System Numbering in Computer Science

This presentation explores the fundamental concept of number systems in computer science, covering their definitions, applications, and conversion methods.

Road Map for Today

01

NUMBERINGNUMBRING

All about the contains •

02

TYPES OF SYSTEM NUMBERING

03

FLOWCHARTS

04

SIMPLE ALGORITHM

WITH FLOWCHARTS

by Saifullah Haidari

Introduction

1

What is a Number System?

A number system defines a set of values to represent a quantity.

2

Examples

Decimal (Base 10), Binary (Base 2), Octal (Base 8), Hexadecimal (Base 16).

3

Usage

Used in various computing processes, data representation, and communication between computers.

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The Decimal Number System (Base 10)

Digits

0, 1, 2, 3, 4, 5, 6, 7, 8, 9.

Example

345 = 3 * 10^2 + 4 * 10^1 + 5 * 10^0.

Usage

The standard system for human-centric calculations.

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The Binary Number System (Base 2)

Digits

0, 1.

Example

1011 (Binary) = 1 * 2^3 + 0 * 2^2 + 1 * 2^1 + 1 * 2^0 = 11 (Decimal).

Usage

Core system for digital electronics and computers.

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The Octal Number System (Base 8)

Digits	0, 1, 2, 3, 4, 5, 6, 7
Example	17 (Octal) = 1 * 8^1 + 7 * 8^0 = 15 (Decimal)
Usage	Sometimes used in computing as a shorthand for binary numbers.

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The Hexadecimal Number System (Base 16)

1

Digits

0-9, A (10), B (11), C (12), D (13), E (14), F (15).

2

Example

1A3 (Hex) = 1 * 16^2 + 10 * 16^1 + 3 * 16^0 = 419 (Decimal).

3

Usage

Widely used in computing for memory addresses and color codes in web design designing, ip addressing, web programming languages like HTML CSS .

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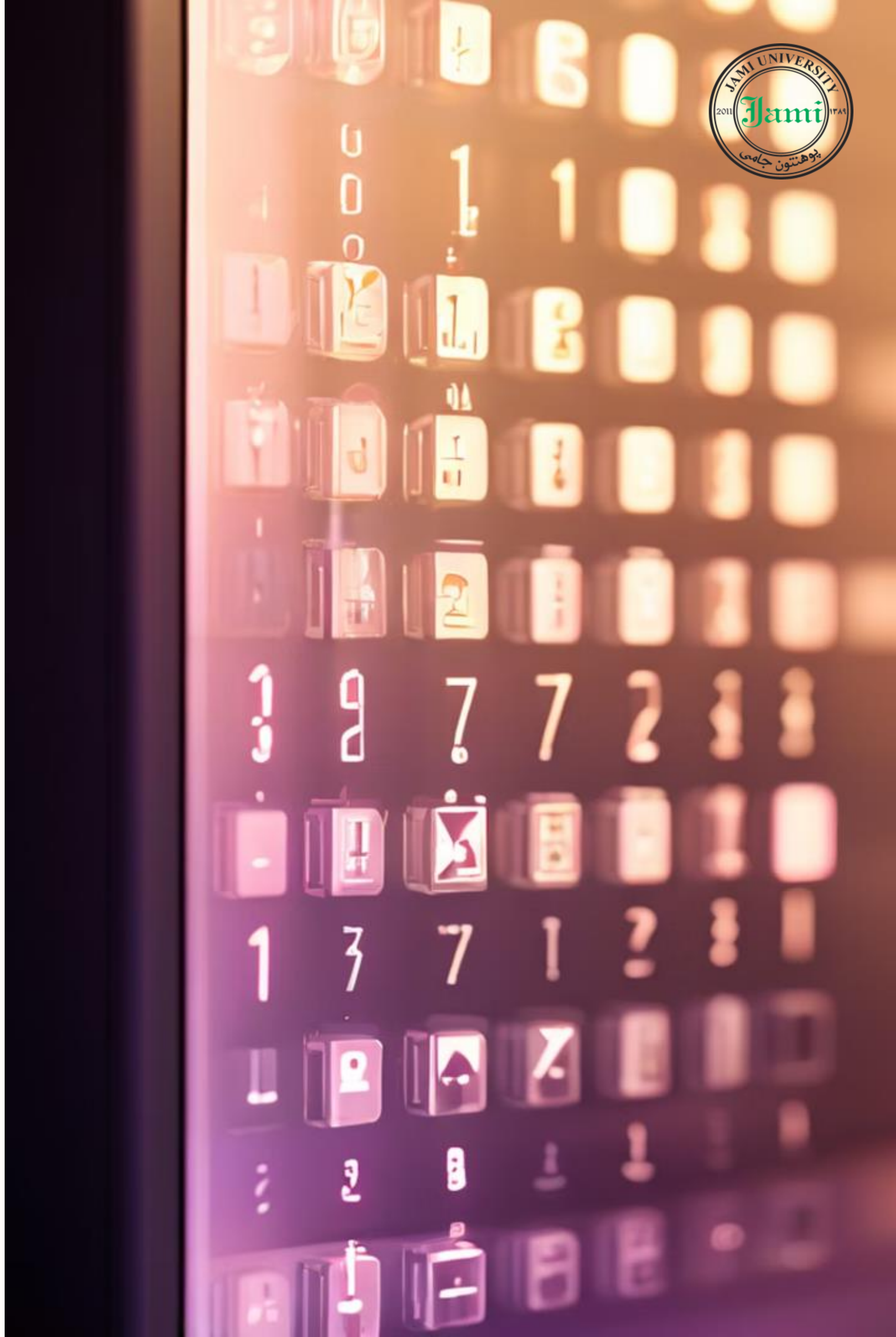

