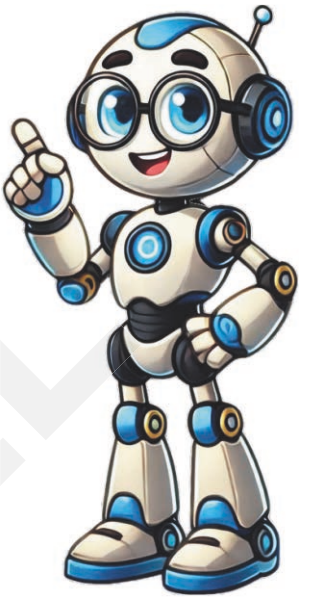
6
Chapter

Perimeter and Area

We'll cover the following key points:

- → Introduction to Perimeter and Area
- → Perimeter of Rectangle
- → Perimeter of Triangle
- → Perimeter of a Regular Polygon
- → Area
- → Units of Area
- → Area of a rectangle
- → Area of a Square
- → Area of a Triangle



Hi, I'm EeeBee

Do you Remember fundamental concept in previous class.

In class 5th we learnt

- → Concept of Area

In class 4th we learnt

- → Meaning of Perimeter

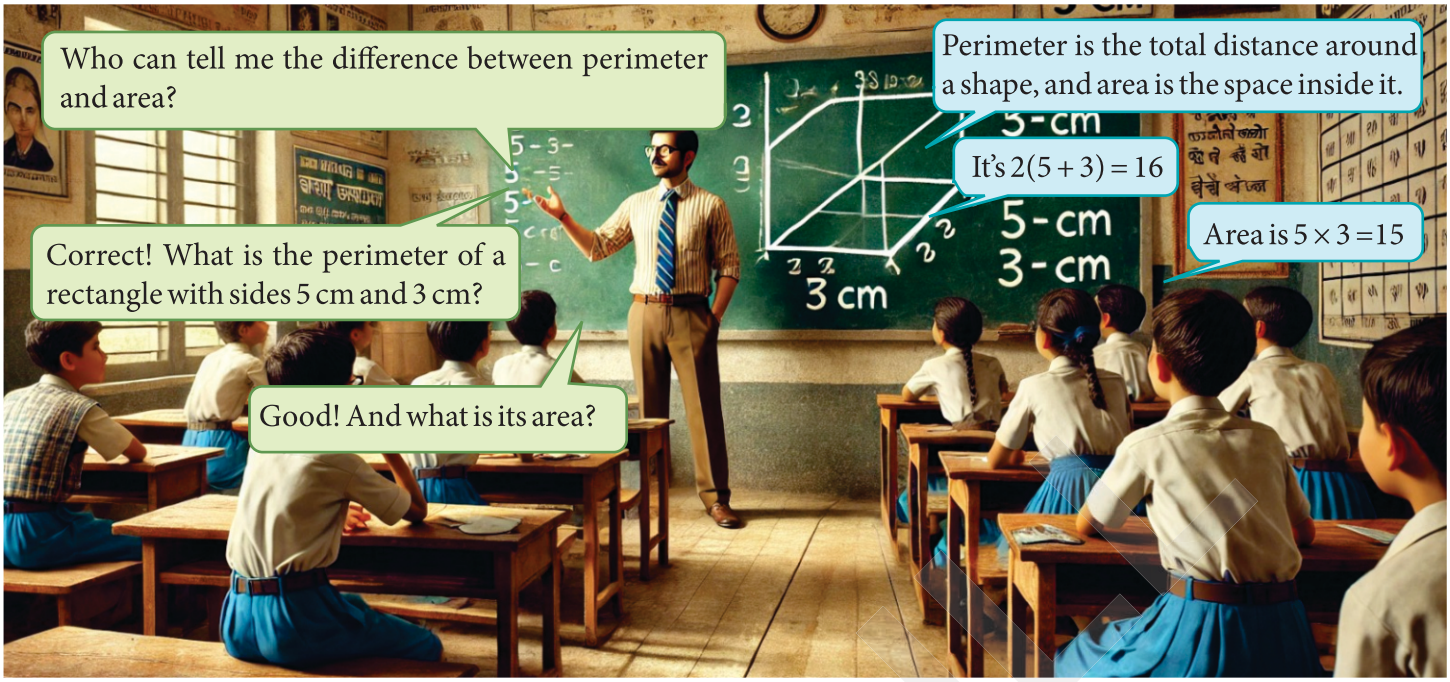
Still curious? Talk to me by scanning the QR code.

Learning Outcomes

By the end of this chapter, students will be able to:

- Calculate the perimeter and area of basic geometric shapes such as squares, rectangles, triangles, and circles.
- Use appropriate units to measure and express perimeter and area.
- Apply the formulas for perimeter and area in practical scenarios.
- Understand the concept of perimeter and area in relation to real-life objects.
- Solve problems involving the perimeter and area of compound shapes.
- Compare and contrast different methods of calculating area.
- Solve word problems involving the perimeter and area of various figures.
- Estimate the area and perimeter of irregular shapes.
- Analyze how changes in dimensions affect both perimeter and area, thereby strengthening spatial reasoning.
- Utilize graphical and digital tools to model, measure, and solve complex real-world area and perimeter challenges.

