
6. Class Routine Mgmt. System,
7. Break-Game,
8. Date Converter,
9. Marksheet Generator,
10. Hangman,
11. Scientific Calculator &
12. Data Encryption/Decryption

Selected By BCT EL 2075

Select Project Title

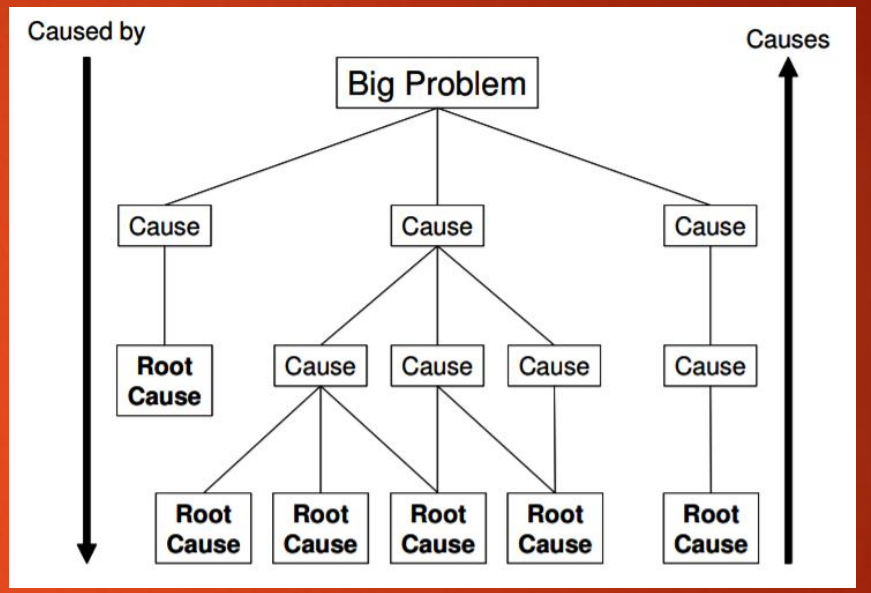
1. Pharmacy Mgmt. System,
2. Workers' Time Logger
3. Hospital Mgmt. System,
4. Hotel Reservation System,
5. Task Reminder
6. Mini-Mart Billing System,
7. Tourist Entry Logger,
8. Bank Mgmt. System
9. Land Converter
10. Tic-tac-toe
11. Telephone Directory
12. eVoting

1. Problem Analysis



Problem Analysis

a) Objectives
b) Output Requirements
c) Input Requirements
d) Processing Requirements
e) Evaluating Feasibility



Problem Analysis: Design a program to calculate area of circle?

Radius, Pi → Calculate → Area

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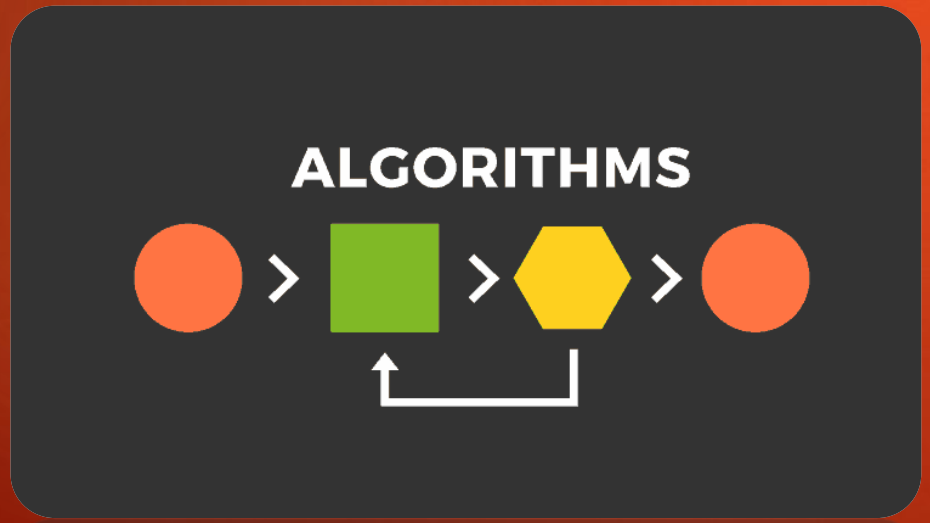
2. Program Design

Algorithm Development

Features of Algorithm

- Sequence
- Decision
- Repetition



Flowcharting

Advantages

- Communication
- Effective Analysis
- Proper Documentation
- Efficient Coding
- Easy in Debugging & Maintenance

Limitations

- Complex Logic
- Difficulty in Alteration & Modifications

2.1 Algorithm

- a process or set of rules to be followed in calculations or other problem-solving operations

Basic Guidelines to prepare Algorithms

- Use plain language
- Do not use any language specific syntax. One must be able to code the algorithm in any programming language.
- Do not assume anything stating everything clearly and explicitly.
- Ensure each algorithm has a *single entry & exit point*.