Conversion Methods

1

Binary to Decimal

Multiply each bit by 2 raised to the position’s power.

Ex: $(01010)_2=(?)_{10}$ ➔ $0*2^4+1*2^3+0*2^2+1*2^1+0*2^0$ =0+8+0+2+0=10

2

Decimal to Binary

Divide the number by 2, keep track of remainders.

Ex: $(10)_{10}=(?)_2$ ➔ 10/2=5 reminder=0 5/2=2 reminder=1 2/2=1 reminder=0 finally 1 is remain so $(01010)_2$

3

Hexadecimal to Binary

Convert each digit to its 4-bit binary equivalent.

Ex: $(A25)_{16}=(?)_2$ ➔ A=10=1010 2=0010 5=0101 so $(101000100101)_2$

4

Octal to Binary

Convert each digit to its 3-bit binary equivalent.

Ex: $(545)_8=(?)_2$ ➔ 5=0101 4=0100 5=0101 so $(010101000101)_2$

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Conversion Examples

Binary to Decimal

Multiply each bit by 2 raised to the position’s power.

1101 (Binary) = 13 (Decimal)

Decimal to Binary

Divide the number by 2, keep track of remainders.

25 (Decimal) = 11001 (Binary)

Hexadecimal to Decimal

Ex: $(2f)_{16}=(?)_{10}$ ➔ $2*16^1 + 15*16^0=15+32=47$

2F (Hex) = 47 (Decimal)

Octal to Binary

Convert each digit to its 3-bit binary equivalent.

71 (Octal) = 111001 (Binary)