Introduction



The perimeter of a shape refers to the total length of its boundary or the distance around the outside of the shape. It's simply the sum of the lengths of all sides of a figure. For example, if you have a rectangle, the perimeter is the total length of all four sides.

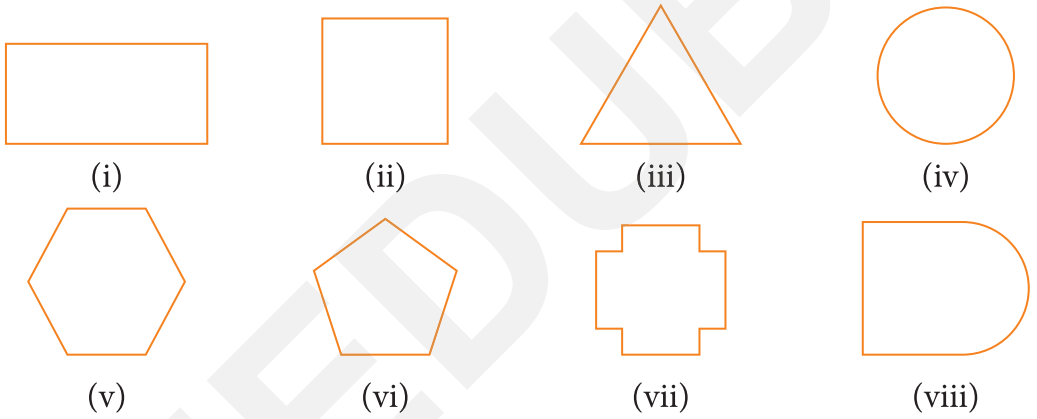


Fig. 6.1

Suppose you wanted to measure the boundary of your school campus, you would likely start by securing one end of a long rope to a nail placed at a point on the boundary. Then, you would walk around the entire campus, ensuring you return to the starting point where the nail is fixed. The total length of the rope would represent the perimeter of the campus. The term "perimeter" comes from two Greek words: 'Peri,' which means **around**, and 'meter,' meaning **measure**. Therefore, we can define perimeter as the total length of the boundary that encloses a **closed figure**.

Perimeter of rectangle

The perimeter of a rectangle is the total distance around the outer edge of the rectangle. It represents the sum of all four sides of the rectangle. A rectangle is a quadrilateral with opposite sides that are

equal in length and four right angles. Rectangle is a plane figure in which the longer pair of opposite sides is called **length** and other pair of shorter sides is called **breadth**.

To find the perimeter of a rectangle, you add together the lengths of all four sides. Since opposite sides of a rectangle are equal, the perimeter can be simplified using the formula:

$$P = 2 \times (l + w)$$

If P represents the perimeter of a rectangle ABCD, and l and b are the length and breadth (width) of the rectangle, then the perimeter is the sum of the lengths of all four sides. The sides of the rectangle are:

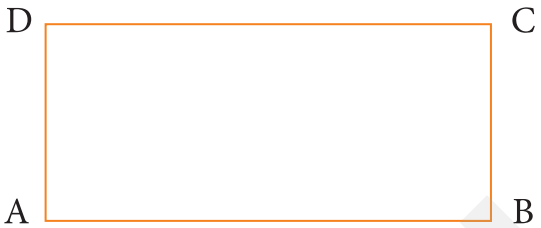


Fig. 6.2

AB = l (length)	BC = b (breadth)	CD = l (length)	DA = b (breadth)

Thus, the perimeter can be written as: P = AB + BC + CD + DA

Substituting the lengths of the sides:

$P = l + b + l + b$

$P = 2l + 2b$

$P = 2(l + b)$

Perimeter of rectangle = 2 (length + breadth)

Perimeter of square

The perimeter of a square is the total length around the square, which is the sum of the lengths of all four equal sides. If P represents the perimeter and the length of each side of the square is a units, then:

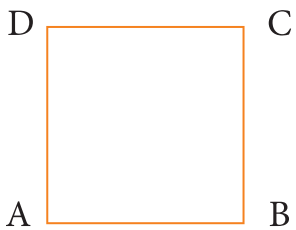


Fig. 6.3

P = AB + BC + CD + DA

Since all sides are of equal length, each side is a units. So, substituting the values for each side:

$P = a + a + a + a$

$P = 4 \times a$ units

Perimeter of square = 4 × length of each sidePerimeter of triangle

The perimeter of a triangle is the sum of the lengths of its three sides. If the lengths of the sides of the triangle are l then the perimeter P can be calculated using the formula:

For triangle △ABC:

- The perimeter P is the sum of the lengths of its three sides: AB, BC, and CA.
- Therefore, the perimeter is given by:

$P = AB + BC + CA$

$P = l + l + l$

$P = 3 \times l$ units

Perimeter of triangle = 3 × length of each side

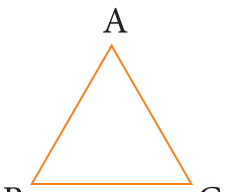


Fig. 6.4

Perimeter of a Regular Polygon

A regular polygon is a polygon in which all sides are of equal length, and all interior angles are of equal measure. Common examples of regular polygons include equilateral triangles, squares, pentagons, hexagons, and so on.

