



CLASS 5

COMPUTATIONAL THINKING & AI

Data Detectives & AI Builders



DECOMPOSE
Break it down



DETECT
Find patterns



DESIGN
Plan solutions



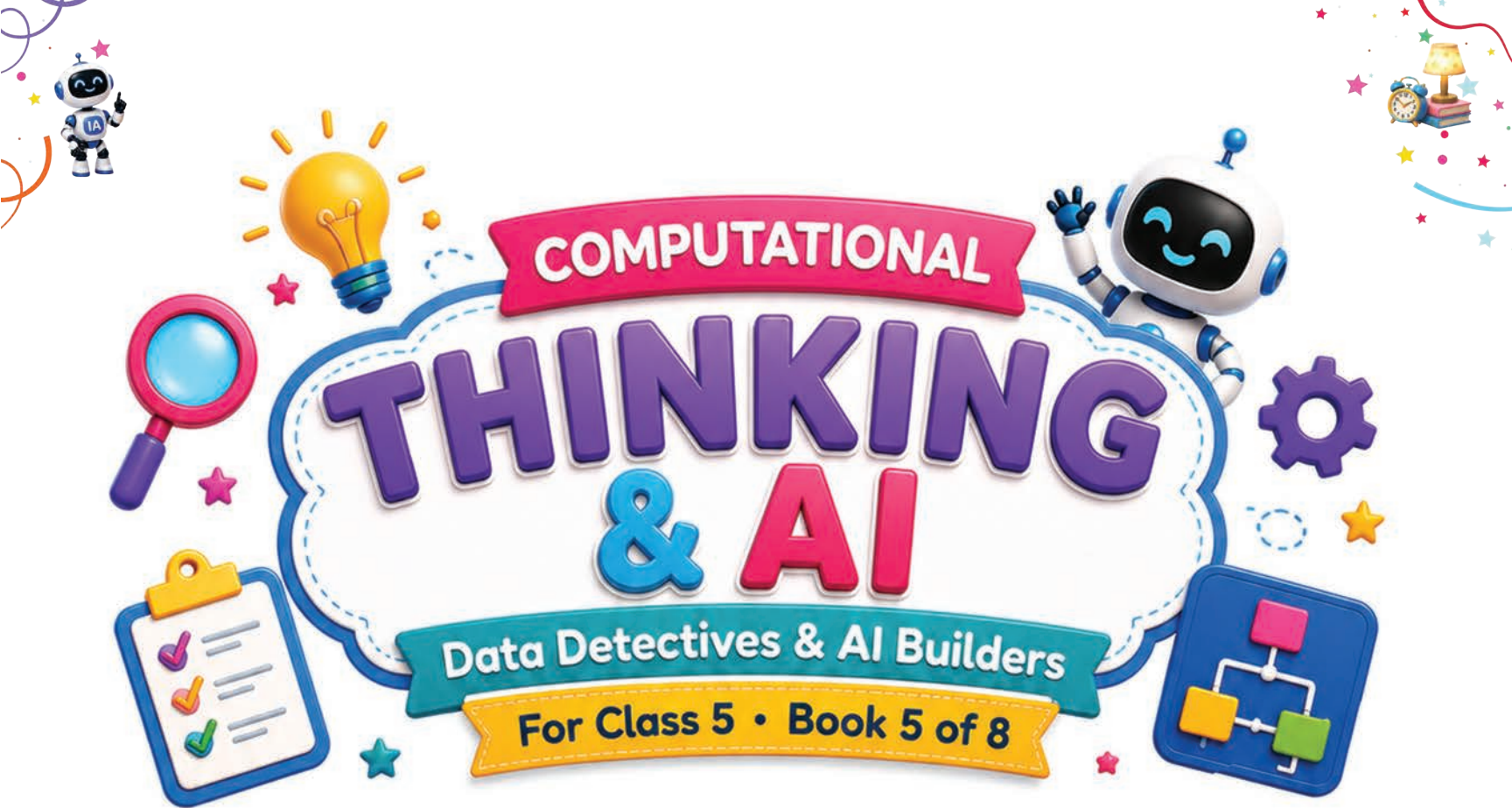
DECIDE
Choose wisely



DEPLOY
Make it real



DISCOVER
Explore more



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NEP 2020 and NCF–SE 2023

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Welcome

A Note for Grown-Ups






♥ Dear Teacher and Parent,

Class 5 is the **BUILD** year! Your child moves from “what AI does” to “**how AI is BUILT.**” They will discover the **AI Project Lifecycle**, learn to **label data**, and meet real **no-code AI tools** like Teachable Machine that real engineers use!



