

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](#)

Safeguarding & Welfare

We are committed to all our students and staff feeling safe and happy; we want to make sure there is always someone you can turn to if you are worried about anything.

If you are feeling upset or unsafe, are worried about a friend, student or family member, or you feel like something isn't right, speak to our safeguarding team:



Ian Wyles
Designated Safeguarding
Lead



Simone Botes



Nurhaan Snyman



Rafiq Manan



Ronald Munodawafa



Tevin Pitts

**Scan to report a
safeguarding concern**



or email the Designated
Safeguarding Lead:
Ian Wyles
safeguarding@hyperiondev.com

Skills Bootcamp

Progression Overview

✓ Criterion 1 - Initial Requirements

Specific achievements **within the first two weeks of the program.**

To meet this criterion, students need to, by no later than **01 December 2024:**

- **Guided Learning Hours (GLH):** Attend a minimum of **7-8 GLH per week** (lectures, workshops, or mentor calls) for a total minimum of **15 GLH.**
- **Task Completion:** Successfully complete the **first 4 of the assigned tasks.**

✓ Criterion 2 - Mid-Course Progress

Progress through the successful completion of tasks **within the first half of the program.**

To meet this criterion, students should, by no later than **12 January 2025:**

- **Guided Learning Hours (GLH):** Complete at least **60 GLH.**
- **Task Completion :** Successfully complete the **first 13 of the assigned tasks.**

Skills Bootcamp Progression Overview

✓ Criterion 3 – End-Course Progress

Showcasing students' progress nearing the completion of the course.

To meet this criterion, students should:

- **Guided Learning Hours (GLH)**: Complete the **total minimum required GLH**, by the **support end date**.
- **Task Completion** : **Complete all mandatory tasks**, including any necessary resubmissions, by the end of the bootcamp, **09 March 2025**.

✓ Criterion 4 - Employability

Demonstrating progress to find employment.

To meet this criterion, students should:

- **Record an Interview Invite**: Students are required to record proof of invitation to an interview by **30 March 2025**.
 - **South Holland Students** are required to proof and interview by **17 March 2025**.
- **Record a Final Job Outcome** : Within 12 weeks post-graduation, students are required to record a job outcome.

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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

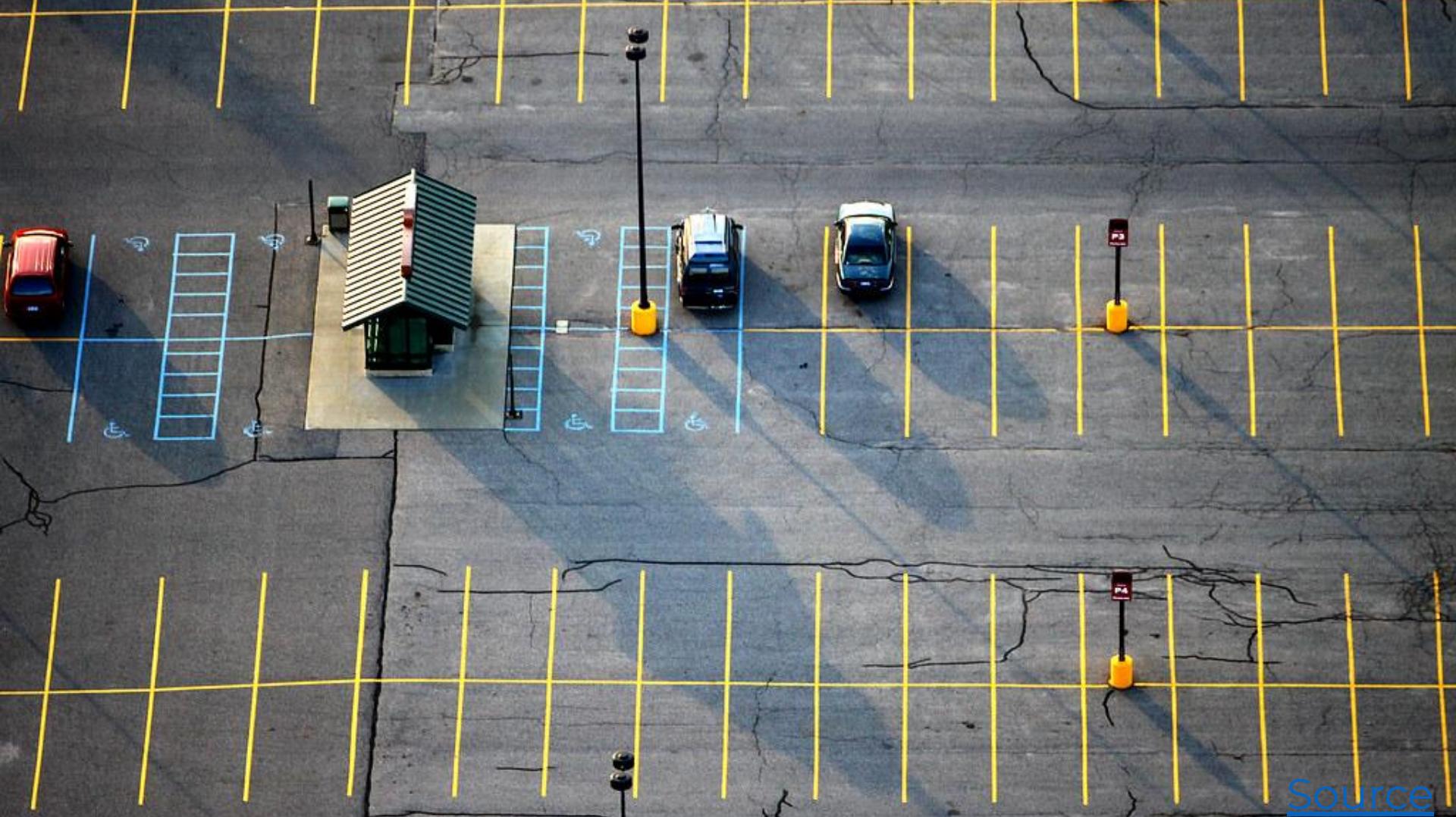
What is the first step in breaking down a problem?