The perimeter of any triangle is the total length of its three sides. Applying this to an equilateral triangle, where all sides are of equal length:

In △DEF, the sides DE, EF and FD are all the same length. Therefore, the perimeter can be written as:

Perimeter of equilateral triangle = DE + EF + FD = DE + DE + DE

Perimeter = 3 × length of one side

Thus, the perimeter of an equilateral triangle △DEF is three times the length of one of its sides.

Sure! Here's another similar problem with a solution:

Example : In a rectangle, the lengths of two adjacent sides are 14 cm and 8 cm. The perimeter of the rectangle is 44 cm. Find the length of the missing side.

Solution: Let the missing side be x cm.

In a rectangle, opposite sides are equal. So, if one side is 14 cm, the opposite side will also be 14 cm. Similarly, the side of length 8 cm will also have a corresponding side of 8 cm.

Now, the perimeter of the rectangle is the sum of the lengths of all four sides:

Perimeter = 14 + 8 + 14 + 8

You are given that the perimeter is 44 cm : 44 = 14 + 8 + 14 + 8

Simplifying : 44 = 44 = 44

Since both sides add up to the given perimeter, there is no missing side in this case, and the rectangle's dimensions are confirmed.

The sides are 14 cm and 8 cm, and the perimeter is correctly 44 cm.

Example : In a pentagon, the lengths of four sides are 10 cm, 15 cm, 12 cm, and 8 cm. The perimeter of the pentagon is 55 cm. Find the length of the missing side.

Solution : Let the unknown side be x cm.

The sides of the pentagon are:

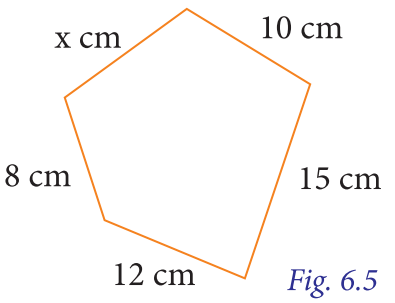


Fig. 6.5

The perimeter is the sum of the lengths of all five sides. The equation for the perimeter is:

Perimeter = 10 + 15 + 12 + 8 + x

You are given that the perimeter is 55 cm, so: 55 = 10 + 15 + 12 + 8 + x

Simplifying the sum of the known sides:

55 = 45 + x

55 – 45 = x

x = 10 cm

The missing side is x = 10 cm

Example : In a triangle, the lengths of two sides are 9 cm and 7 cm. The perimeter of the triangle is 30 cm. Find the length of the third side.

Solution : Let the unknown side be x cm.

The sides of the triangle are:

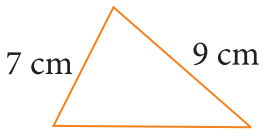


Fig. 6.6

The perimeter is the sum of the lengths of all three sides. Therefore, the equation for the perimeter is:
Perimeter = 9 + 7 + x

You are given that the perimeter is 30 cm, so: 30 = 9 + 7 + x

Simplifying:

30 = 16 + x

30 – 16 = x

x = 14 cm

The missing side is x = 14 cm.

Points of Rules

- A circle has the largest area for a given perimeter! That's why bubbles and planets are round!
- A square has the smallest perimeter for a given area! That's why rooms are often square-shaped.
- If you double the sides of a square, its area becomes 4 times bigger!

Example : Find the perimeter of the following shapes:

(i) A rectangle with dimensions 8 cm by 12 cm.

(ii) A quadrilateral with sides 9 cm, 5 cm, 8 cm, and 7 cm.

(iii) A triangle with sides 6 cm, 10 cm, and 8 cm.

Fun Fact

The Great Wall of China has one of the longest perimeters in the world (over 21,000 km)!

Solution:

(i) Perimeter = 8 cm + 12 cm + 8 cm + 12 cm = 40 cm

(ii) Perimeter = 9 cm + 5 cm + 8 cm + 7 cm = 29 cm

(iii) Perimeter = 6 cm + 10 cm + 8 cm = 24 cm

Example : A farmer has a rectangular field of length 500 m and breadth 350 m. He wants to fence it with 6 rounds of wire. What is the total length of wire required for fencing?

Solution : Perimeter of rectangular field = $2(500 + 350) = 2 \times 850 = 1700$ m

Total length of wire required = $6 \times 1700 = 10{,}200$ m

Example : Meera and Sunil go for jogging every morning. Meera jogs around a 150-meter square field, and Sunil jogs around a rectangular field with dimensions 250 m by 150 m. If they both take 4 rounds each, who covers the greater distance?

Solution: Perimeter of square field = $4 \times 150 = 600$ m

Perimeter of rectangular field = $2(250 + 150) = 2 \times 400 = 800$ m

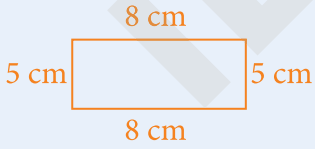
Sunil covers 800 m - 600 m = 200 m more in one round.