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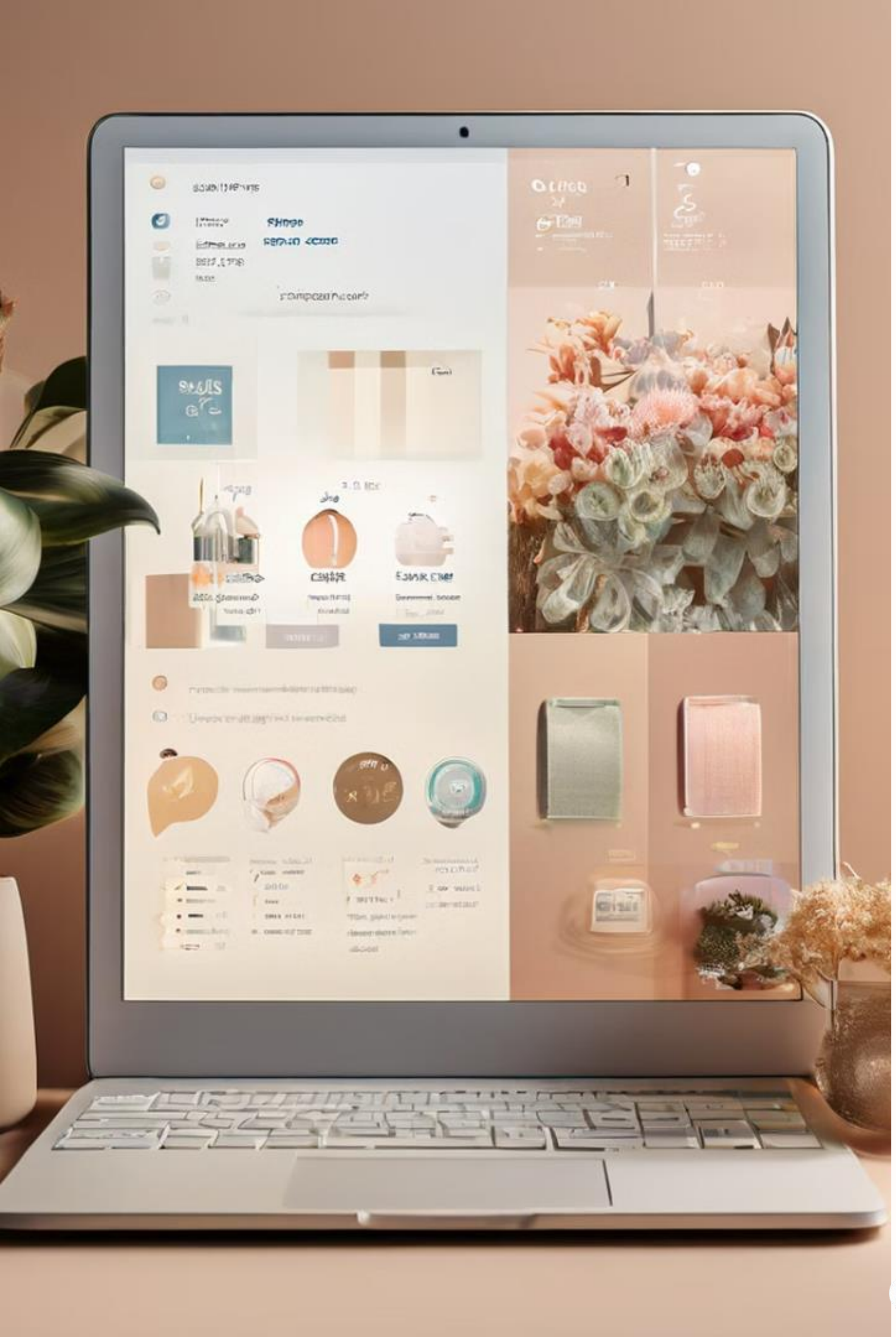

Practical Applications

1 **Binary**

Used in data storage, processing, and transmission.

2 **Hexadecimal**

Simplifies binary representation for programming and debugging Ip addressing web designing .

3 **Decimal**

Everyday calculations and transactions.

4 **Octal**

Used in legacy computing systems and clock system .

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Flowcharts: A Visual Guide to Programming

Flowcharts are a powerful tool for visualizing and understanding algorithms and program execution steps. They provide a clear and concise representation of the logic and flow of a program, making it easier to comprehend and debug.

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Adding Two Numbers

1 **Start**

The flowchart begins with a start symbol, indicating the beginning of the program.

2 **Input Numbers**

Two numbers, A and B, are inputted from the user.

3 **Calculate Sum**

The sum of A and B is calculated and stored in a variable C.

4 **Display Sum**

The calculated sum, C, is displayed to the user.

5 **End**

The flowchart ends with an end symbol, indicating the completion of the program.

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Determining Even or Odd

1

Start

The flowchart begins with a start symbol, indicating the beginning of the program.

2

Input Number

A number, N, is inputted from the user.

3

Calculate Remainder

The remainder of dividing N by 2 is calculated and stored in a variable R.

4

Check Remainder

The flowchart checks if R is equal to 0.

5

Output Result

If R is 0, the program outputs "Even". If R is 1, the program outputs "Odd".