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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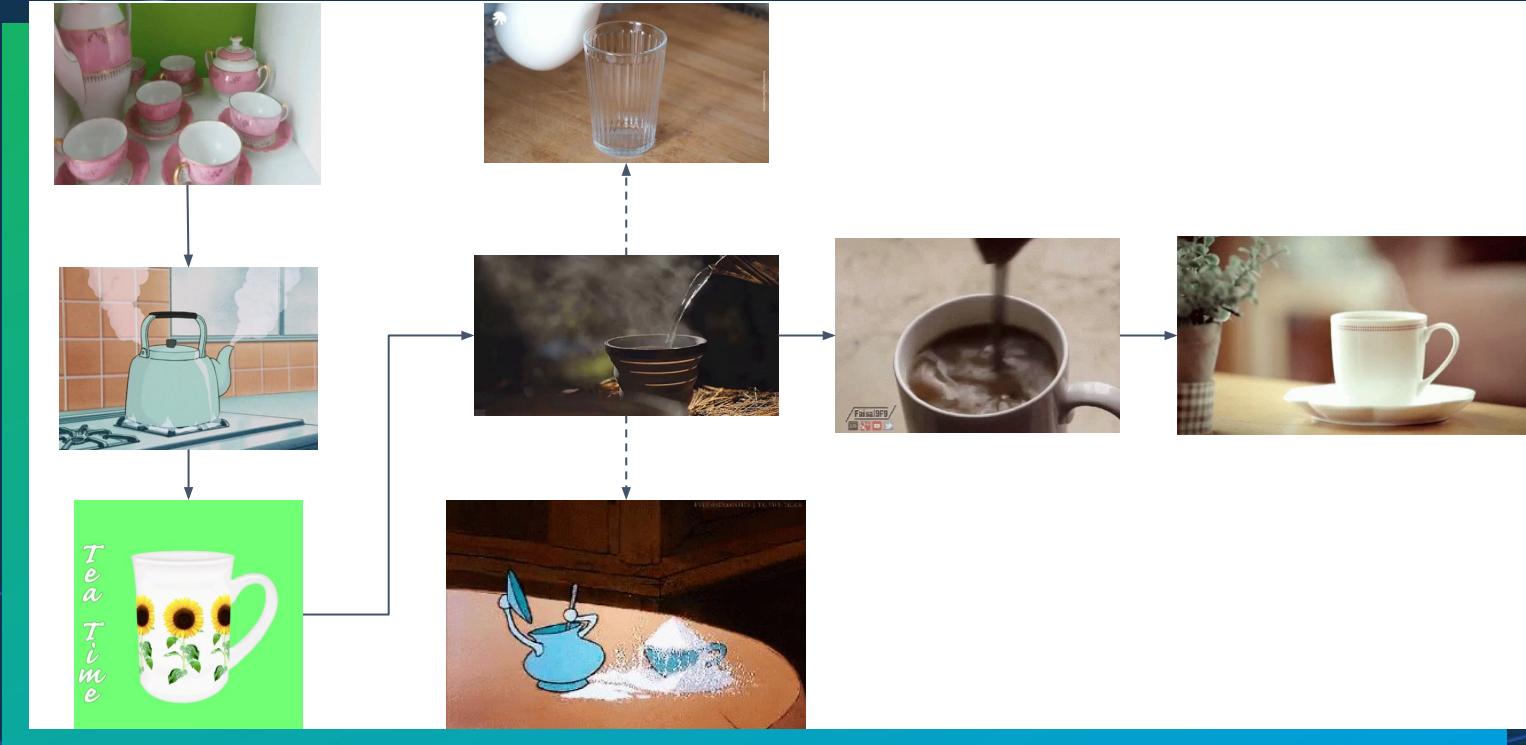