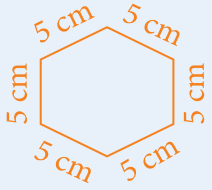
Therefore, Sunil will cover $4 \times 200 = 800$ m more than Meera in 4 rounds.

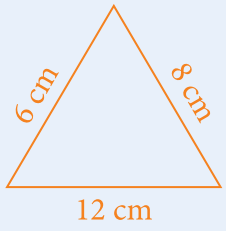
Exercise 6.1

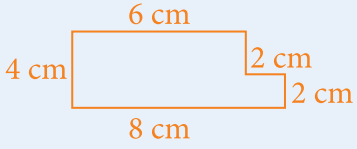
Knowledge Application

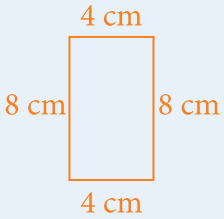
1. Find the perimeter of the following shapes:

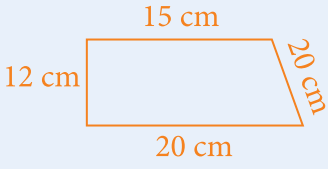
(a) 

(b) 

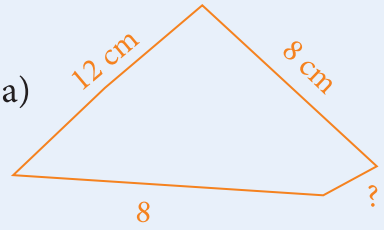
(c) 

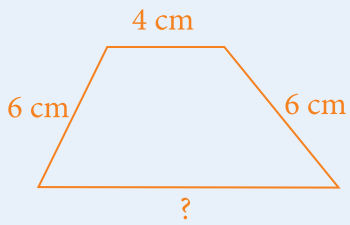
(d) 

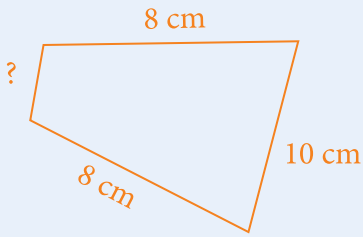
(e) 

(f) 

2. **Find the missing length if the perimeter of the figure is 30 cm:**

(a) 

(b) 

(c) 

3. **A farmer has a rectangular field of length 180 m and breadth 120 m. He wants to fence it with 5 rounds of wire. What is the total length of wire required for fencing?**
4. **Find the cost of fencing a rectangular park of length 200 m and breadth 150 m at the rate of 15 per meter.**
5. **A string is 50 cm long. What will be the length of each side if the string is used to form:**

   (a) An equilateral triangle. (b) A square. (c) A regular hexagon.
6. **A table-top measures 1 m 80 cm by 1 m 20 cm. What is the perimeter of the table top?**
7. **Kiran and Ravi go for jogging every morning. Kiran jogs around a 150-meter square field, and Ravi jogs around a rectangular field with dimensions 250 m by 120 m. If they both take 4 rounds each, who covers the greater distance?**
8. **Find the breadth of the rectangle whose perimeter is 280 cm and whose length is 110 cm.**
9. **A field has dimensions 500 m by 300 m. How much fencing wire is needed to cover the field with 3 rounds of wire?**
10. **Find the missing side of the figure if the perimeter of a quadrilateral is 50 cm and three of the sides measure 15 cm, 12 cm, and 10 cm.**

Area

Area is the amount of space inside a **two-dimensional shape**. It is a measurement of the surface covered by the shape. For example, if you have a piece of land or a sheet of paper, the area tells you how much surface the shape occupies.

Units of Area

Area is usually measured in **square units**. For example, if the length and width of a rectangle are measured in centimeters, the area will be measured in square centimeters (cm^2).

Common units of area include:

- Square meters (m^2)
- Square centimeters (cm^2)
- Square kilometers (km^2)
- Square inches (in^2)
- Square feet (ft^2)Conversion of

Units of Area:

1 square meter (m^2)	= 100 × 100 square centimeters (cm^2)	= 10,000 cm^2
1 square meter (m^2)	= 10 × 10 square decimeters (dm^2)	= 100 dm^2
1 square centimeter (cm^2)	= 10 × 10 square millimeters (mm^2)	= 100 mm^2
1 square kilometer (km^2)	= 1,000 × 1,000 square meters (m^2)	= 1,000,000 m^2
1 square hectometer (hm^2)	= (100 × 100) square meters (m^2)	= 10,000 m^2 = 1 hectare (ha)
1 square decameter (dam^2)	= 10 × 10 square meters (m^2)	= 100 m^2 = 1 are (a)

Additional Conversions:

- 1 square decimeter (dm^2) = 10 × 10 square centimeters (cm^2) = 100 cm^2
- 1 square kilometer (km^2) = 100 hectares (ha)
- 1 acre = 4,046.856 square meters (m^2)
- 100 ares = 1 hectare (ha)

Area of a Square

A square is a special type of rectangle where all four sides are of equal length. This means that the length and breadth of a square are the same. In other words, all sides of a square have the same measurement.

