GENERAL

area and perimeter of composite figures worksheet

Published: September 3, 2026 | Index ID: #-

Area and Perimeter of Composite Figures Worksheet: A Complete Guide

When students first encounter the concepts of area and perimeter, they often feel overwhelmed by the variety of shapes and the seemingly endless number of ways to combine them. Composite figures—shapes formed by joining two or more basic shapes—add an extra layer of complexity, yet mastering them is essential for success in geometry, engineering, architecture, and everyday problem solving. This guide will walk you through the fundamentals, explain how to approach worksheets, provide step by step solutions, and offer practical tips for both learners and educators.

Why Mastering Composite Figures Matters

Composite figures appear in real world contexts such as floor plans, garden layouts, mechanical parts, and computer graphics. Understanding how to calculate their area and perimeter enables:

- Accurate design and construction—engineers and architects need precise measurements to ensure safety and functionality.
- Efficient resource planning—landscapers and builders can estimate material costs by knowing the exact area to cover.
- Improved spatial reasoning—students develop a deeper sense of how shapes interact, which benefits higher level math and science courses.
- Standardized testing readiness—many exams, including SAT, ACT, and state assessments, feature composite figure problems.

Because of these practical applications, teachers emphasize composite figures in worksheets, allowing students to practice the skills in a controlled, incremental manner.

Foundations: Area, Perimeter, and Composite Figures

Area

The **area** of a shape is the amount of two dimensional space it occupies, measured in square units (e.g., square centimeters, square inches). For simple shapes, formulas are straightforward:

- Rectangle: Area = length × width
- Triangle: Area = ½ × base × height
- Circle: Area = < r adius²
- Parallelogram: Area = base × height
- Rhombus: Area = ½ × diagonal • × diagonal ,

Perimeter

The **perimeter** is the total length of a shape's boundary, measured in linear units (e.g., centimeters, inches). For basic shapes:

- Rectangle: Perimeter = 2(length + width)
- Triangle: Perimeter = side • + side , + side *f*

- Circle: Perimeter (circumference) = 2< r adius
- Regular polygon: Perimeter = number of sides × side length

Composite Figures

A composite figure is created by combining two or more basic shapes—often by cutting, overlapping, or adjoining them. The challenge lies in:

1. Identifying the individual components.
2. Determining whether parts overlap or share a common boundary.
3. Applying the correct formulas to each component.
4. Adding or subtracting areas and perimeters appropriately.

When working with worksheets, clarity and systematic analysis are key.

Types of Composite Figures Commonly Found on Worksheets

Adjoined Shapes

Two or more shapes share a common side or edge but do not overlap. Example: a rectangle attached to a triangle along one side.

Overlapping Shapes

Shapes intersect, sharing a common region. Example: a circle overlapping a square.

Cut Out Shapes

A shape is subtracted from another, creating a void. Example: a rectangle with a smaller rectangle removed from the center.

Nested Shapes

One shape is entirely contained within another, often sharing the same center. Example: a small circle inside a larger circle.

Complex Combinations

Worksheets may combine several of the above, such as a rectangle with a triangle cut out and a circle overlapping one corner.

Strategies for Calculating Area of Composite Figures

1. Decompose the Figure

Break the figure into familiar shapes. Draw a diagram and label each component. This visual aid reduces cognitive load and helps avoid double counting.

2. Apply Appropriate Formulas

Calculate the area of each component separately using the formulas listed earlier.

3. Adjust for Overlaps or Voids

- If shapes overlap, subtract the area of the overlapping region from the total.
- If a shape is cut out, subtract its area.
- If shapes are nested but not overlapping, simply sum the areas (the inner shape's area is part of the total).

4. Sum the Adjusted Areas

Add the results from step 3 to obtain the composite area.

Strategies for Calculating Perimeter of Composite Figures

1. Identify Shared Edges

Shared edges between components do not contribute to the external perimeter. Mark these on your diagram.

2. Count Exposed Sides

For each component, count only the sides that are exposed to the outside. Overlapping or shared edges should be omitted.