Write an algorithm to calculate area of circle.

Steps

Step1: Start

Step2: Define constant variable PI which holds value 3.1415

Step3: Define variables: radius, area

Step4: Read radius

Step5: Calculate Area of Circle:

area = PI * radius * radius

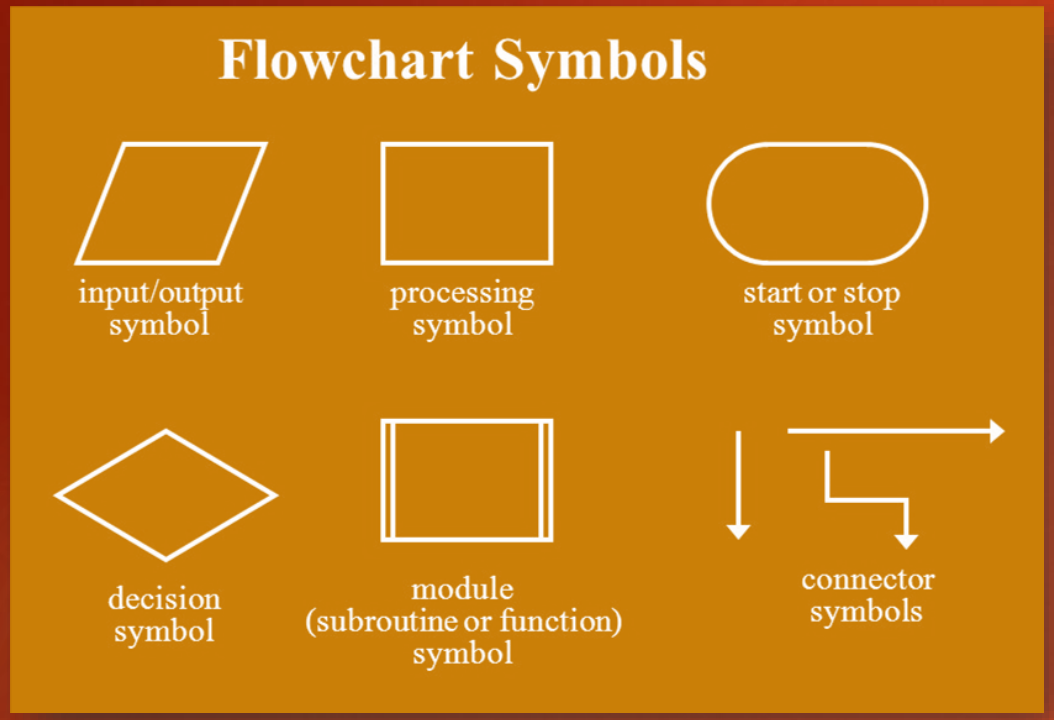
Step6: Display area of circle

Step7: Stop

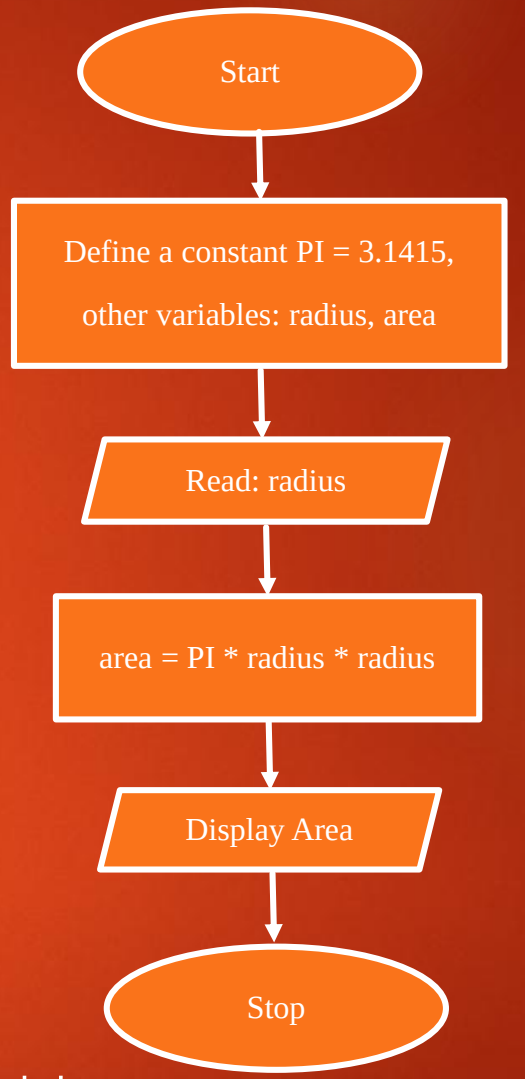
Other Problems:

1. Write an algorithm to calculate simple interest. (SI = PTR/100)
2. Write an algorithm to determine a number whether it is positive or negative.
3. Write an algorithm to test a number for even or odd.
4. Write an algorithm to find the largest among three numbers.
5. Write an algorithm for finding the sum of series 1+2+3+4+… up to n terms

2.2 Flowchart

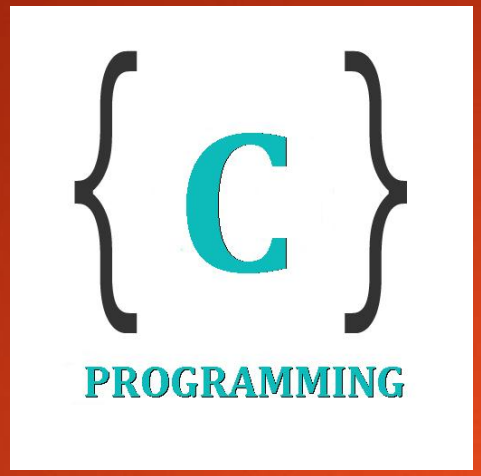


Flowchart to calculate area of circle:



1. Draw a flowchart to calculate simple interest.
2. Draw a flowchart to test positive or negative no.
3. Draw a flowchart to test a number for even or odd.
4. Draw a flowchart to find the largest among three numbers.
5. Draw a flowchart for finding the sum of series 1+2+3+4+… up to n terms

Coding



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AREA.C

```
#include<stdio.h>
#include<conio.h>
#define PI 3.1415

void main(){
        float radius, area;
        clrscr();
        printf("Enter radius to calculate area of circle: ");
        scanf("%f",&radius);
        area = PI*radius*radius;
        printf("\nArea = %f", area);
        getch();
}
```

11:35

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```
Enter radius to calculate area of circle: 5