What's NEW in Class 5:

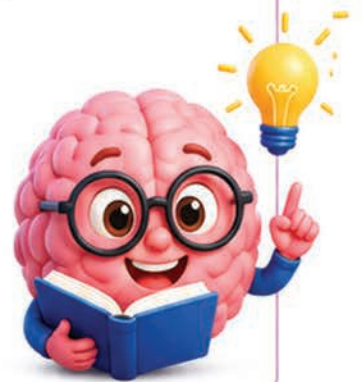
-  The **AI Project Lifecycle** – Problem → Data → Train → Test → Deploy
-  **Data labeling** & datasets
-  **Searching & sorting** algorithms
-  **While loops** vs repeat loops
-  **Functions** – reusable code chunks
-  No-code AI tools introduction (Teachable Machine)
-  **AI for environment, health, education**



First Real Coding Concepts!

Variables, while-loops, conditions, functions – all the building blocks of real programming, in friendly pseudocode.

```
while (condition):  
    do_something()  
  
if (condition):  
    do_this()  
  
function myFun():  
    return value
```



Approx.
50 hours



NEP 2020
aligned



CBSE CT 2026–27
ready



85%
screen-free



Class 5 has **NEW** sign types – look out for them!



Big Idea

A core CT or AI concept (CBSE).



Lab Activity

Hands-on experiments!



India Page

CT/AI in Indian context.



Data Box

NEW! Real datasets!



Code Lab

Pseudocode with functions!



Mini-Project

Multi-step builds.



50 hours over the year

~1 hour per week + projects. Take your time!



Class 5 needs a notebook for projects. Keep one ready!



Hello!

Meet the AI Builders!



Your 7 friends are now AI Builders — and a NEW friend joins!



Diya
AI experimenter pro!



Arjun
Strategy & code wizard!



Mithu
Pattern master!



Beep
Multi-domain AI assistant!



Tara
Project planner!



Veer
Data scientist!



Riya
Real coder!



Kabir ✨ **NEW!**
Data Detective! Loves charts & spotting trends.



8 AI Builders ready to launch!





Inside



What's in this Book?



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5 chapters • 96 pages •
AI Lifecycle & Data unlock!



Chapter 1



Decomposition Detective

Solve real problems by **breaking** them apart!





Chapter 1

Decomposition Master Level!



“
Class 5 detectives use decomposition to SOLVE PROBLEMS!
”

What's NEW:

- Use decomposition for **real problem-solving**
- Decomposing **code** into functions
- Decomposing **data** into rows and columns
- Decomposing big **projects** like movies and YouTube channels



Kabir's Problem-Solving Framework: ≡

1

UNDERSTAND
What's the real problem?

2

BREAK DOWN
Decompose into pieces!

3

SOLVE PARTS
Tackle each small piece!

4

COMBINE
Put solutions back!

EVERY problem is solvable when you decompose it **FIRST!**



Lab Activity · School Lunch Shortage!

**The Problem:**

Some kids in your school come without lunch.
They feel sad. How do we help?



1

STEP 1: UNDERSTAND

Why don't they bring lunch? _____

2

STEP 2: DECOMPOSE – break the BIG problem!**“Help kids with no lunch”**

Get food



Store it



Share fairly



Without shame

3

STEP 3: SOLVE each small part

► “Get food” → ask all kids to bring 1 extra item? Or shop money?



► “Share fairly” → secret bag near library?



4

STEP 4: COMBINE – propose YOUR solution!

My plan: _____



Real code is broken into **FUNCTIONS** – each does one job!



Big Word: **FUNCTION**

A function is a **CHUNK** of code that does **ONE** specific job – and you can **REUSE** it!



