

# Final Exam Review

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Introduction to Computer  
Science Using C

Vincent Zhang  
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# OUTLINE

1. Big O Notation
2. Organizing Large Software
3. C Programming
4. OOP
5. Coding



# 01 | Big O Notation

# Definition

$$f, g: \mathbb{Z}^{\geq 0} \rightarrow \mathbb{R}$$

$f$ : input size  $\rightarrow$  run time

$$\exists c \in \mathbb{R}^{>0}, \exists n_0 \in \mathbb{Z}^{\geq 1} \ni: \forall n \in \mathbb{Z} \geq n_0, f(n) \leq cg(n) \Rightarrow f(n) \in \mathcal{O}(g(n))$$
$$\overline{\lim}_{n \rightarrow \infty} \frac{f(n)}{g(n)} < \infty$$

$$1 < \log n < n < n \log n < n^2 < n^{k \in \mathbb{Z}^{\geq 3}} < a_{>1}^n < n! < n^n; \forall n \geq n_0$$

Ex.1: find Big-Oh of  $f(n) = 3 + n \% 2; \forall n \in \mathbb{N}$





## **02** | Organizing Large Software

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# Software Design / API

## Properties of Software

- Modularity
- Reusability
- Extendibility
- Maintainability
- Correctness
- Efficiency
- Openness
- Privacy and security

## Principles of Good Programming

- Return value
- Parameter order
- Short parameter list

## Properties of Good API For Clients

- Easy to learn and use
- Hard to misuse
- Easy to read and maintain code that uses it
- Appropriate to audience

## For Developers

- Easy to extend
- Does one thing well
- Easy to explain in simple terms
- Implementation dependent
- Good naming and documentation, performance
- Maximize information hiding
- Small size



# 03 | C Programming

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# Compilation Process in C

- Preprocessor: (.c; .h)  $\rightarrow$  .c
- Compiler: .c  $\rightarrow$  .s
- Assembler: .s  $\rightarrow$  .o
- Linker: (.o; ...; .o)  $\rightarrow$  (.exe, .out)







# 04 | OOP

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# Object Oriented Programming

Programming paradigm based on objects.

- Encapsulation
- Information hiding

## Class Components

- Member variables
- Member functions: (con/de)structor

## OOP Concepts

- Inheritance and Polymorphism
- Interface and Implementation





**05**

**Coding**

# THANKS!

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addyouremail@freepik.com  
+91 620 421 838  
yourcompany.com



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