Welcome to this CoGrammar Lecture: Introduction to Flowcharts and Basic Data Structures

The session will start shortly...

Questions? Drop them in the chat.
We'll have dedicated moderators answering questions.

Software Engineering Session Housekeeping

- The use of disrespectful language is prohibited in the questions, this is a supportive, learning environment for all - please engage accordingly. **(Fundamental British Values: Mutual Respect and Tolerance)**
- No question is daft or silly - **ask them!**
- There are **Q&A sessions** throughout this session, should you wish to ask any follow-up questions.
- If you have any questions outside of this lecture, or that are not answered during this lecture, please do submit these for upcoming Academic Sessions. You can submit these questions here: **Questions**

Software Engineering Session Housekeeping cont.

- For all **non-academic questions**, please submit a query: **www.hyperiondev.com/support**
- Report a **safeguarding** incident: **www.hyperiondev.com/safeguardreporting**
- We would love your **feedback** on lectures: **Feedback on Lectures**

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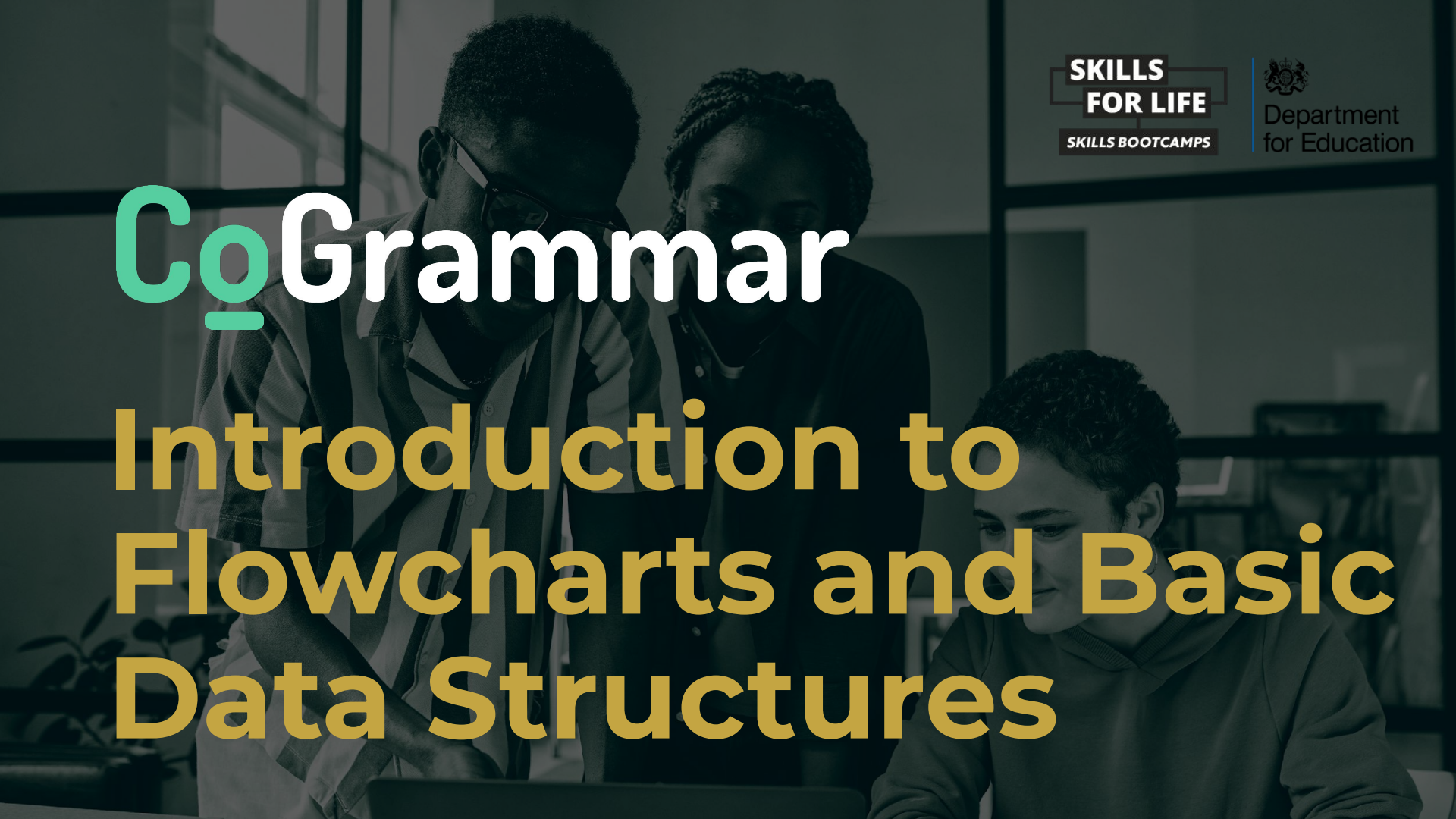
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Introduction to Flowcharts and Basic Data Structures