Without functions (long & messy):

```
# Greet 3 people – without function
say "Hi, Diya!"
say "How are you?"
say "Hi, Arjun!"
say "How are you?"
say "Hi, Mithu!"
say "How are you?"
```



WITH a function (clean & short!):

```
# Define a function called 'greet'
function greet(person):
  say "Hi, " + person + "!"
  say "How are you?"

# Reuse it 3 times!
greet("Diya")
greet("Arjun")
greet("Mithu")
```



Function = decomposed code! Each function = one small job!



Real coders use **HUNDREDS** of functions in one app!





Data is decomposed into ROWS and COLUMNS!






Big Word: DATASET

A collection of organized information.

Rows = items, Columns = facts about each!



Example: A class dataset

 Name	 Favourite Subject	 Age
Diya	Science	10
Arjun	Math	10
Mithu	Art	11
Beep	CT & AI	10
Tara	English	10
Veer	Science	11
Riya	Math	10

★ Why decompose data this way?

- Easy to find facts (rows = each person)
- Easy to compare (columns = same fact)
- AI LOVES tables — easy to learn from!



Quick test: <

1 How many friends like Math? _____



2 How many are age 11? _____





Lab Activity • Family Dataset



★ **Decompose your family into a table!** 5 family members, 4 facts each:

 Name	 Age	 Hobby	 Fav Food
-----	-----	-----	-----
-----	-----	-----	-----
-----	-----	-----	-----
-----	-----	-----	-----
-----	-----	-----	-----



You just made a DATASET! Real AI engineers do this same thing — but with millions of rows!