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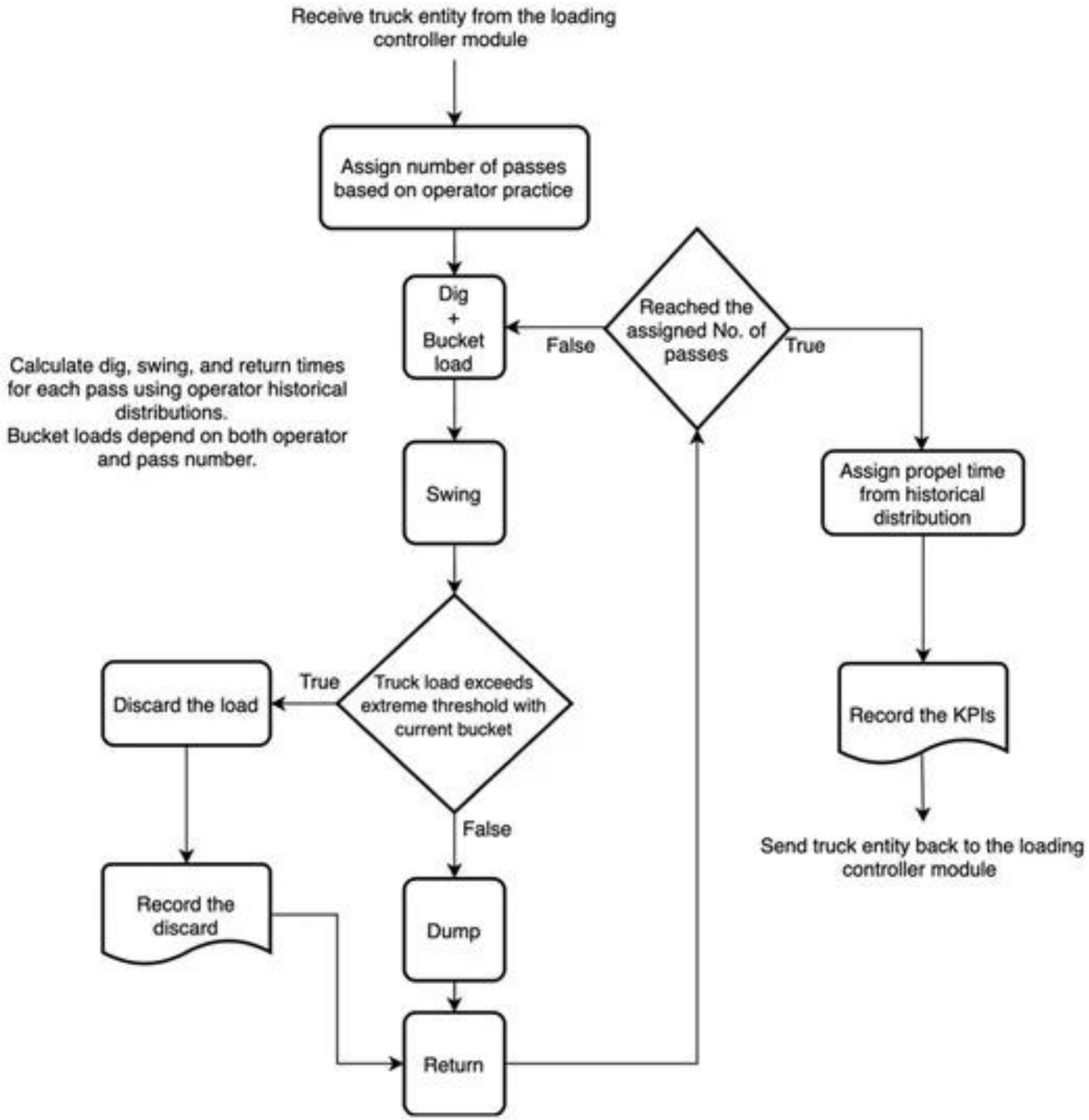

Receive truck entity from the loading controller module

Assign number of passes based on operator practice

Dig + Bucket load

Calculate dig, swing, and return times for each pass using operator historical distributions.
Bucket loads depend on both operator and pass number.