Area = 78.537498
```

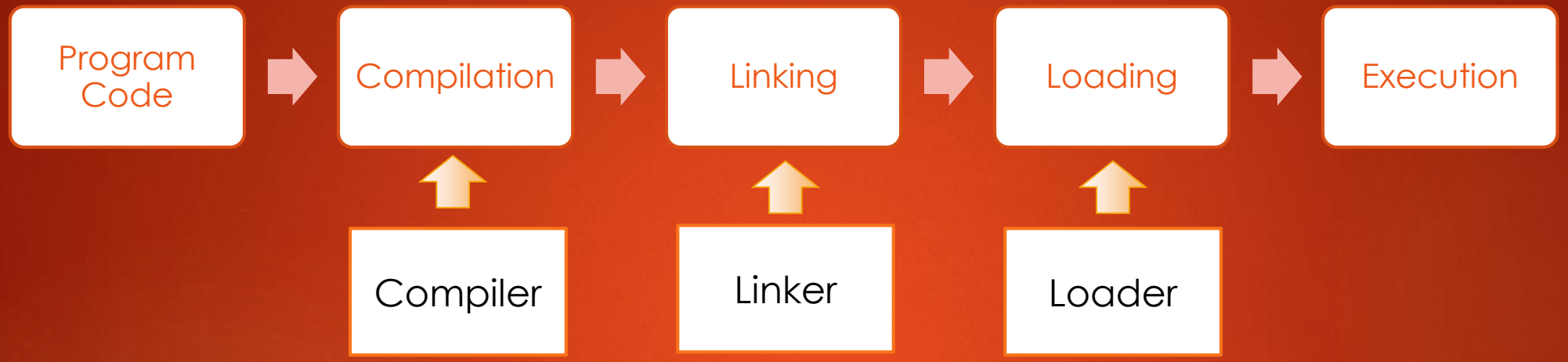
Write an algorithm, flowchart & program code for the following problems:

1. Test a number entered by user is exactly divisible by 5 but not by 7.

   Hint: r1<-n mod 5, r2<-n mod 7
2. Calculate sum of digits of positive integer.

   Hint: r<-n mod 10; s=s+r; n<-n/10
3. Check whether a positive integer is any power of 2 or not

Compilation & Execution



Compilation Process

1. Pre-processing
2. Compilation
3. Assembling &
4. Linking

- The process of changing high level language into machine level language is known as compilation. [Conversion to Object Program]
- During execution, the program may ask for user for inputs and generates outputs after processing the inputs.

Debugging & Testing

Debugging - Process of finding & resolving defects or problems within a computer program

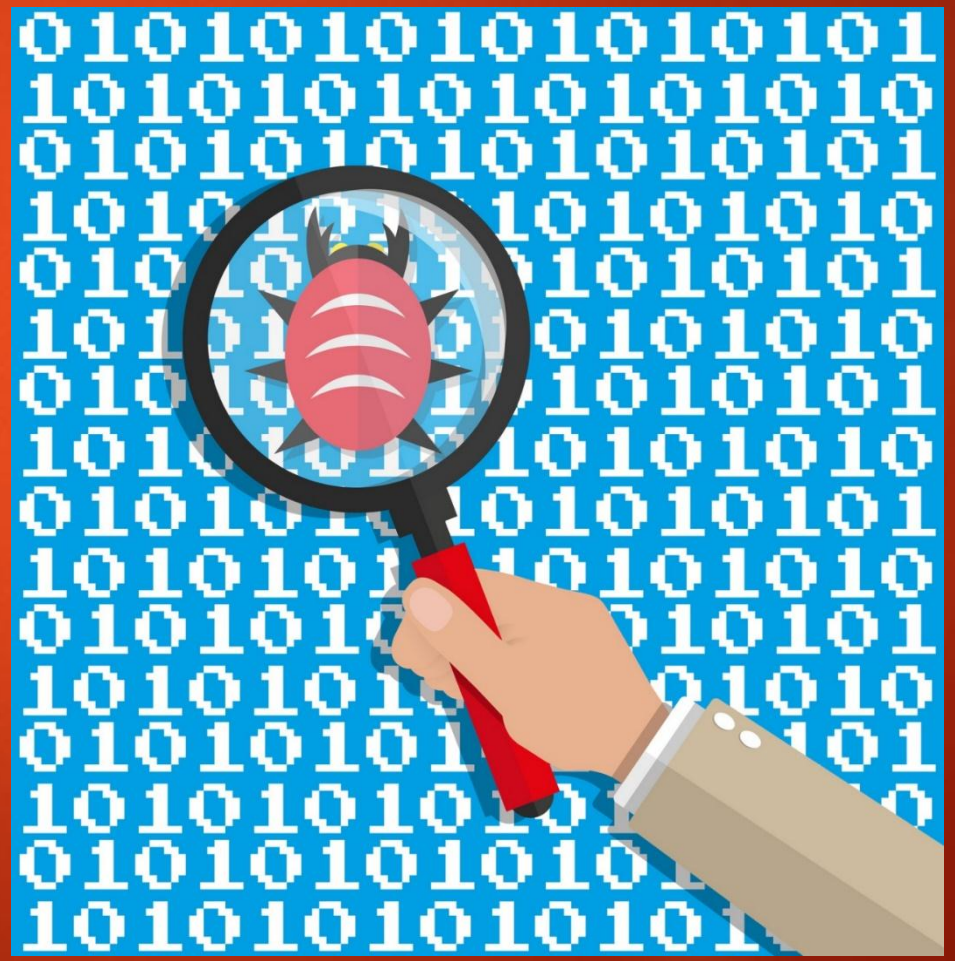
Testing - Activity to check whether the actual results match the expected results and to ensure that the software system is Defect free.

Tools for debugging process

- Watch Values
- Stepping (F7)
- Simulators
- Logic Analyzer
- Breakpoints
- Trace Routines
- Software Interrupts

Error Category

- Syntax Error
- Semantic Error
- Runtime Error
  - Memory Overflow
  - Floating Point Error



Program Documentation

Techniques for Program Documentations

- Diagrams
  - Flowchart,
  - Data Flow Diagram (DFD),
  - E-R Diagram (ERD)
- Comments
- Memory Maps
- Parameter & Definition Lists

Types of Documentations

1. Technical Documentation
2. User Manual

Class Works

- Write an algorithm & flowchart for a program which allows to read N from user and display sum of only even numbers from 1 to N.
- Write an algorithm & flowchart for computing the sum of digits of any number.

Pseudo Code

- Dummy sequence of instructions to Computer
- Mixture of structured English & code

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Write a pseudo code to calculate Simple Interest.

Pseudo Code:

```
Begin
    Read values of P, T, R
    Calculate P*T*R/100
    & assign to variable I
    (I <- P*T*R/100)
    Display I
End
```

- Write a pseudo code to read marks of a student in Computer Programming and display whether s/he is pass or fail in the exam. The pass Mark is 40.
- Write a pseudo code to read three integers and display the lowest among them.
- Write a pseudo code to read a non-zero positive integer and display the count of odd and even digits in it. E.g. 123 => odd = 2, even = 1

Q/A?

Thank You!

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