 **Pattern check – answer using your data:**



1 Who is YOUNGEST? _____ Who is OLDEST? _____

2 Same hobbies in family? _____



3 Any favourite food in common? _____

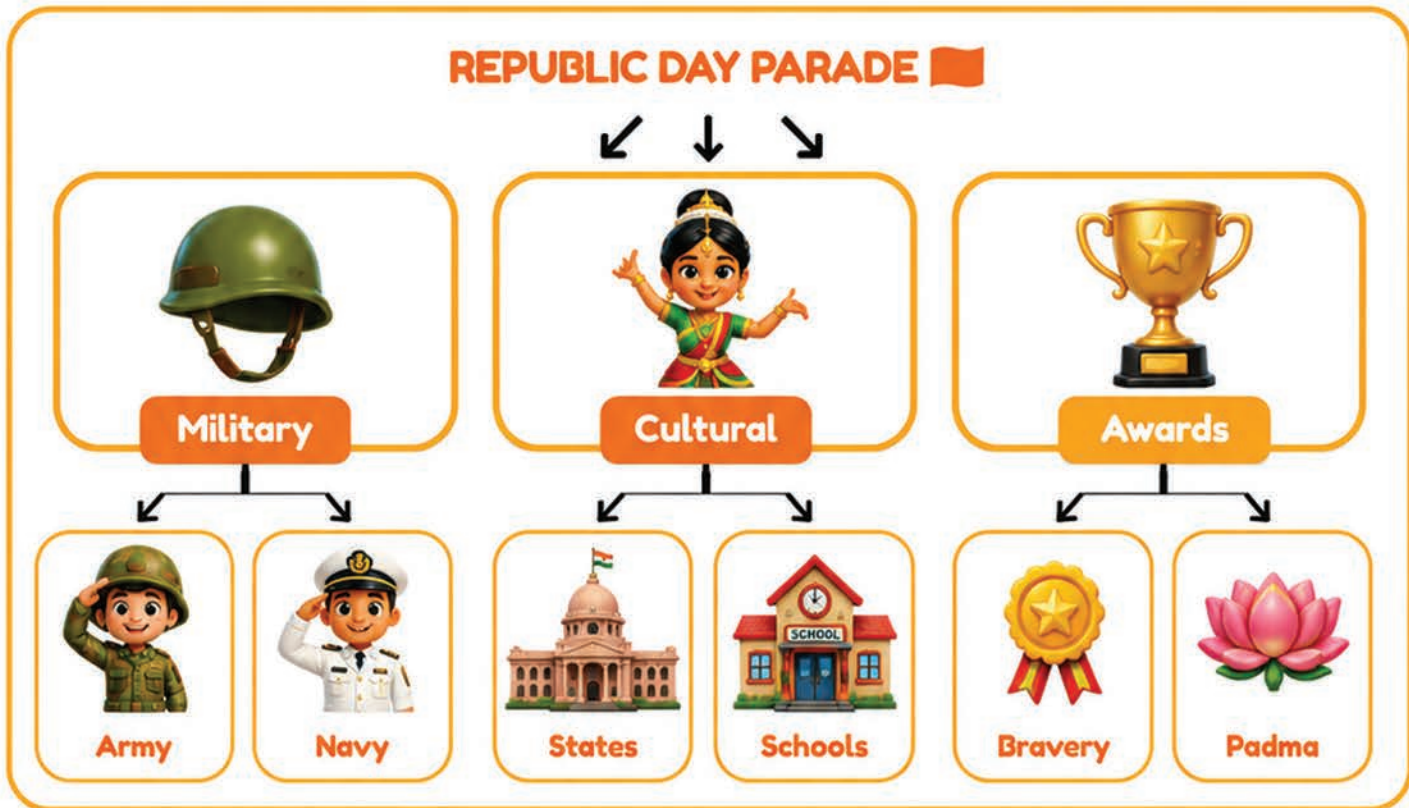


  You're already thinking like a data scientist!



Republic Day parade has **100,000+** people. Decompose it!

REPUBLIC DAY PARADE



Planning the parade:

- 50,000 people need positions
- 30+ tableaux from states
- 10+ regiments march in order
- Helicopters, fighter jets time-coordinated

All this is **DECOMPOSED** into small tasks for hundreds of teams!



Even India's biggest events use computational thinking!