Swing

Truck load exceeds extreme threshold with current bucket

True

Discard the load

Record the discard

False

Dump

Return

Reached the assigned No. of passes

False

True

Assign propel time from historical distribution

Record the KPIs

Send truck entity back to the loading controller module

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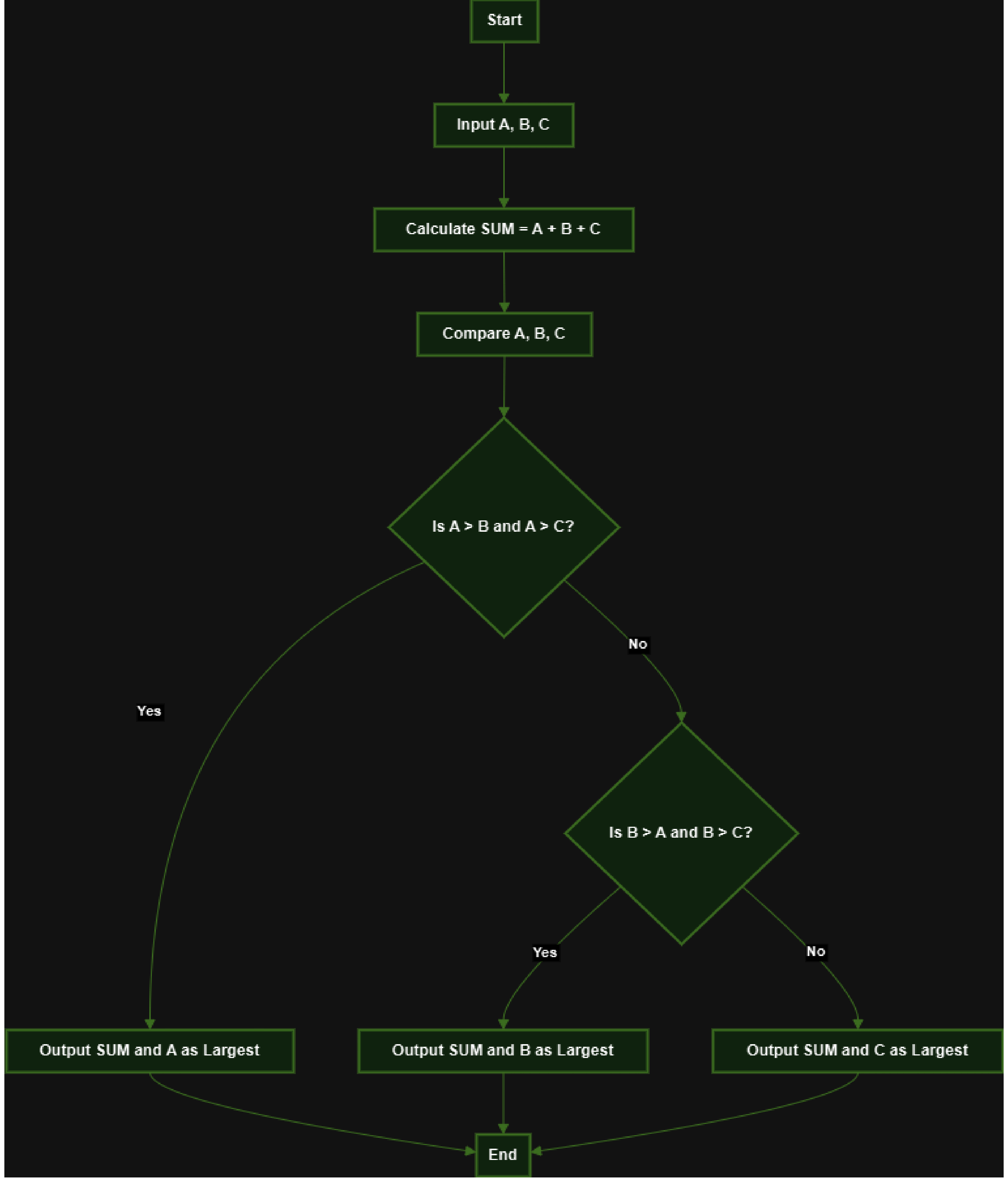
Ex 1:

```
                v

          Input A, B, C

                |

                v

     Calculate SUM = A + B + C

                |

                v

         Compare A, B, C

              / | \

              / | \

         A>B? B>C? C>A?

              | | |

          Yes Yes Yes

              | | |

Largest = A Largest = B Largest = C

              | | |

              v v v

   Output SUM and Largest Number

                |

                v

               End
```



Start
Input A, B, C
Calculate SUM = A + B + C
Compare A, B, C
Is A > B and A > C?
Yes
No
Is B > A and B > C?
Yes
No
Output SUM and A as Largest
Output SUM and B as Largest
Output SUM and C as Largest
End