Definition and Importance

- **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?

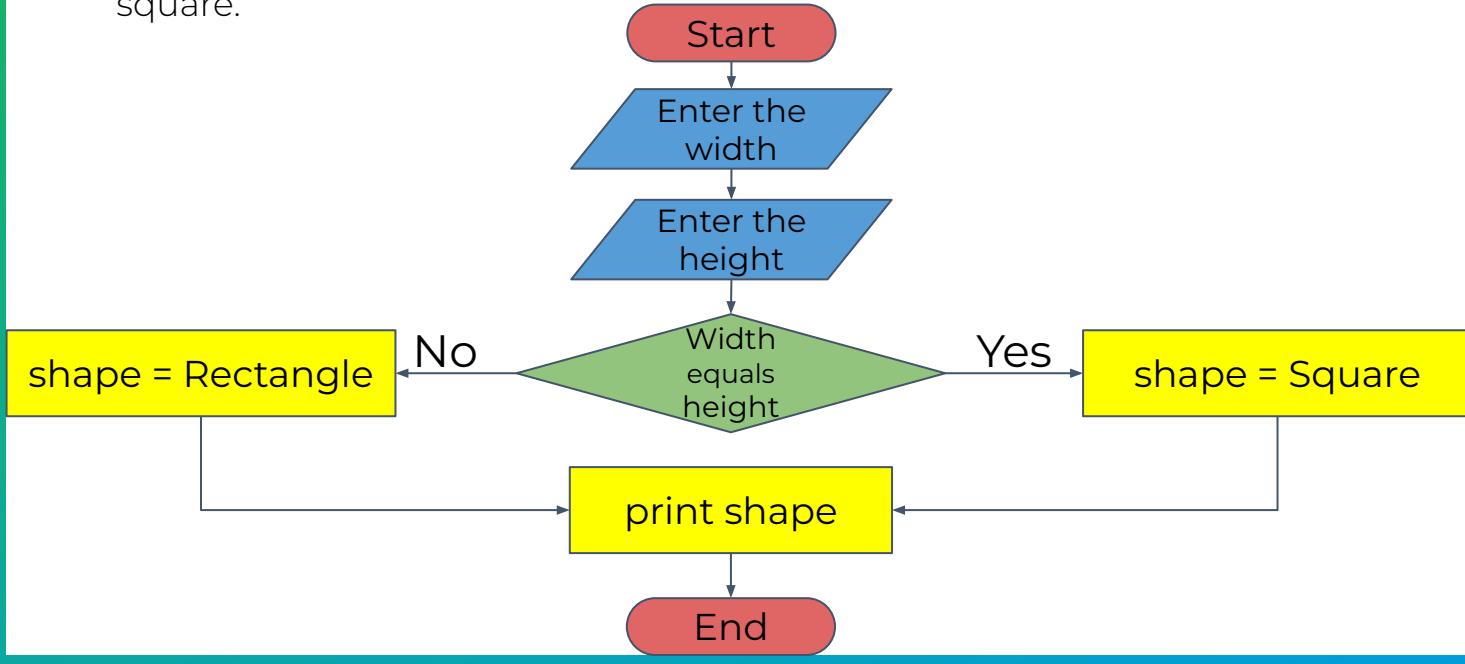
- Planning workflows or algorithms.
- Explaining ideas to a non-technical audience.
- Debugging processes before coding.