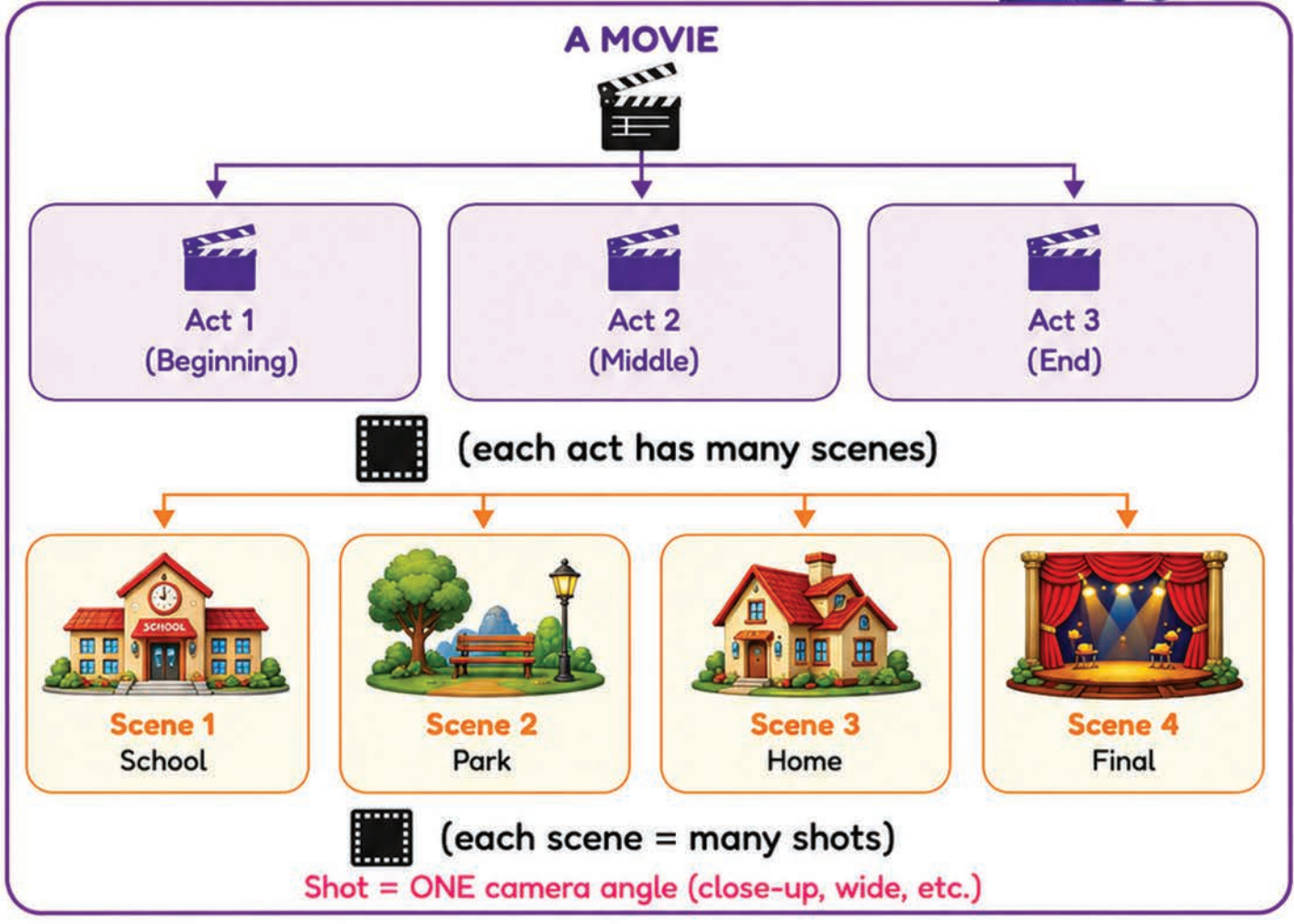
Decompose a Movie



Activity · Film Director Model!



Movies are decomposed: **Movie** → **Acts** → **Scenes** → **Shots!**



★ Your turn: Decompose YOUR favourite movie:

Movie: _____ Act 1 (Start): _____

Act 2 (Middle): _____ Act 3 (End): _____



Chapter 1

Reverse • Composition!



Composition = putting small parts to make BIG things!



Big Word: COMPOSITION

Opposite of decomposition! Combine small parts to **BUILD** something big!

Examples of composition:



Bricks → Wall → House

Small bricks build a HUGE house!



Notes → Tune → Song

7 notes make every song you know!



Letters → Words → Stories

26 letters → millions of stories!



Functions → Programs → Apps

Small code chunks → huge apps!



Big idea:

DECOMPOSE to understand. **COMPOSE** to build! Both are essential!



Try it: What 5 small things would you **COMPOSE** to make a "perfect day"?

1. _____
2. _____
3. _____
4. _____
5. _____



Chapter 1

Mini-Project • YouTube Channel!



Mini-Project • Design Your Channel!



Mission: Decompose what makes a great YouTube channel – then design **YOURS!**

Step 1: Decompose any YouTube channel:



Theme



Videos



Branding



Schedule



Audience



Comments

Step 2: Now design YOUR channel:



Channel name: _____



Theme: _____



Audience (who watches?): _____



Posting schedule: _____

Step 3: First 3 video ideas:



Video 1: _____



Video 2: _____



Video 3: _____





Activity • Traffic Manager!

A city's traffic is **HUGE**. AI cameras help – but first, we must **DECOMPOSE!**

CITY TRAFFIC SYSTEM



Traffic lights



Roads



Vehicles



Pedestrians



Cameras



Police



Signs



Junctions



How AI helps:



Cameras count cars (**Computer Vision!**)



AI predicts where jam will happen (**Pattern!**)



AI controls light timings (**Decisions!**)



Maps suggest fastest routes (**Algorithm!**)



Spot it:

Next time on the road, see if you can spot all 4 AI uses!





Chapter 1

Decomposition Stories



Smart minds always decomposed – even 1000s of years ago!



Aryabhata

Ancient Indian math genius (500 AD). Decomposed big numbers to solve!



Pyramid builders

Egypt: decomposed pyramid into 2 million stones!



ISRO Chandrayaan

Moon mission decomposed into 1000s of small parts!



Game makers

Each game = thousands of small functions!



★ Fun fact:

When ISRO launched Chandrayaan-3 in 2023, the whole mission was decomposed into:



Launch (rocket lift-off)



Orbit (going around Earth)



Transfer (Earth → Moon)



Capture (entering Moon orbit)



Landing (touchdown!) ✨



Tag it:

What's a **BIG** thing **YOU** want to do? Decompose it!



Big goal: _____ Step 1: _____



Detective Puzzles!

Puzzle 1: Decompose a “weekend trip to a hill station” in 6 steps:

1.



2.



3.



4.



5.



6.





Puzzle 2 · Reverse: What BIG thing has these parts?

scenes, dialogue, music, actors, camera, director

Answer: _____



Puzzle 3 · Reverse: What BIG thing has these parts?