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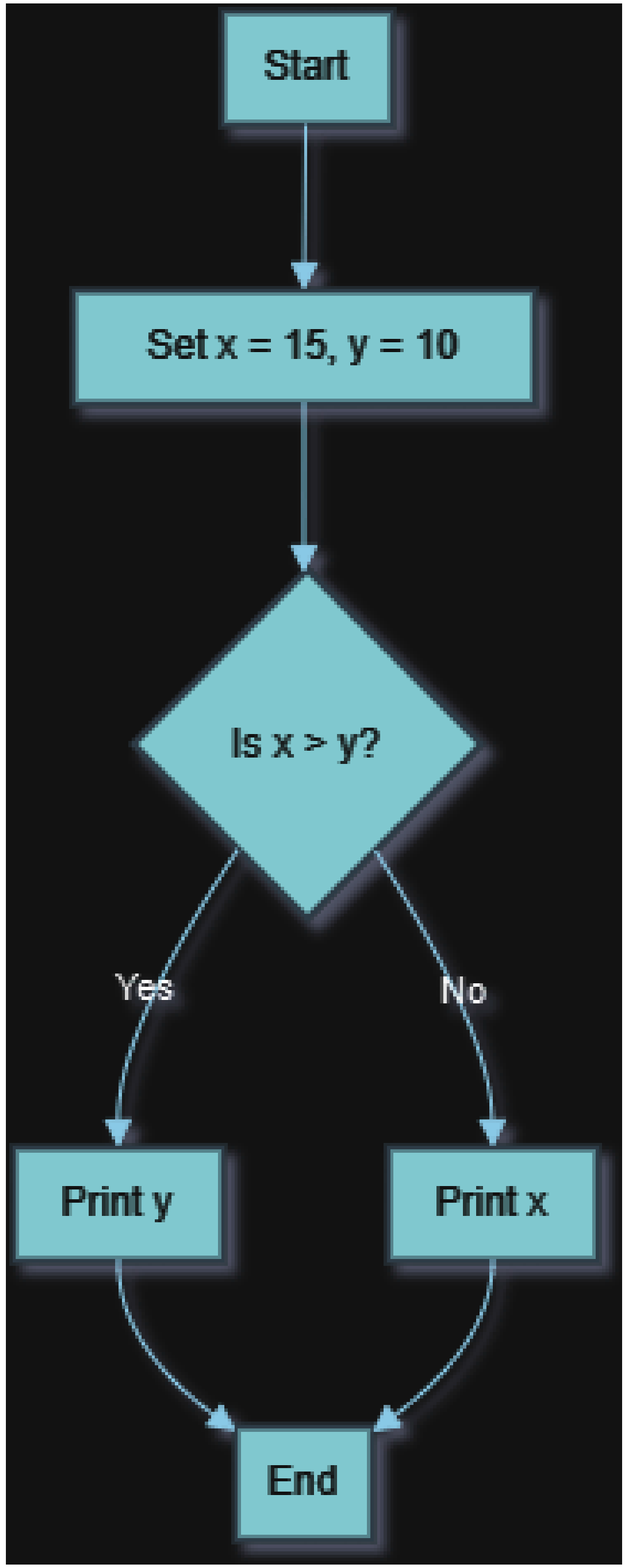
