LENGTH

A LENGTH UNITS

Discover: We can measure length using different units like blocks or erasers. But these units are not the same for everyone. Your friend might have a longer eraser than yours, making it hard to compare. To solve this, mathematicians created a universal unit called the meter, so everyone can measure and compare lengths the same way.

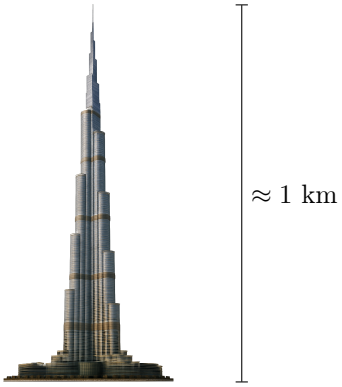
Definition **Units of Length**

- Millimeter (mm): A very small unit of length, about the thickness of a coin.

- Centimeter (cm): A small unit of length, about the width of your finger.

- Meter (m): A longer unit of length, about the height of a 6-year-old girl.

- Kilometer (km): A very long unit of length, about the height of the Burj Khalifa in Dubai, United Arab Emirates.



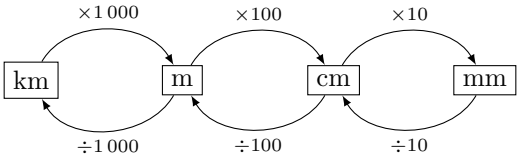
B CONVERSION OF LENGTH UNITS

Definition Conversion of Length Units

- 1 km = 1000 m
- 1 m = 100 cm
- 1 cm = 10 mm

Method Converting using a Multiplication or a Division

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



Method Converting Using a Table

To convert between units of length, we can use a conversion table. For example, to convert 1.2 meters to centimeters:

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

km			m		cm	mm

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

km			m		cm	mm
			1.	2		

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

km			m		cm	mm
			1.	2	0	

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

So, 1.2 m = 120 cm.

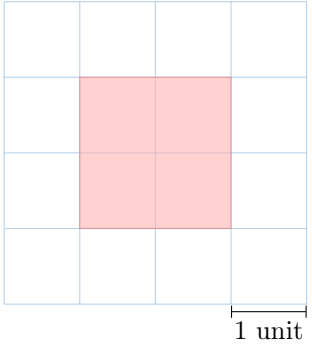
C PERIMETER

Definition Perimeter

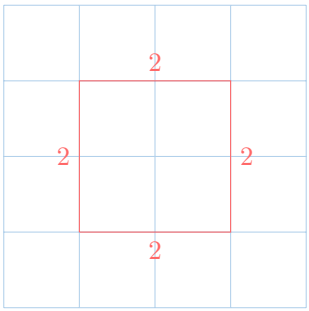
The **perimeter** of a shape is the total length around its outside edge.

To find the perimeter, imagine walking around the shape like it's a park. Count the number of unit lengths along each side as you go.

Ex: Find the perimeter of the red shape:



Answer:



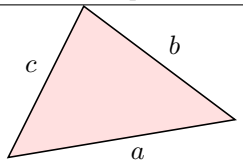
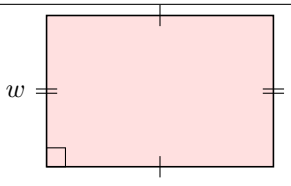
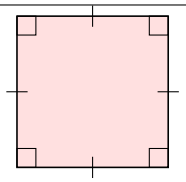
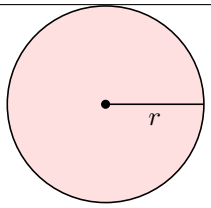
To find the perimeter, we add the length of all 4 sides : $2 + 2 + 2 + 2$.
The perimeter is 8 units.

D PERIMETER OF COMMON SHAPES

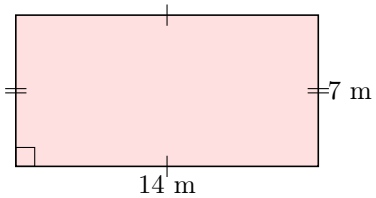
Method Finding a Polygon's Perimeter

To find the perimeter of any polygon (a shape with straight sides), add up the lengths of all its sides.