Basic Flowchart Symbols

Symbol	Name	Function

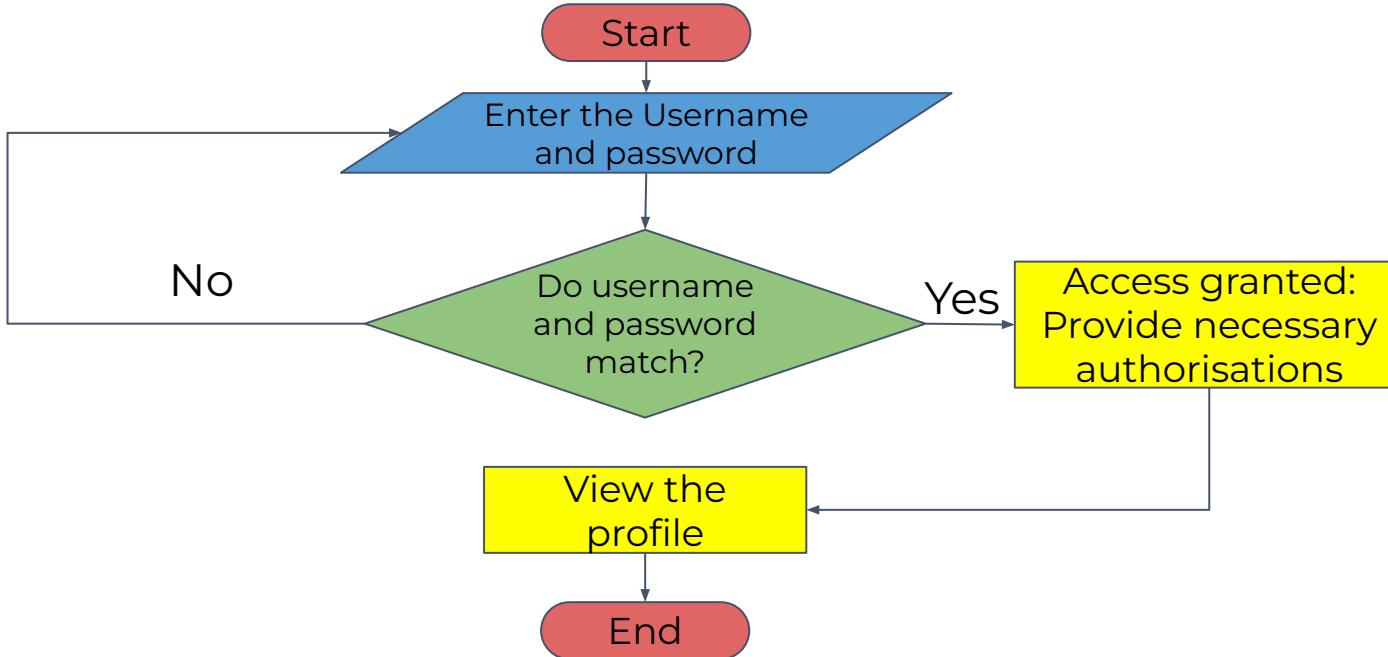
Practice Exercises: Square or Rectangle

- 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

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).

poling 1 n. A long, thin rod, usually rounded. 2 v. To pole, as a boat.

the other end of the axis of a sphere; the earth's axis; the North Pole or 3 A point of maximum strength in an electric field.

person born in or a citizen of Poland. 1 A European animal related to the skunk. 2 U.S. A skunk.

political [pəl'm'ik] 1 adj. Of or having to do with argument. 2 n. An argument, especially political or religious beliefs.

pol'star' n. 1 The North Star; Polaris, that guides or governs.