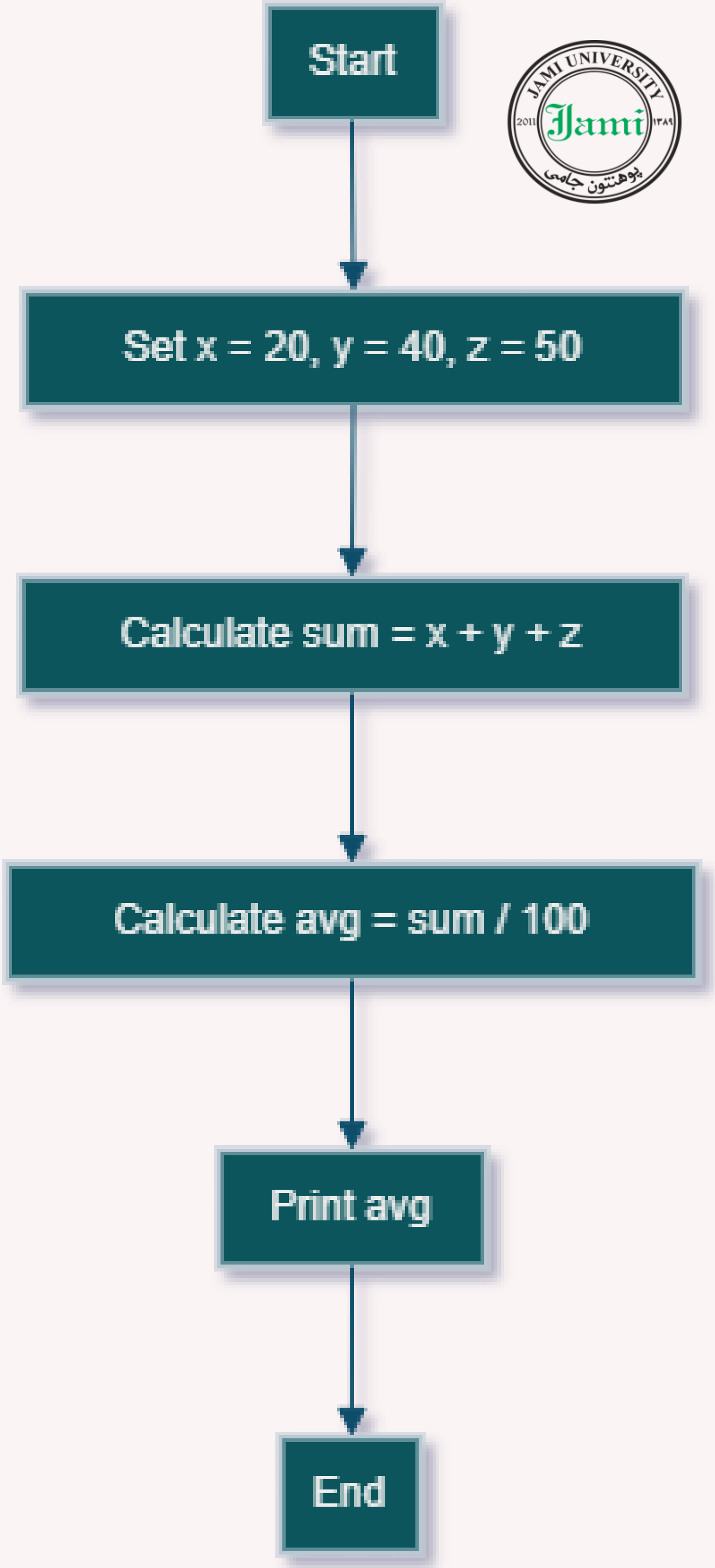
Ex:2

```
start
x=15
y=10
if x>y
print y
else
print x
end
```



