

CBSE CLASS X STANDARD MATHEMATICS

Consolidated 5-Mark Question Guide & Section E Case-Study Strategies

Based on CBSE Past-Year Board Papers (2011–2026) & official NCERT Syllabus Solutions

About This Companion Guide

This high-density workbook is designed for students aiming to maximize scores in the heaviest weightage blocks of the CBSE Class 10 Standard Mathematics paper. It covers **Section D (5-Mark Long Answers)** and **Section E (4-Mark Case-Study Integrated Questions)**. By practicing these exact templates, students transition from mechanical memorization to systematic, examiner-approved logical steps.

1 SECTION D: THE 5-MARK LONG-ANSWER STRATEGIES

Section D consists of 4 questions carrying 5 marks each (total 20 marks). These questions are highly predictable and fall into four major academic divisions.

1.1 Category 1: Geometric Theorem Proofs (Chapter 6: Triangles & Chapter 10: Circles)

Geometric proofs carry the highest structural scoring guarantees if written following the strict board grading rubric.

The 4-Part Theorem Rubric

- 1. The Diagram (1.0 Mark):** Draw a clean, geometric figure with a sharp **pencil and ruler**. A missing, freehand, or unlabelled figure will result in an immediate deduction of a full mark.
- 2. Given & To Prove (1.0 Mark):** State the mathematical setup of the triangle/circle under "Given" (e.g., " $DE \parallel BC$ in $\triangle ABC$ ") and clearly outline your final target identity under "To Prove".
- 3. Construction (1.0 Mark):** Explicitly detail any added auxiliary elements (perpendicular heights, joined lines) in dotted lines on the diagram (e.g., "Draw $DM \perp AC$ and join BE ").
- 4. Logical Proof (2.0 Marks):** Write the proof in a sequential step-by-step format. **Every single geometric statement must include a valid mathematical reason/theorem written inside brackets** next to it.

1.2 Category 2: Heights & Distances (Chapter 9: Applications of Trigonometry)

Typically presented as double-observer or moving-point scenarios (e.g., a car moving towards a tower, or an airplane observed at two distinct angles).

The Double-Observer Solution Blueprint

- **Alternate Interior Angle Rule:** For angles of depression, always draw a horizontal reference line from the observer's eye at the top. Use parallel line properties to translate it to an equal angle of elevation on the ground before setting up your ratios.
- **Right-Triangle Partitioning:** Break the composite diagram into two distinct, right-angled triangles.
- **Equation Chain:** Setup $\tan \theta_1$ and $\tan \theta_2$ ratios for both triangles. Use the shared common side (typically the height of the tower h , or the base distance x) to link the two equations and isolate the unknown variable.

1.3 Category 3: Surface Areas & Volumes (Chapter 12: Combined Solids)

Focuses on measurements of combined geometric solids, such as a cone mounted on a hemisphere, or a cylinder with hemispherical ends.

The Combined Solid Area Trap

Students frequently fail this question by simply adding individual Total Surface Areas (TSA) of the constituent shapes.

TSA of Combined Solid $\neq$ TSA of Solid 1 + TSA of Solid 2

TSA of Combined Solid = Sum of the **Visible Curved Surface Areas (CSA)** of all constituent solids

For example, for a toy made of a cone mounted on a hemisphere:

$$\text{Total Surface Area} = \text{CSA of Cone} + \text{CSA of Hemisphere} = \pi r l + 2\pi r^2$$

1.4 Category 4: Statistics Grouped Data (Chapter 13: Statistics)

Typically requires finding missing frequencies (x and y) when the total frequency (N) and Median/Mean are given.

The Step-Deviation Mean Method

To secure full steps in Mean calculations, use the Step-Deviation Method to simplify calculations:

$$\bar{x} = a + h \left(\frac{\sum f_i u_i}{\sum f_i} \right) \quad \text{where} \quad u_i = \frac{x_i - a}{h}$$

Always construct a neat table containing columns for: Class Interval $\rightarrow$ Class Mark (x_i) $\rightarrow$ Frequency (f_i) $\rightarrow$ Deviation ($d_i = x_i - a$) $\rightarrow$ Step Deviation (u_i) $\rightarrow$ Product ($f_i u_i$).

2 SECTION E: CASE-STUDY INTEGRATED SCORE-MAXIMIZATION TIPS

Section E consists of 3 Case-Based integrated questions carrying 4 marks each (total 12 marks). Each case study has sub-parts of 1, 1, and 2 marks (the 2-mark part always features an internal choice).

The Section E Action Plan

- 1. Discard the Narrative "Noise":** Case-study questions open with a long, real-world scenario (e.g., "India Gate is a famous war memorial..."). Teach students to quickly bypass the descriptive paragraphs and scan for the **actual mathematical coordinates, lengths, heights, and angles** buried in the text or diagrams.
- 2. Independent Sub-Part Execution:** Do not leave the entire case study blank if you get stuck on the final 2-mark question. The first two sub-parts (1 mark each) are designed to be direct, low-calculation lookups or basic formula substitutions. Lock those easy 2 marks in first!
- 3. Evaluate the Internal Choice wisely:** Take 30 seconds to read both options for the final 2-mark question. Write down their raw formulas, and select the one that offers simpler numerical calculations.
- 4. Strict Unit Discipline:** Since case studies represent real-world objects, final answers MUST carry correct units (e.g., meters, cm, rupees, percentage). **Failing to write the correct unit results in an automatic 0.5-mark board penalty.**