Learning Objectives & Outcomes

- Define flowcharts and their purpose in problem-solving.
- Identify the basic symbols used in flowcharting.
- Create simple flowcharts to represent algorithms.
- Explain the concept of data structures.
- Recognize the importance of data structures in efficient problem-solving.
- Identify common data structures: arrays, dictionaries, stacks, and queues.

Quote

A problem well-stated is half-solved. *Charles Kettering*

Poll

What is an algorithm?

1. A computer's hardware component.
2. A set of rules or steps to solve a problem.
3. A type of programming language.

Poll

What is the first step in breaking down a problem?

1. Start writing code immediately.
2. Guess the solution.
3. Understand the core problem

Introduction

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Source

Intuition

- Imagine you're designing a smart parking system. How would you track available parking spots? How would you quickly find the nearest empty space? These challenges require both visual planning (flowcharts) and efficient data organization (data structures).

Review of Pseudocode

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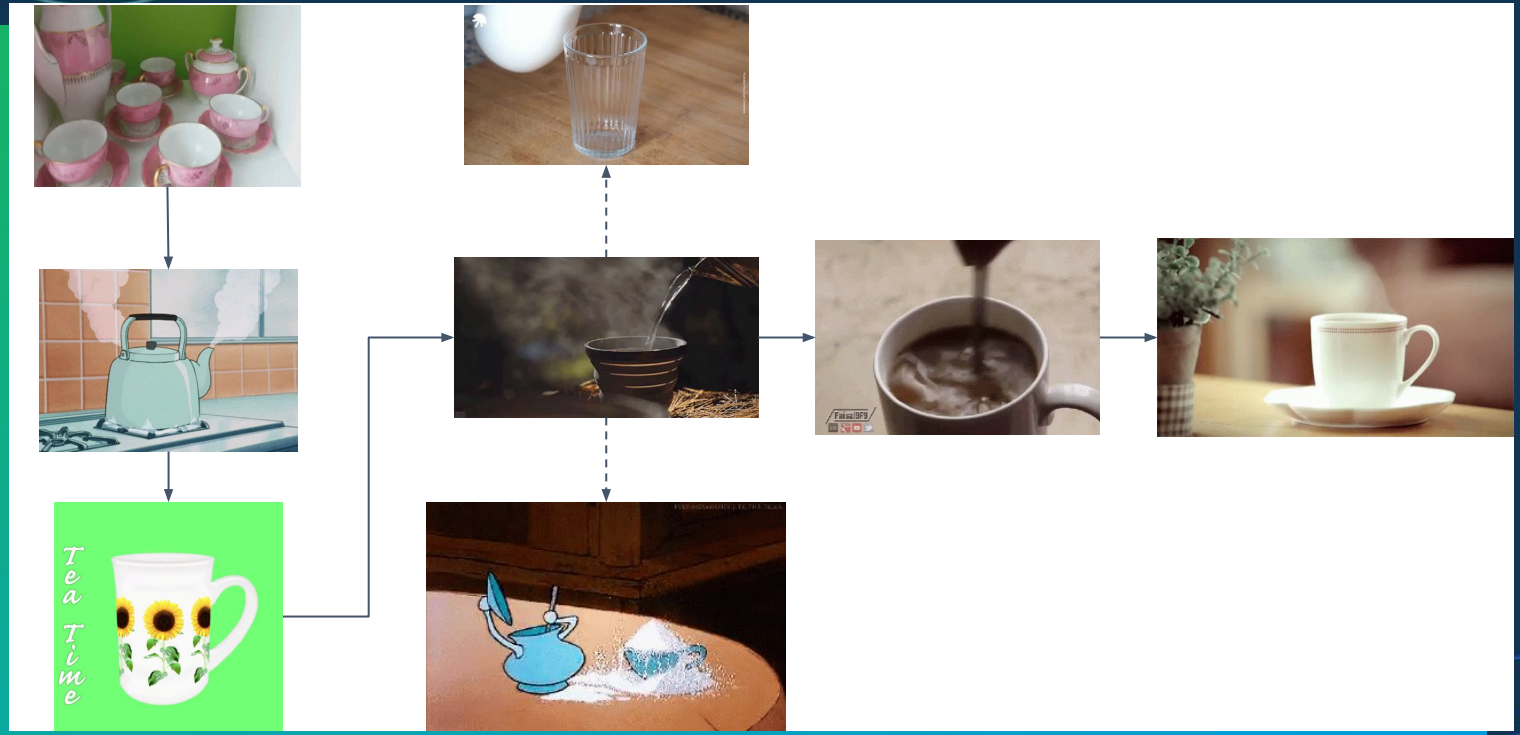
Definition and Importance