The area of a square is the amount of space it covers on a flat surface. Since all sides are equal, we can simply multiply the length of one side by itself to find the area.

Area of Square = Side × Side

Or, we can write it as: Area=Side²

Where Side is the length of one side of the square.

Finding Area Using Square Paper

Square paper (also known as graph paper) is a useful tool for finding the approximate area of a closed figure. The paper is divided into small squares, each with side length of 1 cm, as shown below.

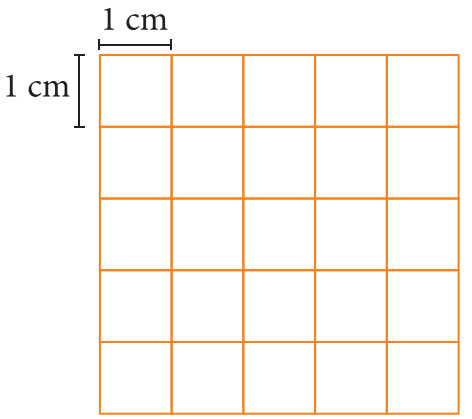


Fig. 6.7

Steps to Find the Area of a Closed Figure Using Square Paper:

1. **Place the Figure on the Square Paper:** Position the given closed figure on the graph paper and trace its outline.

2. **Count Complete Squares:** If the figure encloses an exact number of complete squares, simply count them. This number is the area of the figure in square centimeters.

3. **Handle Partial Squares:** If the outline cuts through the squares, follow these steps:
   - **Count Complete Squares:** Count the squares fully enclosed by the figure. Let this count be n.
   - **Count More Than Half Squares:** Count the squares where more than half of the square is enclosed. Let this count be mm.
   - **Count Exactly Half Squares:** Count the squares that are exactly half enclosed. Let this count be pp.
   - **Ignore Small Squares:** Do not count the squares where less than half of the square is enclosed.

4. **Calculate the Area:** Use the following formula to estimate the area:

$$\text{Approximate Area} = \frac{n + m + 1}{2} p \text{ square centimeters}$$

Example:

Let's use square paper to find the area of a triangle. Suppose the triangle is drawn on the square paper as shown below:

1. Count the number of complete squares inside the triangle. This is n = 12n = 12.
2. Count the number of squares where more than half is enclosed. This is m = 5m = 5.
3. Count the number of squares where exactly half is enclosed. This is p = 2p = 2.

Now, using the formula to calculate the approximate area:

$$\text{Area} = 12 + 5 + \frac{2}{2} = 12 + 5 + 1 = 18 \text{ sq cm}$$

So, the approximate area of the triangle is 18 square centimeters.

Example : Find the area of a floor with dimensions 10 meters by 6 meters.

Solution: Area = Length × Breadth

Area = 10 × 6 = 60sq meters

Example : The area of a square field is 49 sq meters. Find the length of one side of the square.

Solution: Area of square = Side × Side

$49 = \text{Side}^2 = \sqrt{49} = 7$ meters

Example : A rectangular garden has a length of 20 meters and a width of 15 meters. Find its area.

Solution: Area = Length × Width

Area = 20 × 15 = 300sq meters

Example : A floor has a length of 8 meters and a width of 5 meters. A carpet of size 3 meters by 4 meters is laid. Find the area of the floor that is not covered by the carpet.

Solution:

Area of floor = Length × Width

Area of floor = 8 × 5 = 40sq meters

Area of carpet = Length × Width

Area of carpet = 3 × 4 = 12sq meters

Area not covered = Area of floor – Area of carpet

Area not covered = 40 – 12 = 28sq meters

Fun Fact

The Egyptian Pyramids are triangular in shape! The Great Pyramid of Giza is one of the most famous.

Example : A square has a perimeter of 24 meters. Find its area.

Solution:

Perimeter of square = 4 × Side

$24 = 4 \times \text{Side} \Rightarrow \text{Side} = \frac{24}{4} = 6\text{m}$

Area of square = Side × Side

Area = 6 × 6 = 36sq meters

Example : How many square tiles of size 4 cm × 4 cm are needed to cover a floor of size 12 cm × 16 cm?

Solution:

Area of the floor = Length × Breadth

Area of floor = 12 × 16 = 192sq cm

Area of each tile = Side × Side

Area of tile = 4 × 4 = 16sq cm

$\text{Number of tiles} = \frac{\text{Area of floor}}{\text{Area of tile}}$

$\text{Number of tiles} = \frac{192}{16} = 12$

Fun Fact

The Bermuda Triangle is famous for mysterious disappearances!

Example : Draw a rectangle of size 15 units x 10 units. Draw another rectangle inside it, without touching the outer rectangle that occupies exactly half the area of the outer rectangle.

Solution:

- Given dimensions of the rectangle: 15 units × 10 units
- Area of this rectangle = 15 × 10 = 150sq units
- The area of the inner rectangle should be half of the area of the outer rectangle: Area of inner rectangle = 1502 = 75sq units
- Now, we need to find the possible combinations for the sides of the inner rectangle:
  - ✦ 1 × 75
  - ✦ 3 × 25
  - ✦ 5 × 15
  - ✦ 6 × 12.5
  - ✦ 7.5 × 10
- The condition is that the inner rectangle should not touch the outer rectangle. Hence, the best dimensions that fit this condition are 5 units × 15 units, as they fit neatly within the outer rectangle without touching its sides.