Ex 3:

```
start
x=20;
y=40;
z=50;
sum=x+y+z
avg=sum/100
print avd
end
```


Start
Set x = 20, y = 40, z = 50
Calculate sum = x + y + z
Calculate avg = sum / 100
Print avg
End

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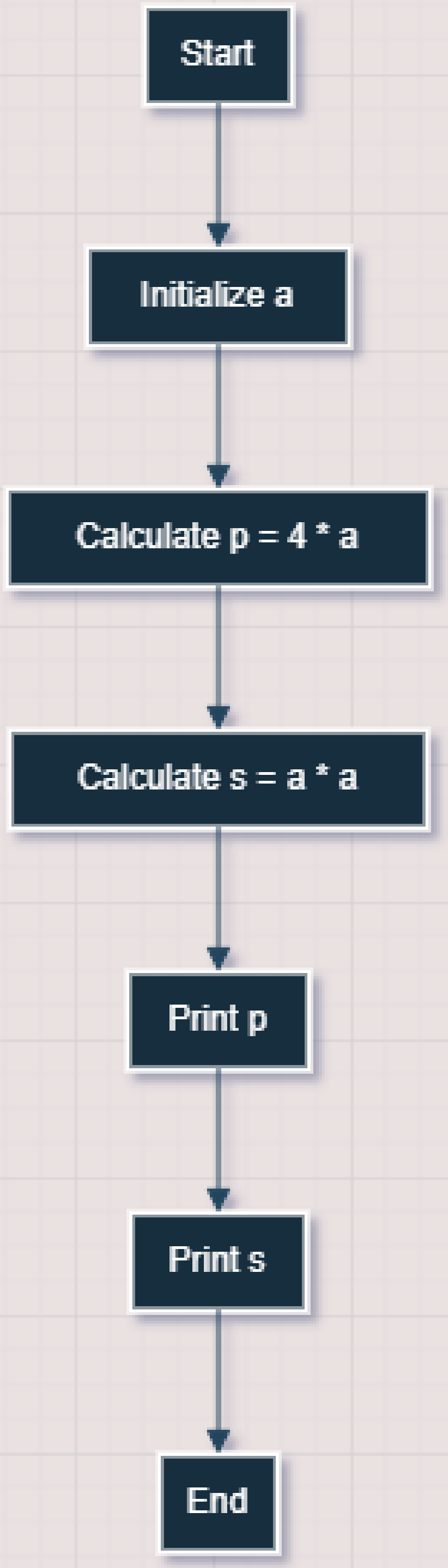
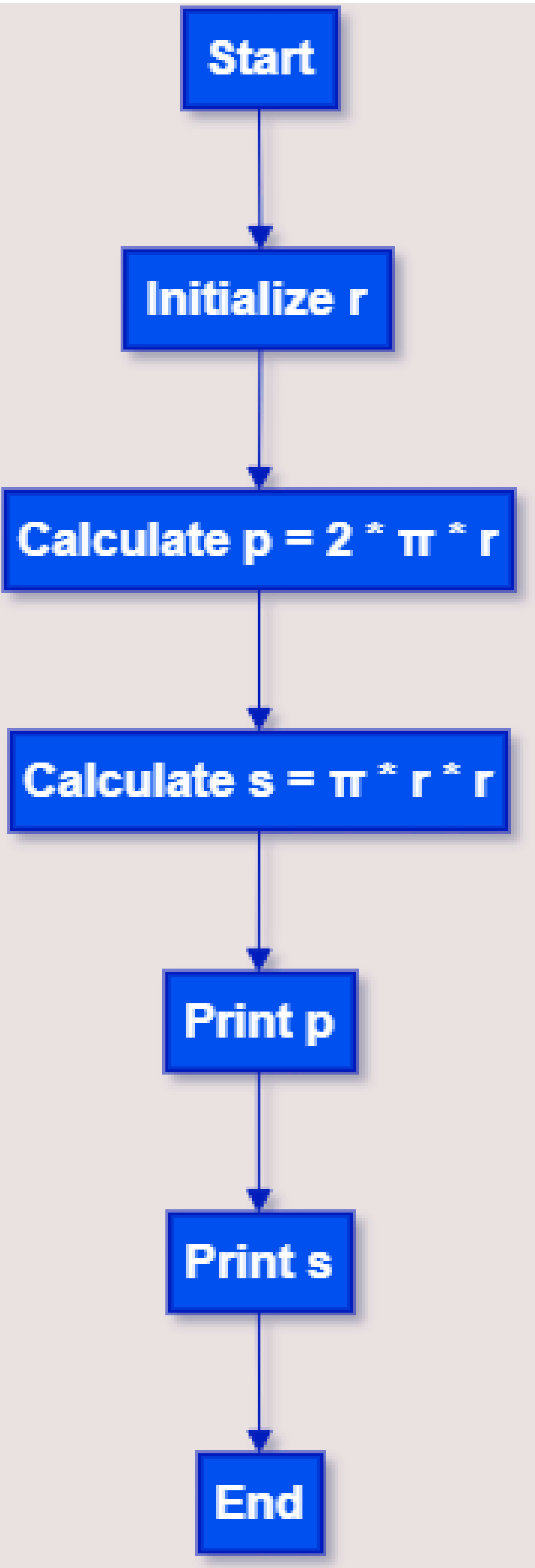


```
Ex_4

start

int a

p=(4*a)

s=(a*a)

print p

print s

end
```

```
Ex_5

start

int r

p=2*pi*r

s=pi*r*r

print p

print s

end
```



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Calculating the Average of Three Numbers

Input Numbers

The flowchart begins by taking three numbers, A, B, and C, as input from the user.

Calculate Average

The average of the three numbers is calculated by summing them and dividing by 3, storing the result in a variable M.

Display Average

The calculated average, M, is displayed to the user.

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Identifying Positive, Negative, or Zero

Start	The flowchart begins with a start symbol, indicating the beginning of the program.
Input Number	A number, N, is inputted from the user.
Check Condition 1	The flowchart checks if N is greater than 0.
Output Positive	If N is greater than 0, the program outputs "Positive".
Check Condition 2	The flowchart checks if N is less than 0.
Output Negative	If N is less than 0, the program outputs "Negative".
Output Zero	If N is equal to 0, the program outputs "Zero".
End	The flowchart ends with an end symbol, indicating the completion of the program.

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As a conclusion of this lesson

NUMBERING	TYPES OF SYSTEM NUMBERING
USAGES	FLOWCHART
ALGORITHM AND FLOW CHART	examples

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Thanks!

Do you have any questions?
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Please keep this slide for your future