English Medium
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TET-II

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Mathematics & Science Pedagogy

Teaching, learning and evidence in the classroom

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

BOOK 08 | Mathematics-Science Series

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Mathematics & Science Pedagogy

Gujarat TET-II · English Medium

Mathematics-Science Series · Book 08

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Examinations qualified

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

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Scope: Mathematics pedagogy (15 marks) and Science pedagogy (10 marks) within the TET-II Mathematics-Science subject section. Syllabus basis: Gujarat Education Department resolution of 8 October 2025, checked on 16 November 2026. The content books in this series treat Mathematics and Science separately.

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Earlier-examination records retain archived year and item labels and use translated or condensed study wording. Where original alternatives are unavailable, short-answer form is retained; alternatives have not been invented. Year-specific policies, schemes and record formats are identified in context. These selected records do not reproduce every historical paper.

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Preface

Dear learner,

A teaching method is useful when it helps a learner understand, reason and act. The important question is what a classroom activity makes possible: which concept it develops, what evidence it provides, and how the teacher responds when an explanation remains insecure.

This second edition retains all 144 practice questions and all 99 earlier-examination records from the preceding revision. It mixes in 78 further practice questions across the 26 chapters. Each of the 222 practice questions has four alternatives, an answer, an explanation and an English Study link to the relevant prior teaching. The 99 earlier-examination records also have explanations and Study links.

Study links identify a paragraph, a table row, a worked example or a diagram. Different questions draw on different parts of each chapter. Read the linked teaching before attempting a question, then use a changed example to check whether the concept or method transfers.

Mathematics pedagogy develops reasoning, meaningful representations, purposeful activity and sound assessment. Worked sequences connect fractions, integers, algebra, geometry, measurement and data with likely learner responses. Science pedagogy connects questions, process skills, fair tests, demonstrations and laboratory work with evidence and explanation. The six teaching diagrams from the preceding revision are retained.

Methods can complement one another. A demonstration does not automatically establish practical competence; a copied answer does not establish understanding; an attractive resource does not by itself improve learning. Plan the intended outcome, invite learner reasoning, collect suitable evidence and revise teaching in response.

Historical questions preserve their year and section context. Read an old programme or exhibition theme as a year-specific fact. When an original paper's alternatives are unavailable, the record remains a short-answer study item. A classroom example explains the principle without claiming that the same method is always best in every situation.

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CHAPTER

1 Nature of Mathematics and Mathematical Thinking

Mathematics studies patterns, quantities, structures, space and relationships. Its educational purpose includes reasoning, representation, problem solving and communication, alongside accurate calculation.

Understand the principle and its classroom use

- A mathematical statement needs clearly defined terms and relevant assumptions. Testing several numerical examples can suggest a conjecture, but a proof explains why it follows for all cases in the stated domain.
- Abstraction retains a relationship while moving beyond a particular object. Three stones, three claps and the numeral 3 can represent the same quantity, but a symbol gains meaning through connections with experience.
- Precision does not require teaching every idea first through an unexplained formal definition. Learners can explore cases, compare strategies and refine language while building a valid concept.
- Mathematisation means identifying quantities, relationships and structures in a situation, then interpreting the mathematical result back in context. A correct numerical operation can still answer the wrong real-world question.

Term or decision	Meaning
Conjecture	A proposed statement suggested by patterns or evidence
Proof	A logically valid justification under stated assumptions
Abstraction	Attention to a structure or relation beyond particular objects
Mathematisation	Representing and reasoning about a situation mathematically

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Worked example: Examples and a proof

1. A learner tests 2+4, 6+8 and 10+12 and proposes that the sum of two even integers is even.
2. Write the integers as 2m and 2n. Their sum is 2(m+n), which is even for integer m, n. The algebra supplies a **general justification**.
3. Invite the learner to explain the role of integer assumptions rather than merely copying the final expression.

Definitions, assumptions and a valid argument

- **Define the objects**, state the domain and distinguish what is given from what must be established. An axiom or postulate is accepted within the system; a theorem requires a deduction from accepted statements.
- Invite a conjecture from varied cases, search for counterexamples, and then justify its scope. An empirical check and a logical proof answer different evidential questions.
- Connect intuition with precision. A learner can first recognise a pattern and later express it using variables; the teacher should make the connection explicit rather than replacing meaning with notation.

Decision or term	Meaning in practice
Definition	Fixes the meaning of a term: an even integer is 2k for integer k
Axiom / postulate	An accepted starting statement in the stated mathematical system
Theorem	A statement established by valid reasoning
Converse	Reverses hypothesis and conclusion; its truth needs a separate check
Counterexample	One valid case disproving a universal claim

Worked example: Test a converse

1. If a number is divisible by 4, it is even. The converse says every even number is divisible by 4.
2. Use 6: it is even but not divisible by 4. The original implication survives; its converse fails.