The dimensions of the required inner rectangle are 5 units × 15 units.

Example : On the four corners of a rectangular lawn, four flower beds, each 3 meters long and 2 meters wide, are dug. Find the area of the remaining part of the lawn if the length of the lawn is 12 meters and the width is 10 meters.

Solution:

- The dimensions of the lawn : 12 meters × 10 meters
- Area of the lawn = 12 × 10 = 120sq meters
- The area of one flower bed : Area of one flower bed = 3 × 2 = 6sq meters
- The area of four flower beds : Area of four flower beds = 4 × 6 = 24sq meters
- The area of the remaining part of the lawn:

  Area of remaining lawn = Area of lawn – Area of four flower beds Area of remaining lawn

  = 120 – 24 = 96sq meters

The area of the remaining part of the lawn is 96 sq meters.

Points of Rules

All triangles have the same formula for area, no matter their type (scalene, isosceles, or equilateral)
If you rotate a right-angled triangle, its area doesn't change!
A triangle is half of a rectangle if we draw a diagonal inside it.

Exercise 6.2

Knowledge Application

1. **Find the area of a rectangular garden with dimensions:**

   (a) 8 m by 6 m (b) 14 m by 7 m (c) 11 m by 9 m

2. **Provide the missing information in the blank:**

   Length (cm) : 6, 5, 10, 12

   Breadth (cm) : 3, 4, 4, 5

   Area (sq cm) : 18, 20, 40, _____

3. **Does the following statement stand True (T) or False (F):**

   (a) The area of a rectangle is calculated by multiplying its length and breadth.

   (b) The perimeter of a square is equal to four times its side length.

   (c) A circle has a constant perimeter called the radius.

   (d) The area of a square is always equal to the square of its side length.

   (e) The perimeter of a rectangle is the sum of all its sides.

   (f) The area of a parallelogram is equal to base × height.

   (g) The perimeter of a circle can be calculated using the formula $P = 2\pi r$.

   (h) The area of a square with side 5 cm is 25 cm^2.

4. **A rectangular swimming pool is 50 m long and 25 m wide. If a square tile of side 2 m is used to cover the pool, how many tiles will be required?**

5. **On a piece of land measuring 20 m by 15 m, four square flower beds of side 3 m each are planted at the corners. Find the area of the remaining land.**

6. **Two plots of land have the same perimeter. One is a square with side 50 m and the other is a rectangle with a width of 30 m. Find the length of the rectangle. Which plot has the greater area, and by how much?**

7. **Provide the missing information in the blanks:**

   (a) The area of a square with side 4 cm is _____ square centimeters.

   (b) The perimeter of a rectangle with length 6 m and breadth 3 m is _____ meters.

   (c) The formula to find the area of a rectangle is _____.

   (d) The perimeter of a square with side length 7 cm is _____ centimeters.

   (e) A circle with a radius of 3 cm has a perimeter (circumference) of _____ cm.

(f) The area of a rectangle with length 8 m and breadth 4 m is _____ square meters.

(g) A square with side length 6 cm has an area of _____ square centimeters.

(h) The perimeter of a rectangle with length 12 cm and breadth 9 cm is _____ centimeters.

8. **The perimeter of a rectangle is 60 meters. If the length is 18 meters, find the width of the rectangle and its area.**

9. **How many square tiles of size 2 m × 2 m are needed to cover a rectangular floor of size 20 m × 15 m?**

10. **The dimensions of a rectangular garden are 30 m × 10 m. If a square of side 5 m is removed from each corner, find the remaining area of the garden.**

Area of a Triangle

In geometry, area is the amount of space inside a shape. For example, if you want to know how much space is inside a triangle, you need to calculate its area.

The area of a triangle tells us how much space is covered by the triangle. The formula to calculate the area of a triangle is simple and easy to remember!

The area of a triangle is given by the formula : **Area of Triangle = 12 × Base × Height**

Where:

- Base is the bottom side of the triangle.
- Height is the distance from the base to the top vertex (the point opposite the base), measured at a right angle (90°) to the base.

Why Do We Use $\frac{1}{2}$ in the Formula?

The reason we multiply by $\frac{1}{2}$ is that a triangle is half of a rectangle. If you draw a rectangle and divide it in half, you'll get two triangles. So, the area of a triangle is half the area of a rectangle.

Points to Remember

1. The base is any side of the triangle you choose to work with.
2. The height is the perpendicular distance from the base to the opposite vertex (the point opposite the base).
3. The area of a triangle is always half of the area of a rectangle with the same base and height.

Area of Triangle

Take a rectangular piece of paper and cut it along one of its diagonals, forming two triangles. Do these two triangles overlap each other exactly? Can we conclude that the two triangles have equal areas?