CPU, RAM, hard drive, keyboard, screen, mouse

Answer: _____



Puzzle 4 · Match levels:

India → _____ (state) → _____ (city) → _____ (locality)

Tree → _____ → _____ → _____



The faster you decompose, the faster you solve!










Try it Yourself!



Master Decomposition Challenge

- 1  **Real Problem:** Find ONE problem in your home. Decompose it. Propose a solution!
- 2  **Data Detective:** Make a dataset of 10 books at home (Title, Author, Pages, Genre)!
- 3  **Function Practice:** Write pseudocode with a function called "wish_birthday"!
- 4  **3-Level Decompose:** Pick a city. Break into 5 places → each place into 3 parts → each part into 2 details!
- 5  **Compose:** Take 5 small things you love. Compose them into a "Perfect Saturday plan"!



In Chapter 1 you learned:



- **Problem-solving** framework (Understand → Decompose → Solve → Combine)
- **Functions** = decomposed code
- **Datasets** = decomposed data (rows + columns)
- **Composition** = reverse decomposition
- Real-world examples: traffic, movies, Republic Day, Chandrayaan!



Decomposition Detective!



★ Next: Pattern Master!





Chapter 2

CT Pillar #2 Master



Pattern Master

Patterns in data, code, language, nature!





Pattern Master Skills!



Class 5 patterns aren't just numbers – they're EVERYWHERE in data!



★ NEW pattern skills:



Fibonacci in nature



Patterns in data charts



Palindromes in language



Patterns in pseudocode



Forecasting using patterns



Patterns in art (M.C. Escher!)



MADAM
LEVEL



Mithu's challenge – find the pattern!

$$3 \cdot 9 \cdot 27 \cdot 81 \cdot 243 \cdot \underline{\quad}$$

Rule: each is PREVIOUS $\times 3$!



Patterns predict the unknown.
That's the magic of math!





The most famous number pattern –
and you'll see it in nature!



Big Word: FIBONACCI

Fee-bo-nah-chee! Each number is the SUM of previous TWO!

1 · 1 · 2 · 3 · 5 · 8 · 13 · 21 · 34 · 55 · 89 ...

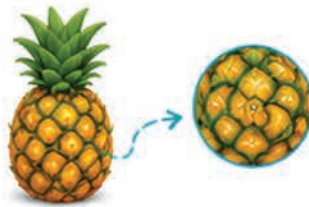


Where do you find Fibonacci?



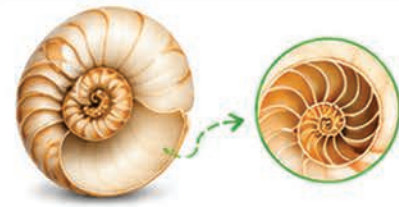
Sunflower seeds

21, 34, or 55 spirals!



Pineapple

5, 8, 13 spirals!



Nautilus shell

Spiral follows Fibonacci!



Rose petals

5, 8, 13 petals!



Tree branches

Branch count grows!



Butterfly wings

Patterns follow it too!



Why nature loves Fibonacci?

It's the MOST efficient way to pack seeds, leaves, branches.
Plants got smart over millions of years!



Continue the Fibonacci:

1, 1, 2, 3, 5, 8, 13, 21, 34, _____, _____, _____



Patterns in DATA Charts!



Kabir spots patterns in charts – like a **data detective!**



Types of patterns in charts:

- Going up** (increasing)
- Going down** (decreasing)
- Wave** (up and down repeatedly)
- Flat** (no change)



Example: Diya's height over 5 years



Year	Age	Height (cm)
2022	6	110
2023	7	118
2024	8	126
2025	9	134
2026	10	142

Pattern: Diya grows about **8 cm** every year!

Predict:

Diya's height at age 11 (2027): _____ cm

Pattern type: / / / _____



AI uses such patterns to predict **markets, weather, even cricket scores!**



Number Detective

Some fractions have **REPEATING** patterns:

$$\frac{1}{3}$$

$$= 0.333333\dots$$

3 repeats forever!



$$\frac{2}{3}$$

$$= 0.666666\dots$$

6 repeats forever!



$$\frac{1}{7}$$

$$= 0.142857142857\dots$$

142857 repeats!