Counterexamples and reasoning programmes

A prime is a positive integer greater than 1 with exactly two positive factors. The number 2 is prime and even, so it disproves "all primes are odd". A defensible revision is "every prime greater than 2 is odd": any larger even integer has 2 as an additional factor.

Ek Kadam Aagal is the GCERT programme identified in the TET-II 2023 item on logical and analytical thinking. A task develops these abilities when learners inspect relationships, compare possible strategies and justify a conclusion. The programme name is a historical examination fact; reasoning is the learning process to practise.

Chapter practice

1. A pupil checks 12 examples and says all prime numbers are odd. What is the most useful next step?
(A) Teach that all odd numbers are prime
(B) Accept the statement because twelve checks are sufficient
(C) Ask the pupil to test 2 and revise the scope of the conjecture
(D) Reject all numerical examples as useless
Answer: C. Ask the pupil to test 2 and revise the scope of the conjecture. The prime 2 is a counterexample; examples support conjecture but do not establish universality.
Study link: Counterexamples and reasoning programmes, p. 3.

2. Which step turns the even-number observation into a general justification?
(A) Test ten larger pairs.
(B) Choose only pairs with equal terms.
(C) Write two even integers as 2m and 2n and factor their sum.
(D) Count how many examples agree.
Answer: C. Write two even integers as 2m and 2n and factor their sum. The sum 2(m+n) is even for all integers m and n; a finite list alone is not a proof.
Study link: Worked example: Examples and a proof, p. 2.

3. Which term matches this description: A proposed statement suggested by patterns or evidence?
(A) Proof **(B)** Conjecture
(C) Abstraction **(D)** Mathematisation
Answer: B. Conjecture. Conjecture: A proposed statement suggested by patterns or evidence.
Study link: Conjecture, p. 1.

4. Which term matches this description: A logically valid justification under stated assumptions?

(A) Conjecture **(B)** Mathematisation
(C) Proof **(D)** Abstraction

Answer: C. Proof. Proof: A logically valid justification under stated assumptions.

Study link: Proof, p. 1.

5. A bus problem is calculated correctly but the result counts seats rather than required buses. Which step is missing?

(A) Use more decimal places.
(B) Replace all quantities by symbols without definitions.
(C) Ignore the stated capacity.
(D) Interpret the mathematical result in the original situation.

Answer: D. Interpret the mathematical result in the original situation. Mathematisation includes interpreting the result against the real question and its constraints.

Study link: Mathematisation and interpretation, p. 1.

6. Which term matches this description: Attention to a structure or relation beyond particular objects?

(A) Mathematisation **(B)** Abstraction
(C) Proof **(D)** Conjecture

Answer: B. Abstraction. Abstraction: Attention to a structure or relation beyond particular objects.

Study link: Abstraction, p. 1.

7. A learner tests 4, 8 and 12 and claims that every even number is divisible by 4. The most useful next example is...

(A) 24 **(B)** 20
(C) 16 **(D)** 6

Answer: D. 6. Six is an even counterexample, unlike the other choices.

Study link: Worked example: Test a converse, p. 2.

8. "Divisible by 4 implies even" is true. What must be checked separately?

(A) The converse that every even integer is divisible by 4.
(B) Whether 4 has a numeral.
(C) Whether one confirming example exists.
(D) Whether the original statement can be copied.

Answer: A. The converse that every even integer is divisible by 4. Reversing hypothesis and conclusion creates another statement; 6 disproves this converse.

Study link: Converse, p. 2; Worked example: Test a converse, p. 2.

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8. When direct pupil work has unsuitable hazards or insufficient supervision, what should planning consider?

(A) Proceed because the lesson is scheduled.
(B) A teacher-controlled demonstration or a safer substitute meeting the learning goal.
(C) Treat a written rule as a substitute for all supervision.
(D) Allow unknown mixtures to identify the hazard afterwards.

Answer: B. A teacher-controlled demonstration or a safer substitute meeting the learning goal. The learning method must fit readiness, risk, equipment and available supervision.

Study link: Laboratory organisation and responsible routines (point 2), p. 156.

Earlier-examination questions

TET-II 2011 | Q10 | Part I | Social Science booklet | Adapted study wording

1. A firecracker burns a child's hand. Which first response is the best of the choices in the paper?

(A) Send someone to call a doctor.
(B) Cool the burned hand with water.
(C) Apply an ointment.
(D) Wash the hand with antiseptic.

Answer: B. Cool the burned hand with water. For an ordinary thermal burn, begin cooling promptly with cool running water for 20 minutes. Alert the teacher and follow the school's first-aid and medical referral procedures.

Study link: Immediate response to an ordinary thermal burn, p. 157.

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