- What is Pseudocode?
  - A simple, plain-language way to describe step-by-step solutions.
  - Focuses on logic, not coding or syntax.
- Why Use Pseudocode?
  - Clarity: Breaks problems into clear, manageable steps.
  - Communication: Helps explain ideas to others without using code.
  - Planning: Creates a roadmap for problem-solving.

Example of Pseudocode: How to make tea



Key Benefits of Pseudocode

- Key Benefits
  - Helps **organize ideas** logically.
  - Simplifies complex problems into clear steps.
  - Makes it easier to check for errors or missing steps.

Transition to Flowcharts

- **Pseudocode to Flowcharts**
  - Pseudocode gives clear written steps.
  - Flowcharts turn those steps into a visual map.
- **What's Next?**
  - Learn how to represent processes visually.
  - Use flowcharts to simplify and share solutions.

Introduction to Flowcharts

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Flowcharts: A Visual Guide to Problem-Solving

- What are Flowcharts?
  - Visual representations of algorithms or processes.
  - **Purpose**: Show problem-solving steps in a clear and concise way.
- Why Use Flowcharts?
  - Easy to **understand** and follow.
  - Help identify **logical errors** and inefficiencies.
  - Facilitate **communication** among programmers and teams.

When to Use Flowcharts?

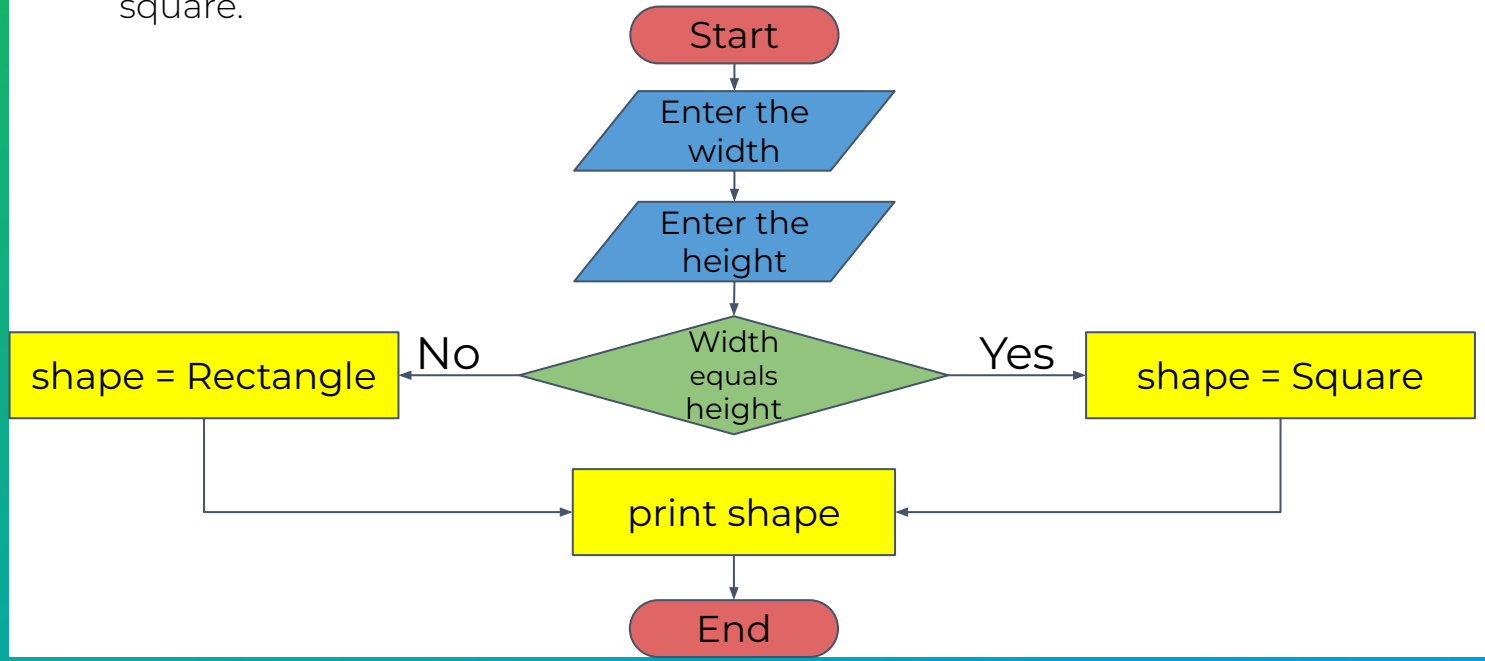
- Planning workflows or algorithms.
- Explaining ideas to a non-technical audience.
- Debugging processes before coding.