★ **Surprise!**

$\frac{1}{7}$ has 6 digits that REPEAT.

Try $\frac{2}{7}$, $\frac{3}{7}$, $\frac{4}{7}$... they **ALL** use the same 6 digits but start in different places!



Times table patterns:

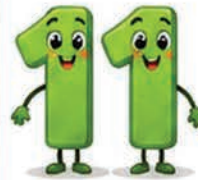
Table of 9:



9, 18, 27, 36, 45, 54, 63,
72, 81, 90

Add digits: 9, 9, 9, 9, 9, 9, 9, 9, 9!

Table of 11:



11, 22, 33, 44, 55, 66,
77, 88, 99

Same digits twice!



Math patterns are **EVERYWHERE** –
just look closely!





Words that read the **SAME** backwards!

Big Word: PALINDROME

Pal-in-drome! A word, phrase, or number that reads the **SAME** forwards and backwards!



★ Famous palindromes:

MOM
M-O-M ↔ M-O-M



RACECAR
R-A-C-E-C-A-R



LEVEL
L-E-V-E-L



121
Number palindrome!



12321
Number palindrome!



99
2-digit palindrome!





★ Indian language palindromes!


नवजीवन · नमन् · कनक
Hindi palindromes!




Are these palindromes? Circle YES or NO:

 **RADAR** → YES NO

 **HELLO** → YES NO

 **NOON** → YES NO

 **1991** → YES NO





Smart coders use patterns to write **SHORT** code!

Pattern: print 1, 2, 3, 4, 5



Without pattern (boring!)

```
say 1 say 2 say 3 say 4 say 5
```



WITH pattern (smart!):



```
for i from 1 to 5: say i
```



Even smarter – square numbers:



```
# 1x1, 2x2, 3x3, 4x4, 5x5
for i from 1 to 5: say i * i
```



What this prints: 1, 4, 9, 16, 25 – the square numbers!

1

4

9

16

25

Your turn: Write pseudocode that prints first 5 even numbers!



```
for i from ___ to ___: say i * ___
```



The “for” loop is in every programming language!





India Page • Patterns in Indian Symbols



Indian flag, currency, and architecture – all patterns!

The Indian Flag:

- **Saffron** • White • **Green** (3 EQUAL stripes)
- Ashoka Chakra: **24 spokes** (each = a value!)
- Pattern: equal **symmetric** strips!



₹ Indian Currency Notes:

- 10, 20, 50, 100, 200, 500, 2000 – pattern: each is **BIGGER!**
- Mahatma Gandhi on **EVERY** note (pattern!)
- Notes have languages of India listed (**17!**)



Indian Architecture:

- Taj Mahal: **symmetric** – left = right!
- **Konark temple**: wheels carved in stone, perfect pattern!
- **Madurai temple**: layered towers, repeating!



Taj Mahal



Konark Temple



Madurai Temple

Find a pattern in YOUR home:



Pattern I found: _____



Where: _____



Patterns make
India amazing! ♥





Use past patterns to **PREDICT** what comes next!

Big Word: FORECASTING

Using past patterns to predict the future. Weather, cricket scores, even YOUR exam marks!



Tara's monthly savings:

Month	Saved (₹)	Total (₹)
Jan	100	100
Feb	150	250
Mar	200	450
Apr	250	700
May	300	1000



Pattern spotted: Tara saves ₹50 more each month!



Forecast:



In June, she'll save: ₹_____



Total by June: ₹_____



By December (12 months): ₹_____



This is how **AI** predicts **cricket scores, election results, weather!**





Chapter 2

Inverse Patterns



Some patterns go **BACKWARDS** – reverse them!




Big Word: INVERSE

Opposite or backwards.
The inverse of “add 5” is “subtract 5”!



★ Pattern + Inverse:

Pattern:

 2 · 4 · 8 · 16 · 32

Rule: **DOUBLE** each time




Inverse:

32 · 16 · 8 · 4 · 2 

Rule: **HALF** each time

Pattern:

 1 · 4 · 9 · 16 · 25

Rule: **square** numbers



Inverse:

25 · 16 · 9 · 4 · 1 


Rule: **reverse order**


⚙️ Make the **inverse**:

1 5 · 10 · 15 · 20 · 25 → Inverse: ____ · ____ · ____ · ____ · ____

2 A · D · G · J · M → Inverse: ____ · ____ · ____ · ____ · ____



 In coding, the “**reverse**” function is used in **MANY** apps – like **reversing a video!**





Make art with patterns that BEND your brain!

