Properties of Certain Transformations

Ex: The diagrams show three transformations or quadrilateral *ABCD*, a translation, a rotation and a reflection. In *ABCD*, we have $BC = 6$, $m\angle C = 50°$, $\overline{DPC}$, $\overline{AB} \parallel \overline{CD}$ and *M* is the midpoint of $\overline{AD}$.

Which of the following are true?

	Translation	Rotation	Reflection
$B'C' = 6$	Yes	Yes	Yes
$m\angle C' = 50°$	Yes	Yes	Yes
$\overline{D'P'C'}$	Yes	Yes	Yes
$\overline{A'B'} \parallel \overline{C'D'}$	Yes	Yes	Yes
M' mdpt of $\overline{A'D'}$	Yes	Yes	Yes
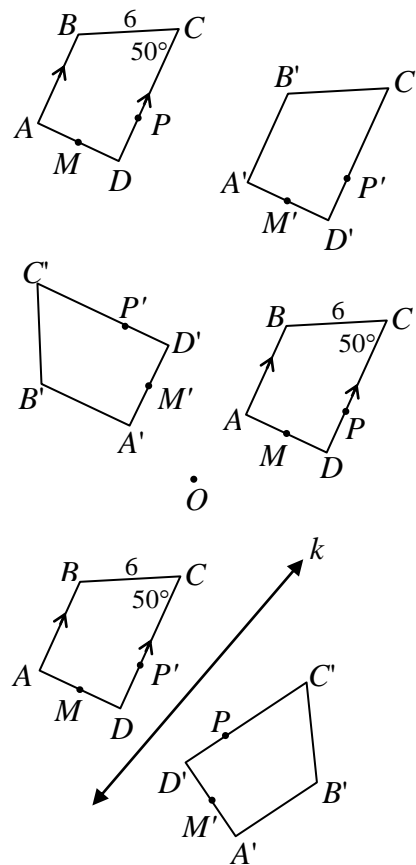
We say these transformations **"preserve" (keep unchanged)**
distance, angle measure, collinearity, parallelism and midpoints

If a segment has a certain length, its image will have the same length.
If an angle has a certain measure, its image will have the same measure.
If points are collinear, their images will be collinear.
If two lines are parallel, their images will be parallel.
If *M* is a midpoint of a certain segment, its image will be the midpoint of the image of the segment.

Rigid Motions

A *rigid motion* is a transformation that

1. **preserves distance (length)**

   The image of a segment will be the same length as the segment

2. **preserves angle measure**

   The image of an angle will be the same measure as the angle

Another way of thinking about it: After a rigid motion, the image of any figure will be exactly the same shape and size as the pre-image.
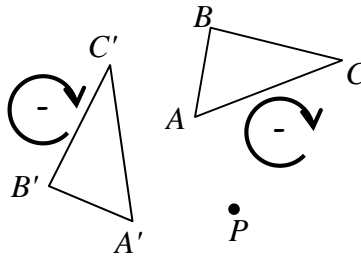
Translations ⎫ Rotations ⎬ are all rigid motions. Reflections ⎭	Also, any composition of translations, rotations and/or reflections will be a rigid motion.

Orientation
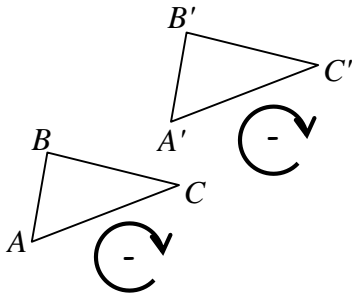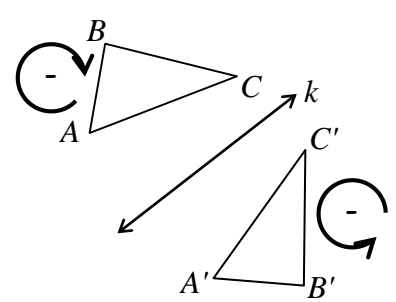
Ex: Translation   Rotation   Reflection

Definition: *Orientation* of a plane figure refers to order or direction of the vertices.

In all three diagrams above, $\triangle ABC$ is oriented clockwise.

Which isometries *preserve orientation*?

Translations and rotations

These are called "direct isometries."

Reflections change orientation: they are "opposite isometries."

A transformation that changes all distances by the same ration is called a similarity.

A dilation is a similarity.