Basic Flowchart Symbols

Symbol	Name	Function

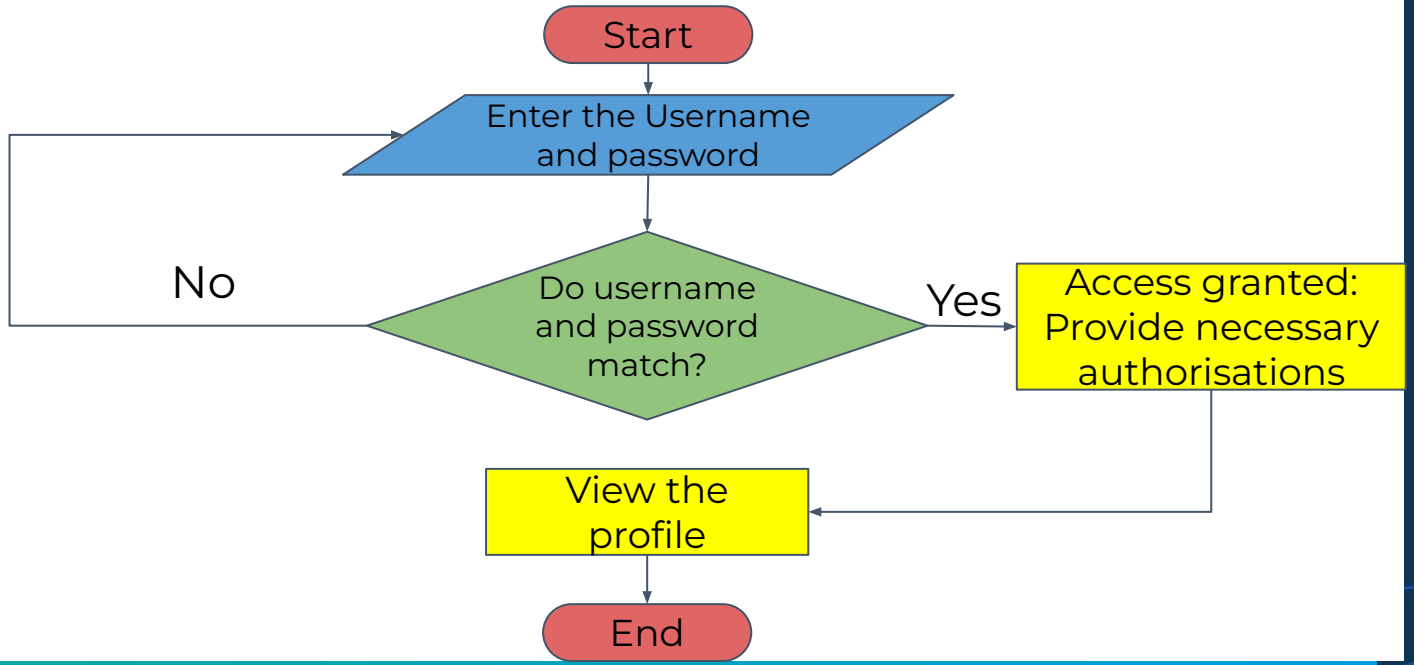
Practice Exercises: Square of Rectangle

- If the width is different from the height, then it is a rectangle, otherwise it is a square.



