AREA

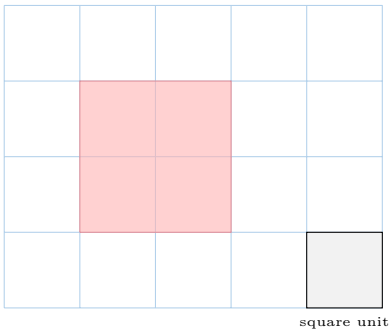
A DEFINITION

Definition Area

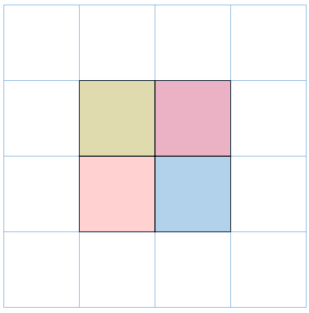
The **area** of a shape is the amount of space it covers on a flat surface. We measure it in square units, like square centimeters or square meters.

To find the area, imagine covering the shape with small squares, like tiles on a floor. Count how many squares fit inside the shape.

Ex: Find the area of the red shape:



Answer: To find the area, we count the number of unit squares inside the shape.

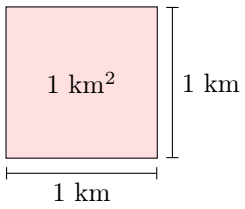


The area is 4 square units.

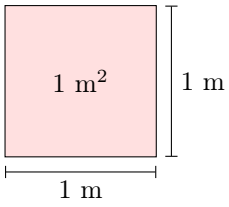
B UNITS OF AREA

Definition Units of Area

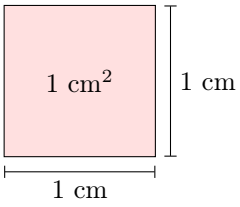
- Square Kilometer $\left(\text{km}^2\right)$: A very large unit of area, about the size of a small town.



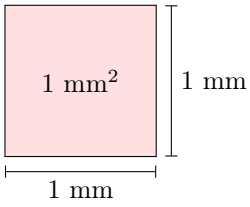
- Square Meter $\left(\text{m}^2\right)$: A larger unit of area, about the space it takes for you to lie down with your arms by your sides.



- Square Centimeter $\left(\text{cm}^2\right)$: A small unit of area, about the size of a big toe nail for a 6-year-old boy.



- Square Millimeter $\left(\text{mm}^2\right)$: A very small unit of area, about the size of a tiny dot made by a pencil.



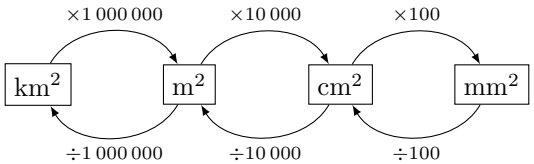
C CONVERSION OF AREA UNITS

Proposition Conversion of Area Units

- $1\,\text{km}^2 = 1\,000\,000\,\text{m}^2$
- $1\,\text{m}^2 = 10\,000\,\text{cm}^2$
- $1\,\text{cm}^2 = 100\,\text{mm}^2$

Method Converting Using Multiplication or Division

- Use **multiplication** to go from a larger unit to a smaller one (like square meters to square centimeters).
- Use **division** to go from a smaller unit to a larger one (like square centimeters to square meters).



Method **Converting Using a Table**

To convert between units of area, we can use a conversion table. For example, to convert 10.5 square meters to square centimeters:

1. Write the units in the table: km^2, m^2, cm^2, mm^2.

km^2		ha			m^2			cm^2		mm^2	

2. Place the number in the column of the unit you start with.

km^2		ha			m^2			cm^2		mm^2	
					1	0.	5				

3. Fill in zeros in the columns to the right until you reach the unit you want to convert to.

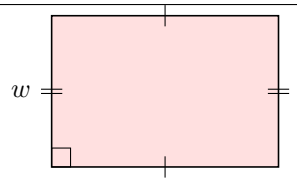
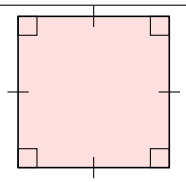
km^2		ha			m^2			cm^2		mm^2	
					1	0.	5	0	0	0	

4. Read the number in the column of the target unit.

So, $10.5\ \mathrm{m}^2 = 10\,500\ \mathrm{cm}^2$.

D AREA OF A RECTANGLE OR A SQUARE

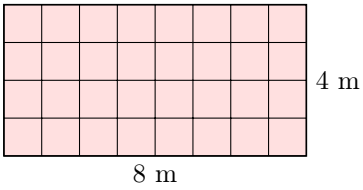
Proposition **Area Formulas**

Name	Shape	Area
Rectangle		$l \times w$
Square		$s \times s$

Method **Finding a Shape's Area**

To find the area of a rectangle or a square, multiply its length by its width.

Ex: Find the area of the rectangle:



Answer: This is a rectangle with length $L = 8$ m and width $l = 4$ m. Using the formula for the area of a rectangle:

$$\begin{aligned} A &= L \times l \\ &= 8 \times 4 \\ &= 32\,\mathrm{m}^2 \end{aligned}$$

So, the area is 32 square meters.