Proposition Perimeter Formulas

Name	Shape	Perimeter
Triangle		$a+b+c$
Rectangle		$l+w+l+w=(2\times l)+(2\times w)$
Square		$s+s+s+s=4\times s$
Circle		$2\times\pi\times r$

Ex: Find the perimeter of the rectangle:



Answer: This is a rectangle with length $l = 14$ m and width $w = 7$ m. Using the formula for the perimeter of a rectangle:

$$\begin{aligned} P &= (2\times l)+(2\times w) \\ &= (2\times 14)+(2\times 7) \\ &= 28+14 \\ &= 42\,\text{m} \end{aligned}$$

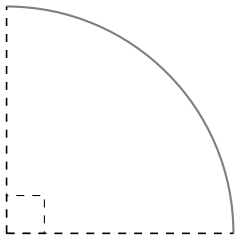
So, the perimeter is 42 meters.

E LENGTH OF AN ARC

Definition Arc of a Circle

An **arc** is a part of the circumference of a circle. The length of an arc depends on the angle it makes at the center of the circle.

Ex: A quarter circle (90 degrees) has an arc that is one-fourth of the full circumference.

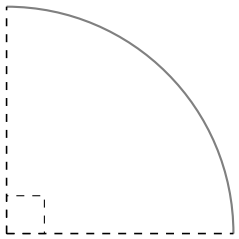


Method Finding the Length of an Arc

To find the length of an arc of a circle:

1. Determine the fraction of the circle that the arc represents by dividing the arc's central angle by 360 degrees: Fraction $= \frac{\text{central angle}}{360}$.
2. Multiply the full circumference by the fraction to find the arc length: Arc length = Fraction × Circumference.

Ex: Find the length of the arc of circle



Answer:

- Determine the fraction of the circle that the arc represents:

$$\begin{aligned}\text{Fraction} &= \frac{\text{central angle}}{360}\\ &= \frac{90}{360}\\ &= \frac{1}{4}\end{aligned}$$

- Multiply the full circumference by the fraction to find the arc length:

$$\begin{aligned}\text{Arc length} &= \text{Fraction} \times \text{Circumference}\\ &= \frac{1}{4} \times 2 \times \pi \times 4\\ &\approx 6.3\,\text{cm} \quad \text{(use calculator)}\end{aligned}$$

F PERIMETER OF COMPOSITE FIGURES

Definition Composite Figure

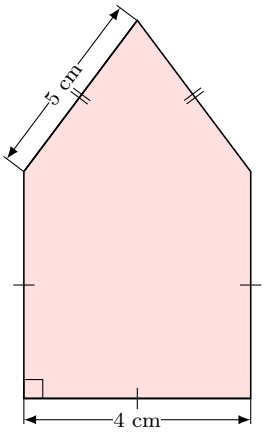
A **composite figure** is a shape made up of two or more simple shapes, like triangles, rectangles, or squares, combined together.

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

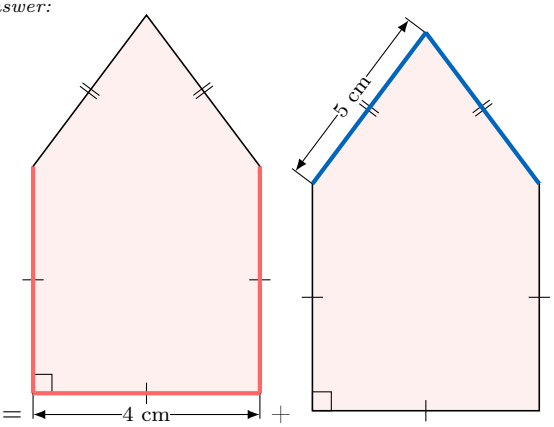
To find the perimeter of a composite figure:

1. Identify all the outer sides of the shape.
2. Add the lengths of these outer sides together to find the total perimeter.

Ex: Find the perimeter of the composite figure:



Answer:



$P =$ +

$P = 3 \times 4 \text{ cm} + 2 \times 5 \text{ cm}$

$P = 22 \text{ cm}$