Practice Exercises: Access Facebook Personal Profile

- If the username and password do not match, re-enter the details, until right.



Introduction to Basic Data Structures

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FROZEN
FRUIT
BREAD
BREAKFAST
POTATOES
VEGETABLES

What Are Data Structures?

- What Are Data Structures?
  - Definition: Organized ways to *store* and *manage* data efficiently.
  - Why Are They Important?
    - Allow us to access, organize, and modify information easily.
    - Help solve problems faster and more efficiently.
- Why Data Structures Matter?
  - Efficiency: Data structures help computers process information quickly.
  - Organization: They keep data well-structured and easy to understand.
  - Problem-Solving: Choosing the right data structure can make problem-solving easier.

Key Data Structures: Arrays/Lists

- Definition: An ordered collection of elements.
  - Example: A shopping list where each item has a specific position.
- Why Use It?
  - Ideal for storing items in a specific order.
  - Easy to access elements by their position.
- Example Use Case:
  - Imagine a row of seats in a theater.
  - Each seat has a number, and you can store something in each seat.

Key Data Structures: Dictionaries

- Definition: Think of them as a collection of "labels" (keys) paired with "things" (values) you want to keep track of.
  - Example: Like a phonebook, where each person's name (key) is linked to their phone number (value).
- Why Use It?
  - They make finding things super fast.
  - You can label your data in a way that makes sense, like pairing names with grades or product IDs with prices.
- Example Use Case:
  - You look up a word (the key) to find its meaning (the value).

MALL MAP

LOWER GROUND

TRADING HOURS:

Mondays to Saturdays	9am - 6pm
Sundays	9am - 3pm
Public Holidays	9am - 5pm

Nanga MALL

UPPER GROUND

BANKS
- LG14 ABSA Bank
- LG37 African Bank
- LG48 Capitec Bank
- ATM1 ABSA Bank
- ATM2 Nedbank & Capitec
- ATM3 STD Bank & Capitec

BOOKS, GIFTS, STATIONERY, CELLPHONES
- UG70 Bargain Books
- LG53 Cell C
- LG51B Cell Touch Repair Centre
- LG54 Crazy Store
- LG21 CUM Books
- UG04B Exclusive Books

- LG58 Pick n Pay
- UG32 Woolworths

ENTERTAINMENT
- UG82 Ster Kinekor
- UG5 The Fun Company
- UG81 The Ice Rink

FASHION
- UG73 3rd Base
- LG60 Ackermans
- UG38 Amani Couture Boutique
- UG05A Bogart Man
- UG11 Cotton On
- UG49 Contempo
- UG8A Davisons

- UG86 GalXboy
- LG17 Gridline
- LG50 Guess
- UG6/7/8 H&M
- UG52 Identity
- RAMP01 i'langa Tailors
- LG61 Jet
- UG10 Jola Boutique
- UG36 Keedo
- UG50 Kingsley Heath
- UG74 Kurt Geiger
- UG68 le coq sportif
- UG28 Legit
- UG5B Levi's
- LG26 Madaiza
- UG51 Markham

- UG56 Queenspark
- UG26 Refinery
- UG85 Skipper Bar
- LG31 Soviet
- UG84 S.P.C.C.
- LG30 Steve Madden
- LG34 Studio 88
- UG61 The Fix
- UG53 Truworths
- UG83 X Kids

FOOTWEAR
- UG60 Aldo
- LG64A Bathu Shoes
- LG62 Shoe City
- UG3A Side Step

- LG1-3 Mopani Pharmacy
- LG52 Signature Cosmetics
- UG37 The Body Shop

HOME, FURNITURE, DÉCOR
- LG16 @homelivingspace
- LG9 Bradlows
- LG32 Le Creuset
- LG24A Mr Price Home
- LG13 Jet Home
- LG10 Pep Home
- LG55 Sheet Street
- UG03 The Bed Shop
- UG62 Yuppiechef

