English Medium
Second Edition · November 2026

TET-II

FREE DEMO

Mathematics

Concepts, methods and problem solving

- Detailed concepts and classroom examples
- Topic-linked practice with explained answers
- Selected earlier-examination questions

BOOK 06 | Mathematics-Science Series

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Mathematics

Gujarat TET-II · English Medium

Mathematics-Science Series · Book 06

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Examinations qualified

TET-1 (2025) | TET-2 (2023) | TAT (2023)

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Mathematics content: 25 marks. Standards 6–8 form the base, with difficulty and linkages through Standard 12. Mathematics pedagogy is covered separately in Book 08. Syllabus basis: Gujarat Education Department resolution of 8 October 2025. Gujarat English-medium textbook editions checked on 16 November 2026.

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Preface

Dear learner,

Mathematics preparation requires a reason for each step. Name the quantity, identify the relevant relationship, keep the conditions and units, and verify the result in the original problem. A plausible numerical answer can still answer a different question.

This second edition retains 292 earlier practice questions and mixes in 112 new questions from across the taught subtopics. Each of the 404 practice questions has four options, a checked answer, an explanation and an English Study link to prior teaching. The links identify the paragraph, worked example or table row that supplies the method or fact.

The 127 selected earlier-examination records use translated or condensed study wording and retain year and question labels. Original alternatives have not been invented where they are unavailable. Wording clarified for a condition or assumption is identified. These are selected records, not a claim that every historical paper is included.

Standards 6–8 form the content base, with difficulty and connections through Standard 12 as specified in the examination framework. The current Gujarat English-medium textbooks were checked for the topic map and terminology, including Ganita Prakash for Standard 6. Mathematics pedagogy is treated separately in Book 08.

Read the diagrams with their labels and conditions. A schematic is not a scale drawing; an outline view can hide cubes; an area and a perimeter use different units. For a probability task, define the experiment and equally likely outcomes. For commercial arithmetic, use the rate and tax conditions stated in the problem.

Attempt a question before reading its answer. Then use the Study link to review the underlying reason and try a fresh example. Exact fractions, dimensional checks and substitution often expose an error more reliably than a quick guess.

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CHAPTER

1 Patterns, Number Play and Mathematical Reasoning

A rule is more useful than a guess

- A **sequence** is ordered. Its entries are terms. A recursive rule gives a term using earlier terms; a position rule gives it using the term number.
- For a constant increase d, the nth term is **a + (n - 1)d**, where a is the first term. There are n - 1 gaps from the first term to the nth.
- For a nonzero constant multiplier r, the nth term is $\mathbf{a \times r^{n-1}}$. Repeated multiplication is different from repeated addition.
- A finite list can fit more than one rule. State the assumed or supplied rule and test every transition. The word "next" alone does not make a continuation unique.
- Separate alternating strands when one rule does not fit adjacent entries. In 4, 12, 6, 24, 8, 36, the odd positions increase by 2 and even positions by 12.

Family	Position rule or construction
Positive even numbers	2n, with n = 1, 2,...
Positive odd numbers	2n - 1
Square numbers	n^2: an n × n array
Cube numbers	n^3: n layers, each containing n^2 cubes
Triangular numbers	1 + 2 +... + n = n(n + 1)/2
Virahanka-type growth	Each later entry is the sum of the preceding two; starting entries must be stated.

Relations that explain visual patterns

- The sum of the first n positive odd numbers is $\mathbf{n^2}$. Add an L-shaped border to a square: its next border contains 2n + 1 dots.
- Consecutive triangular numbers add to a square: n(n + 1)/2 + (n + 1)(n + 2)/2 = $\mathbf{(n + 1)^2}$. Two staircases fit a square.

- The sum 1 + 2 +... + n +... + 2 + 1 is n^2. The middle term n is included once.
- Regular polygons have equal side lengths and equal interior angles. A side count is a numerical pattern; the condition "regular" is an additional geometric condition.

Worked example: A distant term

1. The sequence starts at 9 and rises by 4.
2. The 25th term is $9 + 24 \times 4 =$ **105**.
3. Check the position rule at n = 1: it returns 9.

Worked example: Triangular arrangement

1. For 14 rows, count 1 + 2 +... + 14.
2. Pair the forward and backward sums: 14 pairs each total 15.
3. Twice the required sum is 210; the answer is **105**.

Digit-based investigations

- A **palindrome** reads the same forwards and backwards, such as 7447. Reversing digits is not the same as changing their place values independently.
- For a positive integer, one **Collatz rule** halves an even number and replaces an odd number by 3n + 1. Many examples reach 1; this does not prove the conjecture for all positive integers.
- In the four-digit **Kaprekar process**, arrange the digits in descending and ascending order, retain leading zeros, and subtract. The usual 6174 result concerns four-digit inputs with at least two different digits; repdigits are an exception.
- Use **counterexamples** to refute "always" statements. Nine disproves the claim that every odd number greater than 1 is prime.

