

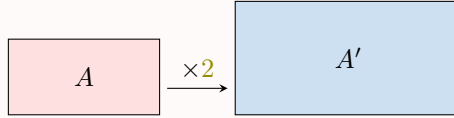
# SIMILARITY

## A WHAT IS A SIMILARITY?

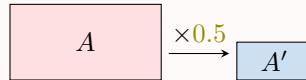
### Definition Similarity and Enlargement/Reduction

A **similarity** with scale factor  $k > 0$  is a transformation that multiplies all distances by the same number  $k$ .

- If  $k > 1$ , the similarity is an **enlargement**.



- If  $0 < k < 1$ , the similarity is a **reduction**.

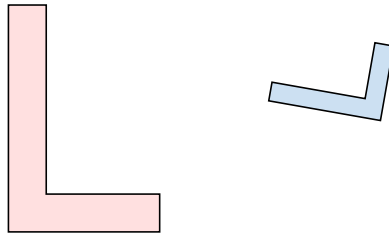


- If  $k = 1$ , the similarity preserves all distances (it is an isometry), so the figure has the same size and shape.

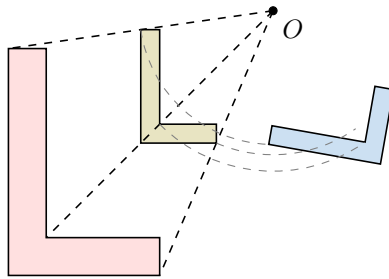
### Theorem Fundamental Transformations Similarity Theorem

Any similarity can be expressed as the composition of one or more fundamental transformations (reflection, translation, rotation, and homothety).

**Ex:** The blue  $L$  is similar to the red  $L$ : it is a reduction of it.



The blue  $L$  is the image of the red  $L$  through a homothety of scale factor 0.5 ( $L \rightarrow L'$ ) followed by a rotation ( $L' \rightarrow L$ ).



## B SIMILAR FIGURES

### Definition Similar Figures

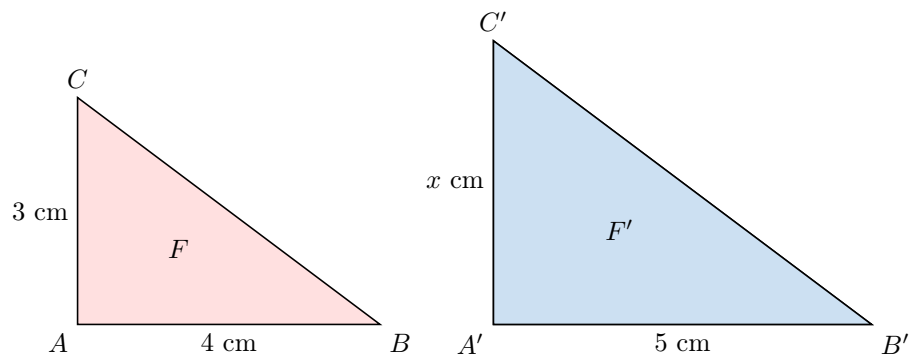
Two figures are **similar** if one can be obtained from the other by a similarity (an enlargement, a reduction, or an isometry).

### Proposition Properties of Similar Figures

For similar figures:

- The ratios of the lengths of corresponding sides are all equal to the same scale factor.
- The corresponding angles are equal.

**Ex:** The figures  $F$  and  $F'$  are similar. Find  $x$ .



*Answer:* The ratios of the corresponding sides are equal:

$$\begin{aligned}\frac{A'C'}{AC} &= \frac{A'B'}{AB} \\ \frac{x}{3} &= \frac{5}{4} \\ x &= 3 \times \frac{5}{4} \\ x &= 3.75 \text{ cm}\end{aligned}$$