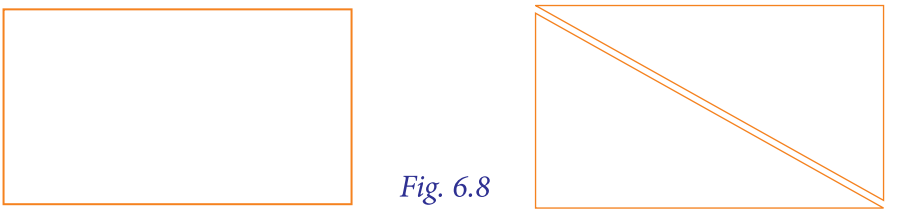


Fig. 6.8

Try this with various rectangles and squares to explore further.

On the square grid Fig., ABCD represents a rectangle with an area of ABCD = 6 × 5 = 30 square units.

Also, the area of triangle ACD can be determined by counting squares:

- Full squares → 8
- Half squares → 6
- More than half squares → 4
- Less than half squares → 2

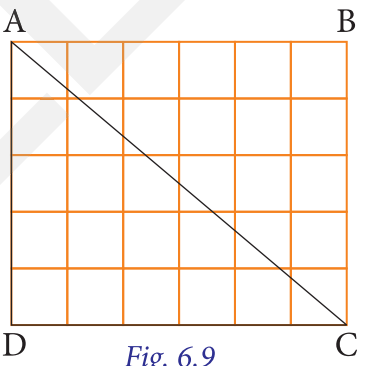


Fig. 6.9

The area of triangle ACD = 8 + (½ × 6) + 4 + 2 = 8 + 3 + 4 + 2 = 17 square units.

Thus, we can conclude that the area of triangle ACD is slightly less than half the area of rectangle ABCD. This experiment suggests that when we cut a rectangle into two triangles by a diagonal, the area of one triangle is typically close to half of the rectangle's area, though it might not always be exactly half due to how we count partial squares.

In the given grid, as shown in Fig., the areas of several figures are calculated by counting the squares:

(i) Area of rectangle ADPQ = 15 square units

(ii) Area of triangle APQC = 18 square units

(iii) Area of rectangle APQD = 22 square units

(iv) Area of rectangle PQCB = 28 square units

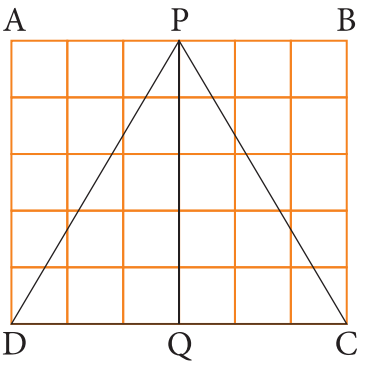


Fig. 6.10

Now, if we compare areas:

- Area of ADPQ = $\frac{2}{3}$ × Area of rectangle APQD
- Area of APQC = $\frac{3}{4}$ × Area of rectangle PQCB

Thus, the area of triangle APDC is the sum of the areas of triangles ADPQ and APQC, which equals the area of rectangle APQD and the area of rectangle PQCB combined.

So, the area of triangle APDC = $\frac{2}{3}$ × Area of APQD + $\frac{3}{4}$ × Area of PQCB.

Example : The area of a triangle is 36 cm^2, and the base is 12 cm. Find the height of the triangle.

Solution : We know the formula for the area of a triangle is:

$$\text{Area} = \frac{1}{2} \times \text{Base} \times \text{Height}$$

Given:

$$\text{Area} = 36cm^2, \text{Base} = 12cm$$

Substitute the given values into the formula:

$$36 = \frac{1}{2} \times 12 \times \text{Height}$$

So, the height of the triangle is 6 cm.

Example : A triangle has a height of 9 cm and a base that is twice its height. What is the area of the triangle?

Solution: Let the height of the triangle be h = 9cm. The base is twice the height, so:

$$\text{Base} = 2 \times 9 = 18cm$$

Now, using the formula for the area of a triangle:

$$\text{Area} = \frac{1}{2} \times \text{Base} \times \text{Height}$$

Substitute the values:

$$\text{Area} \frac{1}{2} \times 18 \times 9 = \frac{1}{2} \times 162 = 81cm^2$$

So, the area of the triangle is 81 cm^2.

Example : A triangular flag has a base of 20 cm and a height of 15 cm. How much area does the flag cover?

Solution : Using the formula for the area of a triangle:

$$\text{Area} = \frac{1}{2} \times \text{Base} \times \text{Height}$$

Given:

$$\text{Base} = 20cm, \text{Height} = 15cm$$

Substitute the given values into the formula:

$$\text{Area} = \frac{1}{2} \times 20 \times 15 = \frac{1}{2} \times 300 = 150cm^2$$

So, the area of the flag is 150 cm^2.

Exercise 6.3

Knowledge Application

1. **The base of a triangle is 12 meters, and the height is 9 meters. What is the area of the triangle?**
2. **Find the area of a right-angled triangle with a base of 14 cm and a height of 8 cm.**
3. **Find the area of a square whose side is:**

   (a) 10 cm (b) 5 cm (c) 15 cm
4. **A triangular plot of land has a base of 10 m and a height of 12 m. What is the area of the plot?**
5. **The area of a triangle is 42 cm^2, and its height is 7 cm. What is the base of the triangle?**
6. **Does the following statement stand True (T) or False (F):**

   (a) If the base of a triangle is doubled and the height remains the same, the area of the triangle will also double.