3. Add Exposed Lengths

Sum the lengths of all exposed sides. If the figure includes curved boundaries (e.g., circles), use the circumference formula for those parts.

4. Verify with a Check

Cross check by comparing the sum of component perimeters minus twice the length of shared edges. The factor of two accounts for the shared edge being counted in both component perimeters.

Step by Step Worksheet Solution Guide

Example Worksheet Problem 1

Calculate the area and perimeter of the composite figure below: a rectangle (8 /cm × 5 /cm) with a right triangle (base 3 /cm, height 4 /cm) attached to one of its longer sides.

Solution

1. Diagram: Draw the rectangle and the triangle sharing a 5 /cm side.
2. Area of Rectangle: 8 /cm × 5 /cm = 40 /cm².
3. Area of Triangle: ½ × 3 /cm × 4 /cm = 6 /cm².
4. Total Area: 40 /cm² + 6 /cm² = 46 /cm².
5. Perimeter of Rectangle: 2(8 /cm + 5 /cm) = 26 /cm.
6. Perimeter of Triangle: 3 /cm + 4 /cm + 5 /cm = 12 /cm (hypotenuse = 5 /cm via Pythagorean theorem).
7. Shared Edge: 5 /cm (the side where the triangle attaches).
8. Composite Perimeter: (26 /cm + 12 /cm) – 2(5 /cm) = 38 /cm.

Example Worksheet Problem 2

A circle (radius 4 cm) overlaps a square (side 6 cm) such that the circle’s center lies on one of the square’s sides. Find the area of the composite figure.

Solution

1. Area of Circle: < r K" Ò cÀ /cm².
2. Area of Square: 6² = 36 /cm².
3. Overlap Area: Calculating the exact overlap requires integral calculus. For worksheet purposes, assume the overlap is a semicircle (common in many problems). Semicircle area = ½ × 16< Ò ƒÀ /cm².
4. Total Area: 16< ² 3b b ƒÀ = 8< ² 3b ö6Û"à

Practice Problems with Solutions

Problem Set 1

1. A rectangle (10 /cm × 4 /cm) has a square (4 /cm × 4 /cm) cut out from one corner. Find the area and perimeter.
2. A right triangle (base 6 /cm, height 8 /cm) is attached to the longer side of a rectangle (12 /cm × 6 /cm). Find the composite area and perimeter.
3. Two circles (radii 3 /cm and 5 /cm) overlap partially. Their centers are 6 /cm apart. Find the total area of the composite figure.

Solutions

1. Area: 10 × 4 = 40 /cm² – 4 × 4 = 16 /cm² !’ 24 /cm².
   Perimeter: 2(10 + 4) = 28 /cm – 2 × 4 = 20 /cm (subtract shared edges).
2. Area: Rectangle 12 × 6 = 72 /cm². Triangle ½ × 6 × 8 = 24 /cm². Total = 96 /cm².
   Perimeter: Rectangle 2(12 + 6) = 36 /cm. Triangle sides: 6 /cm, 8 /cm, 10 /cm (hypotenuse). Shared side 6 /cm. Composite perimeter = (36 + 24) – 2(6) = 48 /cm.
3. Area of Circle 1: < r ;" Ò “À /cm².
   Area of Circle 2: < r [" Ò #SÀ /cm².
   Overlap Area: Use the formula for overlapping circles:
   Overlap = r •² cos {¹((d² + r •² – r ,²)/(2d r •)) + r ,² cos {¹((d² + r ,² – r •²)/(2d r ,)) – ½ " {(-d + r • + r ,)(d + r • – r ,)(d – r • + r ,)(
   Plugging values (d = 6 /cm, r • = 3 /cm, r , = 5 /cm) yields an overlap "H 12.57 /cm².
   Total Area: 9< ² #SÀ – 12.57 "H 34< b "ãSr $, bã*ƒ* ö6Û"à

Tips for Students and Teachers

For Students

- Practice diagramming—draw every problem before calculating.

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