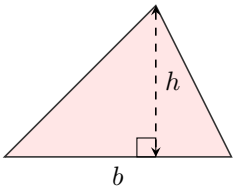
E AREA OF A TRIANGLE

Proposition Area of a Triangle

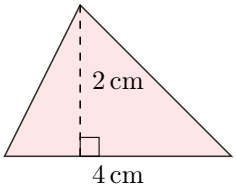
The area of a triangle is found by multiplying the base by the height and dividing by 2:

$$\text{Area of a triangle} = \frac{\text{base} \times \text{height}}{2}$$

$$A = \frac{b \times h}{2}$$



Ex: Find the area of the triangle:



Answer:

$$\begin{aligned} A &= \frac{b \times h}{2} \\ &= \frac{4 \times 2}{2} \\ &= 4\,\text{cm}^2 \end{aligned}$$

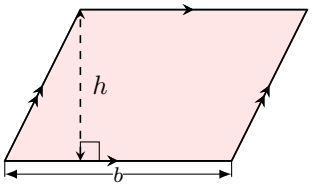
F AREA OF A PARALLELOGRAM

Proposition Area of a Parallelogram

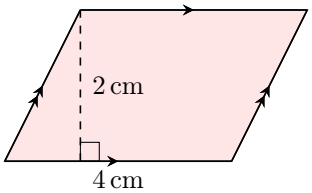
The area of a parallelogram is found by multiplying the base by the height:

$$\text{Area of a parallelogram} = \text{base} \times \text{height}$$

$$A = b \times h$$



Ex: Find the area of the parallelogram:



Answer:

$$\begin{aligned} A &= b \times h \\ &= 4 \times 2 \\ &= 8\,\text{cm}^2 \end{aligned}$$

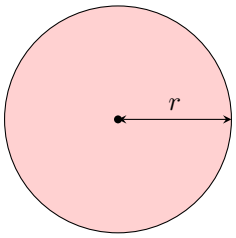
G AREA OF A CIRCLE

Proposition Area of a Circle

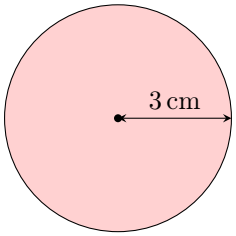
The area of a circle is found by multiplying pi by the radius squared:

$$\text{Area of a circle} = \pi \times \text{radius} \times \text{radius}$$

$$A = \pi r \times r$$



Ex: Find the area of the circle:

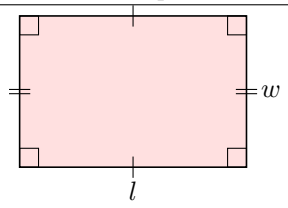
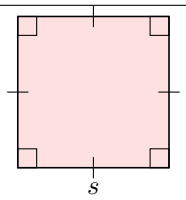
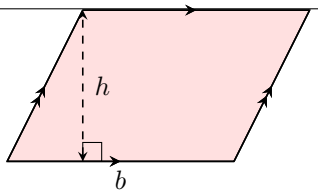
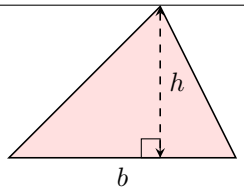
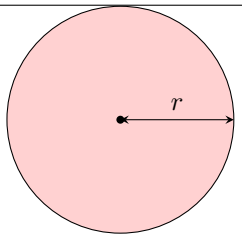


Answer:

$$\begin{aligned} A &= \pi r^2 \\ &= \pi 3^2 \\ &\approx 28.3\,\text{cm}^2 \end{aligned}$$

H AREA FORMULAS

Proposition **Area Formulas**

Name	Shape	Area
Rectangle		$A = l \times w$
Square		$A = s \times s$ $= s^2$
Parallelogram		$A = b \times h$
Triangle		$A = \frac{b \times h}{2}$
Circle		$A = \pi \times r \times r$ $= \pi r^2$

I AREA OF COMPOSITE FIGURES

Definition **Composite Figure**

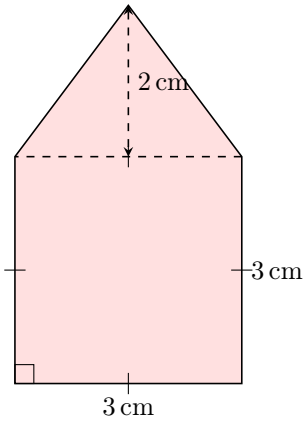
A **composite figure** is made up of two or more simple geometric shapes, like rectangles, triangles, or circles, combined together.

Method **Finding the Area of a Composite Figure**

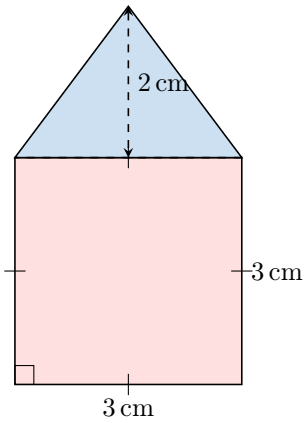
To find the area of a composite figure, follow these steps:

1. Divide the figure into simple, non-overlapping shapes, such as rectangles, triangles, or circles.
2. Find the area of each simpler shape using the appropriate formula.
3. Add the areas together to find the total area of the composite figure.

Ex: Find the area of the composite figure below, which is made up of a square and a triangle:



Answer:



$$
\begin{aligned}
A &= \text{Area of square} + \text{Area of triangle} \\
&= s \times s + \frac{b \times h}{2} \\
&= 3 \times 3 + \frac{3 \times 2}{2} \\
&= 9 + 3 \\
&= 12\,\text{cm}^2
\end{aligned}
$$