   (b) The area of a triangle is always half of the area of a rectangle with the same base and height.

   (c) The height of a triangle can be found by dividing the area by the base.

   (d) If the height of a triangle is zero, its area will be zero.

   (e) The area of a triangle depends only on its base, not on its height.

   (f) The area of a right-angled triangle is always half of the area of a square with the same base and height.
7. **Provide the missing information in the blanks:**

   (a) The area of a triangle is always _____ the area of a rectangle with the same base and height.

   (b) To find the area of a triangle, we multiply the base by the _____ and divide by 2.

   (c) The area of a triangle is expressed in _____ units, like square centimeters or square meters.

   (d) A triangle with a base of 15 cm and height of 8 cm has an area of _____ cm^2.

   (e) The height of a triangle is the perpendicular distance from the base to the _____ of the triangle.
8. **A triangle has a base of 14 cm and a height of 7 cm. Find the area of the triangle.**
9. **A triangle has an area of 36 square meters, and its height is 6 meters. Find the base of the triangle.**
10. **A triangular garden has a base of 30 meters and a height of 10 meters. How much area does the garden cover?**

Think Tank

Gap Analyzer™
Take a Test

1. Tick (✓) the correct answer:

a. What is the perimeter of a square with side length 5 cm?

(i) 10 cm ☐ (ii) 15 cm ☐ (iii) 20 cm ☐ (iv) 25 cm ☐

2. The formula for the area of a rectangle is:

(i) Length × Width ☐ (ii) 2 × (Length + Width) ☐

(iii) Side × Side ☐ (iv) Length × Height ☐

3. A triangle has a base of 6 cm and a height of 4 cm. What is its area?

(i) 12 cm^2 ☐ (ii) 24 cm^2 ☐ (iii) 20 cm^2 ☐ (iv) 16 cm^2 ☐

4. The perimeter of a rectangle with a length of 10 cm and width of 6 cm is:

(i) 30 cm ☐ (ii) 32 cm ☐ (iii) 26 cm ☐ (iv) 40 cm ☐

5. The area of a square with a side length of 8 cm is:

(i) 64 cm^2 ☐ (ii) 32 cm^2 ☐ (iii) 16 cm^2 ☐ (iv) 128 cm^2 ☐

2. Provide the missing information in the blanks:

a. The formula for the perimeter of a rectangle is _____.

b. The area of a triangle is calculated as _____ × height ÷ 2.

c. The perimeter of a square is _____ times the length of one side.

d. The unit of area is always in _____ units.

e. The area of a rectangle with length 12 cm and width 5 cm is _____ cm^2.

3. A rectangular park is 50 m long and 30 m wide. Find:

a) The perimeter of the park.

b) The area of the park.

4. A circular pond has a radius of 5 meters. A walkway of 1.5 meters width is built around it. Find:

a) The area of the walkway.

b) The total area including the walkway.

5. Match the Columns:

Column A	Column B
a) Square	i) Side × Side
b) Rectangle	ii) $\pi \times r^2$
c) Triangle	iii) Length × Width
d) Circle	iv) ½ × Base × Height

Custom Learning Path

Scan to Create Your Own Learning Path

Assertion and Reason

Experiential Learning

Each question has two statements, Assertion (A) and Reason (R). Choose the correct option:

A: Both A and R are true, and R is the correct explanation of A.

B: Both A and R are true, but R is not the correct explanation of A.

C: A is true, but R is false.

D: A is false, but R is true.

1. **Assertion (A):** The area of a rectangle increases if its length or width increases.
   Reason (R): The area of a rectangle is directly proportional to its length and width.
2. **Assertion (A):** The perimeter of a square is always greater than its area.
   Reason (R): The perimeter is calculated by adding the sides, and the area is calculated by multiplying the sides.
3. **Assertion (A):** A triangle with a base of 10 cm and a height of 5 cm has an area of 50 cm^2.
   Reason (R): The area of a triangle is calculated as ½ × Base × Height.
4. **Assertion (A):** The perimeter of a circle is also called its circumference.
   Reason (R): The formula for the circumference of a circle is $2\pi r$.

HOTS (Higher Order Thinking Skills)

Critical Thinking

1. A square and a rectangle have the same perimeter of 40 cm. The rectangle's length is 12 cm. Find:
   a) The width of the rectangle.
   b) The area of both the square and the rectangle. Which one has the greater area?
2. A circular garden has a radius of 7 m. A path of 2 m width is built around it. Find:
   a) The area of the path. b) The total area including the path.

Case Study

Critical Thinking

A school is building a new rectangular playground. The length of the playground is 60 meters, and the width is 40 meters. A running track of 2 meters width is built around the playground.

Questions:

1. What is the area of the playground?
2. What is the perimeter of the playground?
3. Calculate the total area occupied by the running track and the playground together.
4. What is the area of just the running track?
5. If the school wants to cover the playground with grass at a cost of ₹50 per square meter, what will be the total cost?