Worked example: Kaprekar step

1. Start from 3524.
2. Descending form: 5432. Ascending form: 2345. Difference: **3087**.
3. The next step is 8730 - 0378 = **8352**. Keep the zero when arranging four positions.

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Common errors

- Counting n rather than n - 1 gaps.
- Treating observed examples as a proof for all integers.
- Ignoring a changing difference, a position condition or an exceptional input.
- Counting a shared corner twice when a square border is added.

Number-play details from the current Standard 6 scope

- In a row of **supercells**, a cell qualifies when its number is strictly greater than each immediately adjacent cell. An end cell has only one neighbour. In a two-dimensional grid, use the adjacency definition specified in the task.
- A **digit sum** adds the digits, not their place values. For 6,482, the digit sum is 20. It can support divisibility tests but does not equal the number.
- To minimise a number with a fixed positive digit sum, use as few digits as possible, then minimise the leftmost digit. For digit sum 17, the smallest positive integer is **89**.
- Count digit occurrences by position. A repeated digit in one number contributes more than once. Distinguish "numbers containing 6" from "occurrences of digit 6".

Worked example: Supercells in a row

1. Consider 12, 40, 18, 35, 9.
2. 40 exceeds both neighbours 12 and 18; 35 exceeds 18 and 9.
3. The end entries do not exceed their only neighbour. There are **two supercells**.

Count structures without losing shared parts

- A pattern can concern **terms, positions, digits, tiles, edges or intersections**. Identify the object being counted before applying a rule.
- In a row of n squares made from matchsticks, the first square needs four sticks and each further square shares one side. Total sticks = **4+3(n-1)=3n+1**. Separate squares would need 4n.

- In a triangular dot arrangement, row lengths 1,2,..., n total **n(n+1)/2**. In a square array there are n^2 dots. A picture can contain both arrangements, so name the counted set.
- For digit questions, distinguish a numeral's **value**, its **digit sum** and the number of **occurrences** of one digit. They are different quantities.

Worked example: Counting a digit by positions

1. Count occurrences of digit 2 in the integers from 1 to 40.
2. The units position contributes 2,12,22,32: four occurrences. The tens position contributes 20 through 29: ten occurrences.
3. Total = **14 occurrences**. The number 22 correctly contributes twice. There are only thirteen numbers containing a 2.

Worked example: A border of unit tiles

1. A square array has 9 tiles along each side. Count its outer border.
2. Four side counts give $4\times9=36$ but count each corner twice. Subtract the four duplicates.
3. Border tiles = **32**, also 9^2-7^2. The interior is a 7×7 array.

Verification for an unseen pattern

- Check the rule at an early position, a later supplied position and the requested position.
- If the task provides a diagram, check shared edges/corners rather than trusting a formula for a superficially similar pattern.
- For an "always" statement, seek a proof or a counterexample; a long list of confirming examples is not a proof.

Visual sequences: count what changes

A diagram can grow by adding a row, a border, a layer or new connections. First name the counted object: **dots, small regions, edges or line segments**. The same picture may give different sequences for different objects.

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23. Thirty INR 2/INR 5 coins total INR 102. Number of INR 5 coins is...

(A) 16 **(B)** 18

(C) 12 **(D)** 14

Answer: D. 14. 5 x+2(30-x)=102 gives x=14.

Study link: Worked example: A count and a monetary total, p. 201.

24. A fixed budget buys 30 items before a 25% price rise. How many whole items can it now buy?

(A) 37.5 **(B)** 25

(C) 24 **(D)** 22.5

Answer: C. 24. Divide the original quantity by 1.25: 30/1.25=24.

Study link: Worked example: Cost after a price rise, p. 197.

Earlier-examination questions

TET-II 2012 | Q99 | Translated study form | Wording clarified | Short-answer form

1. Four-legged animals and two-legged birds total 32 heads and 100 legs. How many are birds?

Answer: 14. Let b be two-legged birds: 2b + 4(32 - b) = 100, giving b = 14.

Study link: A heads-and-legs model, p. 201.

TET-II 2012 | Q111 | Translated study form | Short-answer form

2. An inlet fills a tank in 6 hours; an outlet empties it in 15 hours. How long to fill it with both open?

Answer: 10 hours. Net rate is 1/6 - 1/15 = 1/10 tank per hour, assuming constant rates.

Study link: Worked example: Rates with a leak, p. 200.

TET-II 2014 | Q85 | Translated study form | Short-answer form

3. Two machines separately make 3000 shirts in 100 and 150 days. Find their combined daily output.

Answer: 50 shirts per day. Separate daily rates are 30 and 20; add them.

Study link: Add rates in a common unit, p. 201.

TET-II 2015 | Q102 | Translated study form | Short-answer form

4. An inlet fills a tank in 4 hours; with a leak, filling takes 4.5 hours. How long would the leak alone take to empty a full tank?

Answer: 36 hours. Leak rate = 1/4 - 1/4.5 = 1/36 tank per hour.

Study link: Worked example: Rates with a leak, p. 200.

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