Who was M.C. Escher?

A Dutch artist who made art with crazy patterns – birds that turn into fish, stairs that lead nowhere!



Try YOUR Escher-style art:

1 Draw a square. Inside, draw a fish 🐟



2 Draw 8 more squares around it



3 In each, slowly change fish → bird (5 steps in between)



4 The fish at one end → bird at the other end!



Try drawing 9 squares – fish to bird transformation:



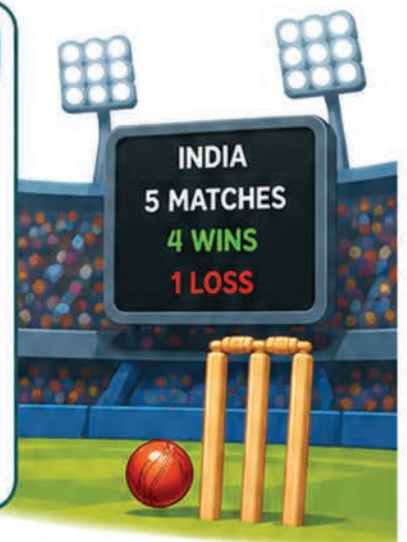
Patience, **patterns**, and **imagination** turn simple shapes into **amazing art!**



Mini-Project • Pattern Hunter

**Mission:** Find patterns in a cricket scoreboard!**Step 1:** India played 5 matches. Here are scores:

Match	India Score	Result
Match 1	320/8	Won
Match 2	280/6	Won
Match 3	240/10	Lost
Match 4	350/4	Won
Match 5	310/7	Won

**Step 2:** Find patterns:

Average score: _____



Pattern in wins? When did India lose? _____



When India scores > 300, what happens? _____

Step 3: Predict! If India plays a 6th match and scores 290, will they win?

Prediction: _____ Why? _____



Real cricket analysts do exactly this – with thousands of matches!






Hard Patterns!

1 Teaser 1: 2 · 3 · 5 · 7 · 11 · 13 · ·

Hint: These are **PRIME** numbers! (Only divisible by 1 and itself)



2 Teaser 2: 1 · 8 · 27 · 64 · 125 · , ,

Hint: These are **CUBE** numbers (1^3 , 2^3 , 3^3 , 4^3 , 5^3)



3 Teaser 3: Word pattern: CAR · CARD · CARDS · ·

Rule: **add 1 letter** each time



4 Teaser 4: Tricky! 1, 2, 6, 24, 120, _____

Hint: $1 \times 1 = 1$, $1 \times 2 = 2$, $2 \times 3 = 6$, $6 \times 4 = 24$, $24 \times 5 = 120$,
 $120 \times 6 = \text{_____}$ (**Factorial!**)



5 Teaser 5: Mega tricky! O, T, T, F, F, S, S, E, N, _____

Hint: **First letters** of One, Two, Three, Four... what's 10?



6 Teaser 6: 31, 28, 31, 30, 31, 30, 31, , ,

Hint: **Days** in each month!



Look closely, **think smart**,
and **patterns** will be your
superpower!





Try it Yourself!



Pattern Master Challenge



1. **Sunflower Hunt:** Find a sunflower or pinecone. Count the spirals!



2. **Family Forecast:** Track your savings 4 weeks. Predict week 5!



3. **Make a Palindrome:** Find 5 palindromes around you (numbers, words, names!)



4. **For-loop Code:** Write pseudocode that prints 10 even numbers!



5. **Cricket Captain:** Pick a team. Find scores from last 5 games. Predict next!



In Chapter 2 you learned:

- ★ **Fibonacci** in nature
- ★ Patterns in **charts & data**
- ★ **Palindromes** (in English & Hindi!)
- ★ Patterns in **pseudocode** (for-loops!)
- ★ **Forecasting** & inverse patterns
- ★ **Pattern art** (Escher!)



Pattern Master!



Next: **Abstraction Architect!**

