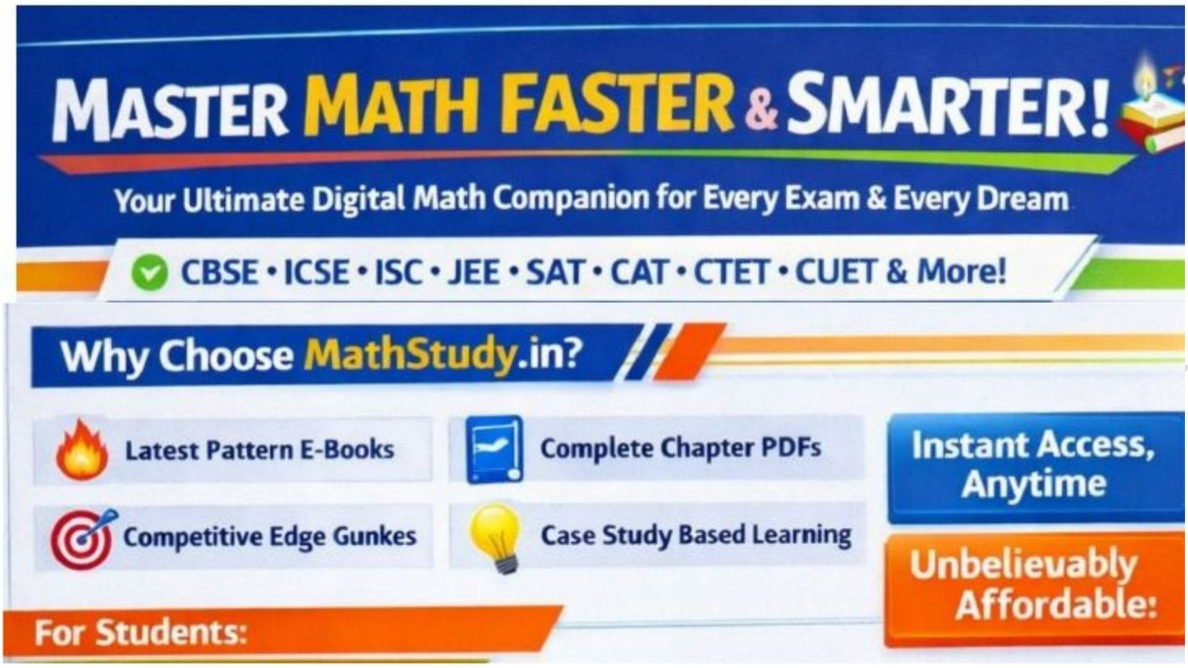
SOLUTIONS



Special Features

- **Board-Specific** – CBSE, ICSE, ISC, State Boards
- **Exam-Focused** – JEE, SAT, CAT, CTET, CUET, NTSE
- **Grade-Wise** – Class 6 to 12
- **Bilingual Options** – English & Hindi Medium Support
- **Printable & Shareable** – Use offline, anytime

How to Order:

Visit : https://www.mathstudy.in
Browse by Exam, Class, or Topic
Add to Cart & Checkout

Contact & Support:

✉️ Email: admin@mathstudy.in
💬 WhatsApp Support Available : +91-+91 92118 65759

💡 Why Wait? Empower your learning journey, save time, and achieve your dreams!

🌐 Explore & Start Learning Today:
https://www.mathstudy.in – Premium eBooks for success
https://www.udgamwelfarefoundation.com – Free PDFs, practice tests, & guida

MathStudy.in — Empowering Learners, Enabling Educators, Encouraging Excellence.
Digital Learning | Affordable Excellence | Trusted by Thousands

SOLUTIONS: AREAS OF PARALLELOGRAMS AND TRIANGLES

Mathematics | Class IX (2026/SOL-ARPARA/09/002)

Section A: Multiple Choice Questions

1. **1 : 1** — Parallelograms on the same base and between same parallels are equal in area.
2. **Equal area** — A median divides a triangle into two triangles of equal area.
3. **1 : 2** — Area of triangle is half the area of the parallelogram on same base/parallels.
4. **24** cm^2 — $Area(\triangle APB) = \frac{1}{2}Area(ABCD) = \frac{1}{2} \times 48 = 24$.
5. **96** cm^2 — $Area = \frac{1}{2} \times d_1 \times d_2 = \frac{1}{2} \times 12 \times 16 = 96$.
6. **Remain the same** — $Area = \frac{1}{2} \times (2b) \times (\frac{h}{2}) = \frac{1}{2}bh$.
7. **Greater than rectangle** — For the same area/base, a slanted parallelogram has a larger perimeter than a rectangle.
8. $\frac{1}{4}area(\triangle ABC)$ — $Area(BED) = \frac{1}{2}Area(ABD) = \frac{1}{2}(\frac{1}{2}ABC)$.