JEWELLERS & ACCESSORIES

KIOSKS
- LGM Mugg & Bean on the Go
- K02 Super Steers Biltong
- KA2 Vuse

LIQUOR STORE
- LG59 Pick n Pay Liquor

LUGGAGE
- LG56 Destinations by Frasers

MUSIC & ELECTRONIC
- LG25 Gadget Geeks
- LG63 Hifi Corporation
- LG52A Incredible Connection

RESTAURANTS & FOOD
- LG41A Biltong Boyz
- UG75 Cappuccino`s
- UG71 Doppio Zero
- UG39A Galaxy Grill
- LG42 King Pie
- UG1&2 Mediterranean Seafood
- UG83 Milky Lane
- UG40 Mugg & Bean
- LGM Mugg & Bean on the Go
- UG76 Nando's
- UG72 Panarotti's
- UG78 RocoMamas
- UG78A Salsa Mexican Grill
- LG69 Scoops

- LG11 South African National Blood Services
- LG57 Tasko Sweets
- LG40A The IV Bar
- LG28-29 Toys R Us & Babies R Us

SPORTSWARE & OUTDOOR
- UG31 Cape Union Mart
- LG24 Mr Price Sport
- LG66 Salomon
- UG27A Sportscene
- UG48 Totalsports

Key to Plan
- ATM ATM
- Baby care

Key Data Structures: Stacks

- Definition:
  - A stack is like a pile of items where you can only add or remove things from the top.
  - It follows the **Last In, First Out (LIFO)** principle—this means the last thing you add is the first thing you take out.
  - Example: Like a phonebook, where each person's name (key) is linked to their phone number (value).
- Why Use It?
  - They're perfect for tasks where you need to go backward, like undoing actions.
  - Also helpful for temporarily holding things in order.
- Example Use Case:
  - Pancake flipping while cooking:
    - Imagine stacking pancakes as you cook them. The last pancake you put on the stack is the first one you take off to serve.


Takis
FUEGO
Hot Fries
Sun Chips
100% Whole Grain
Garden Salsa
Baked
50% Less Fat
Cheetos
Cheddar Jalapeño
Crunchy
Fritos
Chili Cheese
Flavored Corn Chips
Original
100% Real Cheese
204
206
208
210
304
306
308
310
Press Selection For Price

Key Data Structures: Queues

- Definition:
  - A collection of items that follows the First In, First Out (FIFO) principle.
  - Example: A queue at a ticket counter where the first person in line is served first.
- Why Use It?
  - Useful for processing tasks in order.
- Example Use Case:
  - Pancake flipping while cooking:
    - Songs are added to a queue and played in the order they were added.

The Telegraph

Interactive Activity

Activity: Match Tasks to Data Structures

Match each task with the most suitable data structure:

1. Organize books by genre and quickly find a specific book.
    a. Options: List, Dictionary, Stack, or Queue?
2. Keep track of recent actions in an image editing app for undo functionality.
    a. Options: List, Dictionary, Stack, or Queue?
3. Process customers waiting for service at a coffee shop.
    a. Options: List, Dictionary, Stack, or Queue?
4. Store the sequence of levels completed in a video game and allow replaying them in order.
    a. Options: List, Dictionary, Stack, or Queue?

Poll

Which of the following correctly represents the decision-making process in a flowchart?

1. Use a rectangle with \"Decision\" written inside.
2. Use a diamond to represent a condition.
3. Use an oval with \"Yes/No\" written inside.

Poll

You need to design a program to match students to their grades using flowcharts and data structures. Which data structure would be most efficient?

1. A stack, as grades can be pushed and popped.
2. A dictionary, as it allows for quick lookups using student names as keys.
3. A queue, as grades are processed sequentially.

Lesson Conclusion and Recap

Recap the key concepts and techniques covered during the lesson.

- Flowcharts provide visual clarity to algorithmic processes
- Different data structures serve different purposes
- Choosing the right data structure can significantly improve program efficiency
- Pseudocode can be systematically translated into flowcharts

Resources

Resources

- Online Flowchart Tools:
  - draw.io
  - Lucidchart
- Data Structure Visualization Websites:
  - VisuAlgo
  - Printables - CS Unplugged

Questions and Answers

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Thank you for attending

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