

Patterns in Mathematics

Case Study Based Worksheet 1

Name:	Class:	Section:
Date:	Roll No.:	Marks: ____ / 20

Case Study 1: The Auditorium Seating Plan

The annual day function of a school is being held in the auditorium. The chairs are arranged in rows in a special pattern so that everyone can see the stage clearly. The first row (closest to the stage) has 1 chair, the second row has 3 chairs, the third row has 6 chairs, the fourth row has 10 chairs, and this pattern continues — each new row follows the triangular number pattern. The event coordinator wants to plan seating for 8 rows and needs your help using the number pattern.

Answer the following questions based on the case study above:

1. Which well-known number sequence describes the number of chairs in each row?

2. How many chairs will be placed in the 5th row?

3. How many chairs will be placed in the 8th row?

4. What is the total number of chairs needed for the first 4 rows together?

5. The coordinator says, 'If I add two consecutive triangular numbers, I always get a square number.' Verify this using row 3 and row 4 (6 and 10).

Answer Key — Worksheet 1

Case Study 1: The Auditorium Seating Plan

1. Triangular numbers (1, 3, 6, 10, 15, 21, 28, 36, ...)
2. 15 chairs
3. 36 chairs
4. $1 + 3 + 6 + 10 = 20$ chairs
5. $6 + 10 = 16$, and $16 = 4^2$, which is a square number — so the statement is verified as true

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Case Study Based Worksheet 2

Name:	Class:	Section:
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Case Study 2: The Honeycomb Tile Design

A tile designer is creating a decorative floor pattern for a museum lobby using hexagon-shaped tiles, inspired by a honeycomb. She places 1 hexagon tile in the centre. Around it, she adds rings of tiles: the number of tiles used up to each ring follows the hexagonal number pattern 1, 7, 19, 37, 61, She wants to calculate how many tiles are required as the design grows outward, ring by ring, for a large lobby floor.

Answer the following questions based on the case study above:

1. How many tiles in total are used up to (and including) the 3rd ring, according to the pattern?

2. How many tiles will be needed up to the 5th ring?

3. The designer knows that multiplying a triangular number by 6 and adding 1 gives a hexagonal number. Use the 4th triangular number (10) to check this rule.

4. How many additional tiles are added when going from ring 2 (7 tiles) to ring 3 (19 tiles)?

5. If the pattern continues, how many tiles will be needed up to the 6th ring?

Answer Key — Worksheet 2

Case Study 2: The Honeycomb Tile Design

1. 19 tiles
2. 61 tiles
3. $10 \times 6 + 1 = 61$, which matches the 5th hexagonal number — the rule is verified
4. $19 - 7 = 12$ additional tiles
5. 91 tiles

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Case Study Based Worksheet 3

Name:	Class:	Section:
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Case Study 3: Growing Savings with Doubling Pattern

Riya starts a 'doubling savings challenge' with her friends. On Day 1, she saves ₹1. On Day 2, she saves ₹2. Each day after that, she saves double the amount she saved the previous day (Day 3: ₹4, Day 4: ₹8, and so on) — following the Powers of 2 pattern. She wants to track her total savings over two weeks and understand how quickly the pattern grows.

Answer the following questions based on the case study above:

1. Which number pattern describes Riya's daily savings amount?

2. How much money will Riya save on Day 6?

3. What is Riya's total savings after 4 days (Day 1 + Day 2 + Day 3 + Day 4)?

4. Riya notices that her total savings after any number of days is always 1 less than the next day's saving amount. Verify this for Day 4 (total = 15) and Day 5's saving (16).

5. If Riya continues the pattern, on which day will her daily saving first cross ₹100?

Answer Key — Worksheet 3

Case Study 3: Growing Savings with Doubling Pattern

1. Powers of 2 (1, 2, 4, 8, 16, 32, ...)
2. ₹32 ($2^5 = 32$)
3. $1 + 2 + 4 + 8 = ₹15$
4. $16 - 1 = 15$, which matches the total after Day 4 — the observation is verified
5. Day 8, when she saves ₹128 ($2^7 = 128$), which is the first amount greater than ₹100

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