Section B: Very Short Answer Questions

1. **Proof:** Diagonal AC of $\|^{gm}$ $ABCD$ forms $\triangle ABC$ and $\triangle CDA$. By SSS congruence $(AB = CD, BC = DA, AC = AC)$, $\triangle ABC \cong \triangle CDA$. Congruent triangles have equal areas.
2. **Proof:** $\triangle PXQ$ and $\|^{gm}$ $PQRS$ are on the same base PQ and between same parallels $PQ \parallel SR$. $\therefore Area(\triangle PXQ) = \frac{1}{2}Area(PQRS)$. Also, $Area(PQRS) = Area(\triangle PSX) + Area(\triangle PXQ) + Area(\triangle QRX)$. Substituting $Area(\triangle PXQ)$, we get: $2Area(\triangle PXQ) = Area(\triangle PSX) + Area(\triangle PXQ) + Area(\triangle QRX)$. $\implies Area(\triangle PXQ) = Area(\triangle PSX) + Area(\triangle QRX)$.
3. **Proof:** Join HF. $ABFH$ and $HFCD$ are parallelograms. $Area(\triangle HEF) = \frac{1}{2}Area(ABFH)$ and $Area(\triangle HGF) = \frac{1}{2}Area(HFCD)$. Summing gives $Area(EFGH) = \frac{1}{2}Area(ABCD)$.
4. **Proof:** Since AB bisects CD at O, AO is the median of $\triangle ACD$ and BO is the median of $\triangle BCD$. $Area(\triangle AOC) = Area(\triangle AOD)$ and $Area(\triangle BOC) = Area(\triangle BOD)$. Summing gives $Area(\triangle ABC) = Area(\triangle ABD)$.

Section C: Short Answer Questions

1. **Proof:** Let $\triangle ABC$ and $\triangle ABD$ be on base AB with $AB \parallel CD$. Since altitude (distance between parallels) is constant (h), $Area(ABC) = \frac{1}{2} \times AB \times h$ and $Area(ABD) = \frac{1}{2} \times AB \times h$. Thus, areas are equal.
2. **Proof:** $\triangle BAC$ and $\triangle EAC$ are on same base AC and between $AC \parallel BE$. $\therefore Area(BAC) = Area(EAC)$. $Area(ABCD) = Area(ADC) + Area(BAC) = Area(ADC) + Area(EAC) = Area(\triangle ADE)$.

3. **Proof:** $Area(\triangle APB) = \frac{1}{2}Area(ABCD)$ (Base AB, parallels $AB \parallel CD$). $Area(\triangle BQC) = \frac{1}{2}Area(ABCD)$ (Base BC, parallels $BC \parallel AD$). $\therefore Area(\triangle APB) = Area(\triangle BQC)$.

Section D: Long Answer Questions

1. **Proof:** $\triangle ADX$ and $\triangle ACX$ are on same base AX and $AX \parallel DC \implies Area(ADX) = Area(ACX) \dots (1)$. $\triangle ACX$ and $\triangle ACY$ are on same base AC and $AC \parallel XY \implies Area(ACX) = Area(ACY) \dots (2)$. From (1) and (2), $Area(\triangle ADX) = Area(\triangle ACY)$.

2. **Proof:** (a) F, E are midpoints $\implies FE \parallel BC$ and $FE = \frac{1}{2}BC = BD$. Since $FE \parallel BD$ and $FE = BD$, $BDEF$ is a parallelogram. (b) DEF, BDF, CDE, AFE are 4 congruent triangles $\implies Area(DEF) = \frac{1}{4}Area(ABC)$. (c) $Area(BDEF) = Area(BDF) + Area(DEF) = 2 \times \frac{1}{4}Area(ABC) = \frac{1}{2}Area(ABC)$.

Section E: Case Study Question

1. **Diagonal** AC.

2. **500** m^2 (Same base AC, same parallels).

3. **Diagonal** AC.

4. **Triangles on same base and between same parallels are equal in area**.

5. **Remains 1 : 1** (Both areas increase proportionally).