over a high, horizontal bar, made

Polish [po'lish] 1 adj. Of or relating to (the Polish) language of Poland. 2 n. The language of Poland.

polit-bu-ro [pol'it'-byōōrō] n. The council on policies for a Communist party.

polite [pə'līt'] adj. 1 Showing consideration for others; mannerly. It would be polite to ask them to join us. 2 Refined; cultured; polite society. —**polite'ly** adv. —**polite'ness** n.

politic [pol'ə-tik] adj. 1 Skillful, ingenious, or shrewd; crafty: a politic statesman. 2 Planned to fit the situation; prudent; expedient: a politic remark. 3 Political.

political [pə-lit'i-kəl] adj. 1 Of, having to do with, or involved in government or politics. 2 Of or about politicians. —**polit'i-cally** adv.

political science The study of the principles of government.

politician [pol'ə-tish'ən] n. 1 A person who takes part in or is skillful at politics. 2 A person who takes part in politics for selfish reasons.

politics [pol'ə-tiks] n. 1 The science or techniques of government; political science. 2 The activities of those who control or serve government. 3 Political principles. 4 The occupation of an individual. 5 The occupation of a person in politics.

MALL MAP



TRADING HOURS:

Mondays to Saturdays 9am - 8pm
 Sundays 9am - 3pm
 Public Holidays 9am - 5pm

Hanita
MALL



BANKS	LOWER GROUND					UPPER GROUND				
LG14 ABSA Bank	LG58 Pick n Pay	UG66 GalXboy	UG56 Queenspark	LG1-3 Mopani Pharmacy	KIOSKS	LG11 South African National Blood Services				
LG37 African Bank	UG32 Woolworths	LG17 Gridline	UG26 Refinery	LG52 Signature Cosmetics	LG41 Biltong Boyz					
LG48 Capitec Bank	ENTERTAINMENT	LG50 Guess	UG85 Skipper Bar	UG37 The Body Shop	LG42 Milky Lane					
ATM1 ABSA Bank	UG82 Ster Kinekor	UG52 Identity	LG31 Soviet	K02 Super Steers Biltong	LG43 Tasko Sweets					
ATM2 Nedbank & Capitec	UG5 The Fun Company	RAMP01 i'longo Tailors	UG84 S.P.C.C.	K22 Vuse	LG44 The IV Bar					
ATM3 STD Bank & Capitec	UG81 The Ice Rink	LG61 Jet	LG34 Studio 88	LG18 Doppio Zero	LG28-29 Toys R Us & Babies R Us					

BOOKS, GIFTS, STATIONERY, CELLPHONES	FASHION	FOOTWEAR	JEWELLERS & ACCESSORIES	RESTAURANTS & FOOD
UG70 Bargain Books	UG36 3rd Base	UG68 le coq sportif	LG1-3 Mopani Pharmacy	LG11 South African National Blood Services
LG53 Cell C	UG60 Ackermans	UG74 Kurt Geiger	LG52 Signature Cosmetics	LG41 Biltong Boyz
LG518 Cell Touch Repair Centre	UG38 Amari Couture Boutique	UG69 Legit	UG37 The Body Shop	LG42 Milky Lane
LG54 Crazy Store	UG11 Cotton On	UG58 Levi's	K02 Super Steers Biltong	LG43 Tasko Sweets
LG21 CUM Books	UG49 Contempo	LG64 Bathu Shoes	K22 Vuse	LG44 The IV Bar
UG048 Exclusive Books	UG90 Divisions	LG62 Shoe City	LG18 Doppio Zero	LG28-29 Toys R Us & Babies R Us
		LG26 Madaiza	LG24A Mr Price Home	
		LG34 Side Step	LG13 Jet Home	
			LG10 Pep Home	
			LG55 Sheet Street	
			UG03 The Bed Shop	SPORTSWARE & OUTDOOR
			UG62 Yippiechef	UG182 Mediterranean Seafood
				UG31 Cape Union Mart
				LG40 Mugg & Bean
				LG66 Salmon
				UG27A Sportscene
				UG48 Totalsports

Key to Plan

- 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.



selection
price

Press Selection
For Price

204 () () 206 () () 208 () () 210 () ()



selection
For Price

Press Selection
For Price

304 () () 306 () () 308 () () 310 () ()



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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