CBSE Class 9 Maths Notes Chapter 9: To give students a concise and straightforward grasp of the material, we have created notes for CBSE Class 9 Maths Notes Chapter 9. Experts in the field have created the Class 9 Chapter 9 Areas of Parallelograms and Triangles Notes PDF by us, tailoring it to meet the requirements of the learners.

The CBSE Class 9 Maths Notes Chapter 9 will assist you in going over the ideas and formulas of the Areas of Triangles and Parallelograms in great detail. An additional advantage is that the CBSE Class 9 Maths Notes Chapter 9 are easily downloadable in PDF format, allowing you to have them on hand and make revisions as needed.

CBSE Class 9 Maths Notes Chapter 9

Definition of Triangle

A triangle is a two-dimensional figure made up of three lines and corners.

Properties of a Triangle

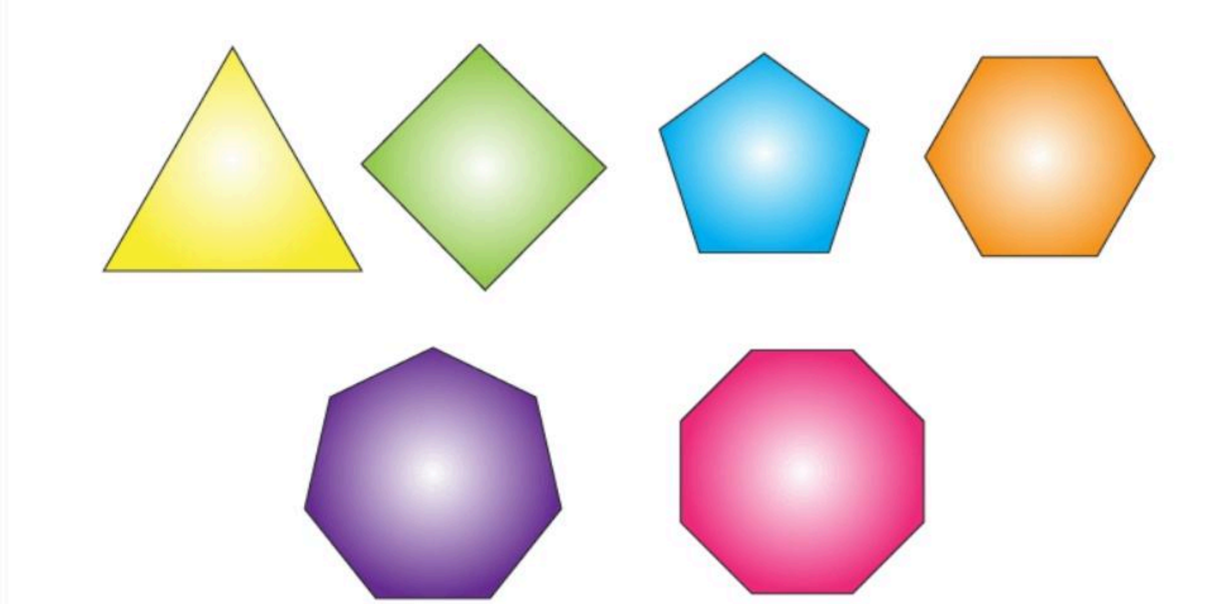
- The polygon with the least sides is a triangle.
- It is a two-dimensional closed figure made up of three-line segments and corners, and as such, it takes up space that is enclosed by the sides.

Since a triangle is the most basic polygon, one can use the area of finite sets of triangles to define the area of other polygons. As an illustration: Since a hexagon is composed of two triangles, its area is equal to the sum of its two triangles.

Area Proposition

Area of a Closed Shape

The term "planar area" refers to the area of any plane that is surrounded by a closed figure. The "area" of that figure is the measurement of this area. The numerical representation of this is employed by all units.

