Chapter 01 Patterns in Mathematics

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Mindmap

- Introduction to Patterns
  • Repeating arrangements of numbers, shapes, or objects
  • Found in nature, designs, daily life
- Types of Patterns
  • Number Patterns
    - Even numbers: 2, 4, 6, 8, …
    - Odd numbers: 1, 3, 5, 7, …
    - Skip counting: 5, 10, 15, 20, …
      • Shape Patterns
    - ▲ ■ ▲ ■ ▲ ■ …
    - ○ △ □ ○ △ □ …
      • Growing Patterns
    - Each step increases: 1, 2, 4, 7, 11, …
      • Repeating Patterns
    - Same group repeats: ABABAB, Red-Blue-Red-Blue
- Rules of Patterns
  • Identify the rule (e.g., “add 3”, “alternate shapes”)
  • Extend the pattern using the rule
- Magic Squares & Number Towers
  • Magic square: rows, columns, diagonals add to same total
  • Number tower: each block = sum of two below it
- Real-life Applications
  • Calendar patterns
  • Tiling designs
  • Sequences in music or poetry

Notes with Relevant Examples

1. Number Patterns
   Example 1: Find the next three terms: 3, 6, 9, 12, …
   Rule: Add 3 → Next terms: 15, 18, 21
   Example 2: Complete: 20, 18, 16, __, __
   Rule: Subtract 2 → 14, 12
2. Shape Patterns
   Example: ▲, ■, ●, ▲, ■, ●, __, __
   Rule: Repeat ▲ ■ ● → Next: ▲, ■
3. Growing Patterns
   Example: Number of dots: Step 1 = 1, Step 2 = 3, Step 3 = 6
   Pattern: +2, +3 → Step 4 = 10
4. Magic Square (3×3)
   Example:
   2 7 6

9 5 1
4 3 8
Each row/column/diagonal sums to 15

5. Number Tower
   Example:
   ?
   8 7
   3 5 2
   Bottom: 3+5=8, 5+2=7 → Top: 8+7=15

Unit Test

Q1. Write the next three numbers in the pattern: 7, 14, 21, __, __, __

Q2. Identify the rule and complete: 100, 95, 90, __, __

Q3. Draw the next two shapes: ○ △ □ ○ △ □ __ __

Q4. Fill the missing number in the number tower:

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    ?
  6   5
2   ?   3
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Q5. In a magic square, if one row is 4, 9, 2, what is the magic sum?

Q6. What is the 6th term in the pattern: 1, 3, 6, 10, 15, __?

Q7. Complete the pattern: A, C, E, G, __, __

Q8. How many circles will be in Step 4 if:
Step 1: ●
Step 2: ●●
Step 3: ●●●
Step 4: ?

Worksheet

W1. Find the rule and write the next four terms:
a) 5, 10, 15, __, __, __, __
b) 1, 4, 7, 10, __, __, __, __

W2. Complete the shape pattern:
a) ▲, ▲, ■, ▲, ▲, ■, __, __, __
b) 🔴, 🔵, 🔴, 🔵, 🔵, 🔴, 🔵, 🔵, 🔵, __, __

W3. Fill the blanks in the number tower:

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   __
 9  __
4  5  3
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W4. Create your own repeating pattern using two letters and two numbers (e.g., A1B2A1B2…). Write first 8 terms.

W5. Is the following a magic square? Verify.
2 7 6
9 5 1
4 3 8

W6. Write the first six even numbers. What is the pattern rule?

W7. If a pattern starts with 2 and you add 5 each time, write first five terms.

W8. Draw Step 3 of this growing pattern:
Step 1: ▲
Step 2: ▲▲
Step 3: ?

Solutions – Unit Test

A1. 28, 35, 42
A2. Rule: Subtract 5 → 85, 80
A3. ○, △
A4. Bottom middle = 5 – 2 = 3? Wait: 2 + ? = 6 → ? = 4; then top = 6 + 5 = 11
So:

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    11
  6   5
2   4   3
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A5. 4 + 9 + 2 = 15
A6. Pattern: +2, +3, +4, +5, +6 → 15 + 6 = 21
A7. I, K (skip one letter each time)
A8. 4 circles

Solutions – Worksheet

W1.
a) Rule: +5 → 20, 25, 30, 35
b) Rule: +3 → 13, 16, 19, 22

W2.
a) ▲, ▲, ■
b) 🔴, 🔵 (pattern: 1 red, then increasing blues: 1B, 2B, 3B…) → after 3 blues, next is red, then 4 blues? But given: R B R BB R BBB → next: R, BBBB → so: 🔴, 🔵

W3.
Bottom: 4 + 5 = 9 (left), 5 + 3 = 8 (right)
Top: 9 + 8 = 17
So:

```
    17
  9   8
4   5   3
```

W4. Example: A2B4A2B4A2B4A2 (any valid repeating sequence)

W5. Yes. All rows, columns, diagonals sum to 15.

W6. 2, 4, 6, 8, 10, 12 → Rule: Start at 2, add 2 each time

W7. 2, 7, 12, 17, 22

W8. ▲▲▲