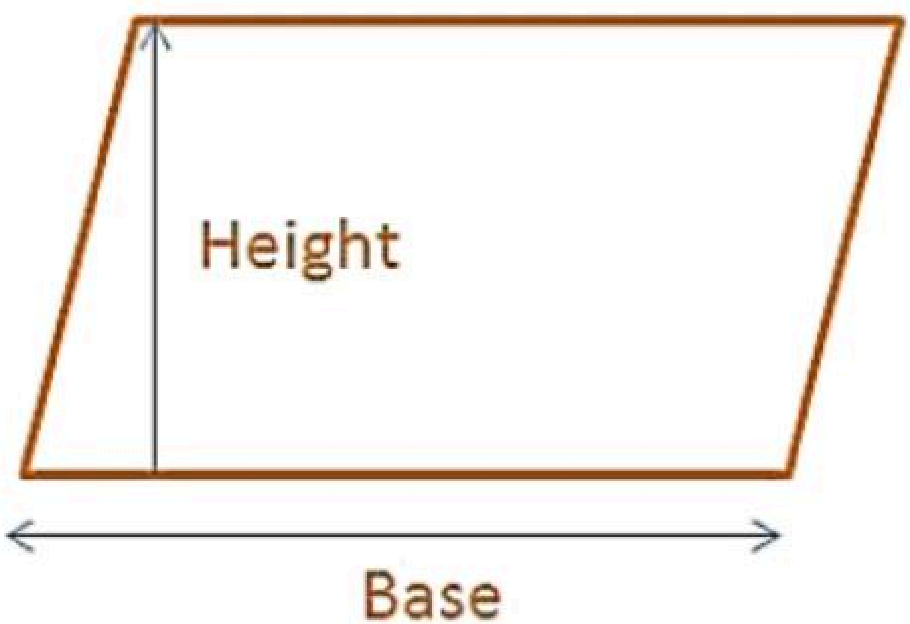


Properties of the Area of a Figure

The two figures are considered congruent if their sizes and shapes match. Additionally, the two figures' areas would match if they were congruent.

The two figures don't need to be congruent if their areas are equal.

Area of Parallelogram



- Area of parallelogram = base × height
- Height is perpendicular to the base.

Figures on the Same Base and Between the Same Parallels

It is presumed that the two figures are on the same base and between the same parallels if they have the same base and the vertices opposite the base are also on the line parallel to the base.

Parallelograms on the Same Base and Between the Same Parallels

The area must equal the two parallelograms if they share the same base and are situated between the same parallel lines.

Median of a Triangle

The median is the length of the line that connects each vertex of the triangle to the opposing side's center.

The triangle has three medians, and the centroid is the point where these medians intersect.

The triangle is divided into two equal parts by the middle.

Definition of Unit Area

The unit area is the area bounded by a figure whose sides are unit length. It is a positive real number and is commonly represented in square units.

Notation of Area of a Polygon

The area of a polygonal figure A is denoted by ar(A). In meters, it is denoted by m square.

Area Axioms

a. **Congruent Area Axiom:**
If $\triangle\ ABC \cong \triangle\ PQR$ then area of triangle ABC = Area of triangle PQR.

b. **Area Monotone Axiom:**
If R_1 and R_2 two polygonal regions such that $R_1 \subset R_2$ area of $R_1 \leq R_2$.

c. **Area Addition Axiom**

If R_1 and R_2 are two polygonal whose intersection is either a finite number of line segments or a single point and $R = R_1 + R_2$ then $ar(R_0) = ar(R_1) + ar(R_2)$. In figs (i) the region is divided into two regions R_1 and R_2.

Area of a Rectangular Region

Given that $AB = a$ metres and $AD = b$ metres, hence $ar(ABCD) = ab$ sq. m. (Using addition area axiom)

Theorem 1
Statement:
Diagonals of a parallelogram divides it into two triangles of equal area.

Given:
ABCD is a parallelogram. AC is one of the diagonals of the parallelogram ABCD.

To Prove:
$ar(ABC) = ar(DBC)$

Proof:
In triangles ABD and DBC,

$AB = DC$ (Opposite sides of parallelogram)

$AD = BC$ (Opposite sides of parallelogram)

$BD = BD$ (Common side)

(Area congruency axiom)

Hence, $ABC \cong DBC$ (SSS congruency)

$ar(ABC) = ar(DBC)$ (Using congruent area axiom)

Theorem 2

Statement:

Parallelograms on the same base and between the same parallel lines are equal in area.

Given:

ABCD and ABEF are two parallelograms having same base AB and same parallels AB and CF.

To Prove:

Area of parallelogram $ABCD \ = \ ABEF$

Proof:

$ar(||^m ABCD) = ar(ABED) + ar(EBC)$ …. (1) (area addition axiom)

$ar(||^m ABEF) = ar(ABED) + ar(AFD)$ …. (2) (area addition axiom)

Now in triangles EBC and AFD,

$AF \ = \ BE$ (Opposite sides of a parallelogram)

$AD \ = \ BC$ (Opposite sides of a parallelogram)

Angle $AFD = BEC$ ($AB \ || \ BE$and $FC$is a transversal)

Hence are corresponding angles.

$EF \ = \ AB \ = \ CD$

$EF \ - \ DE \ = \ CD \ - \ DE$i.e., FD = EC

Triangle $EBC \cong AFD$ (SAS congruency condition)

$ar(EBC) = ar(AFD)$ (Area congruency condition)

Corollary Statement:

Parallelograms on equal bases and between the same parallels are equal in area.

Given: $||^m ABCD$and $||^m PQRS$ are between the same parallels l and m such that $AB = PQ$(equal bases).

To Prove: $ar(||^m ABCD) = ar(||^m PQRS)$.

Construction:
Draw the altitude EF and GH.

Proof:

$l\ ||m$ (From given data)

EF = GH (perpendicular distance between the same parallels)

$ar(||^m ABCD) = AB \times EF$

$ar(||^m PQRS) = PQ \times GH$ (area of a = base x alr)

Since $AB = GH$ (given)

and $EF = GH$(construction)

Hence, $ar(||^m ABCD) = ar(||^m PQRS)$

Theorem 3

Statement:

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

Given:
Triangles ABC and DBC stand on the same BC and between the same parallels l and m.

To prove:
$ar(ABC) = ar(DBC)$

Construction:
CE || AB and BF || CA

Proof:
$||^m ABCE$and $||^m DCBF$ has same base BC and lies between the same parallels$l\ and\ m.$

$||^m ABCE$=$||^m DCBF$ .... (1)

AC is a diagonal of $||^m ABCE$ which divides the parallelogram into two triangles of equal areas.

Similarly, we can prove that

$ar(BCD) = \frac{1}{2} ar(||^m DCBF)$

From (1), (2) and (3), we can write

$ar(ABC) = ar(DBC)$

Hence the theorem is proved.

Theorem 4

Statement:

Triangles of equal areas, having one side of one of the triangles equal to one side of the other, have their corresponding altitudes equal.

Given:
Two triangles ABC and DEF are such that:

(i) $ar(ABC) = ar(DEF)$

(ii) $BC = EF$

$AM \ and \ DN$ are altitudes of triangle $ABC$and triangle DEFrespectively.

To prove:
$AM = DN$

Proof:
In triangle $ABC,\ AM$ is the altitude, BC is the base.

$$\Delta ABC = \frac{1}{2} \times BC \times AM$$

In $\Delta DEF,\ DN$ is the altitude and EF is the base.

$$\Delta DEF = \frac{1}{2} \times EF \times DN$$

$$\frac{1}{2} \times BC \times AM = \frac{1}{2} \times EF \times DN$$

Also $BC = EF$ (given)

Also $BC = EF$ (given)

$\frac{1}{2} AM = \frac{1}{2} DN$

i.e.,$AM = DN$.

Hence the theorem is proved.

Benefits of CBSE Class 9 Maths Notes Chapter 9

Since the principles of mathematics surround us and a lack of comprehension of them can lead to serious issues in life, mathematics is vital to our everyday existence. It's a subject where solving various numerical problems requires a lot of practice and formula understanding.

Students in class 9 can now improve their ability to solve mathematical problems by practicing the problems from the CBSE Class 9 Maths Notes Chapter 9, which are available here. To help students do well on their exams, all of the explanations have been selected from the Class 9 Math NCERT textbook.

Our subject matter specialists develop notes for all the exercises in the NCERT textbook according to the prescribed syllabus, so that students in Class 9 can profit from them while they prepare for their exams. Students can thus easily get a comprehensive knowledge of these concepts by reading our CBSE Class 9 Maths Notes Chapter 9 and practicing them at their own pace.

To help students become more adept at solving problems, subject matter experts have clearly articulated the notes. Students can consult the study materials offered by us to gain a better understanding of the Areas of Triangles and Parallelograms.