

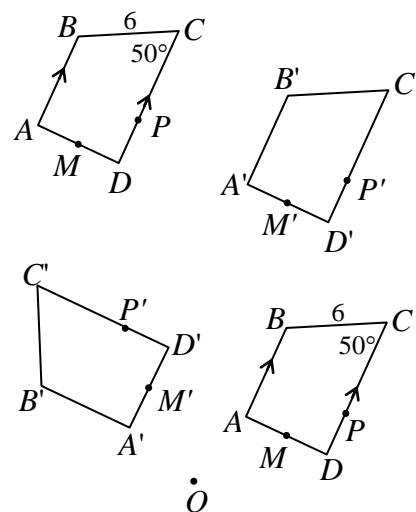
## Geometry Notes TG - 8: Rigid Motions

### Properties of Certain Transformations

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

Which of the following are true?

	Translation	Rotation	Reflection
$B'C' = 6$			
$m\angle C' = 50^\circ$			
$\overline{D'P'C'}$			
$\overline{A'B'} \parallel \overline{C'D'}$			
$M'$ mdpt of $\overline{A'D'}$			



We say these transformations

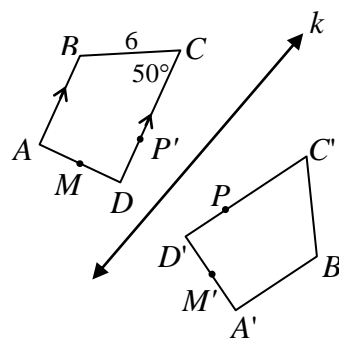
If a segment has a certain length, its image will have the same length.

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.

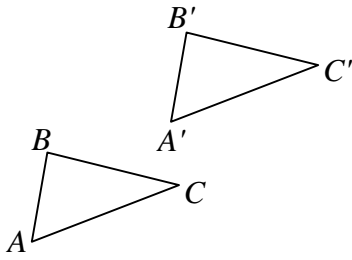
2.

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.

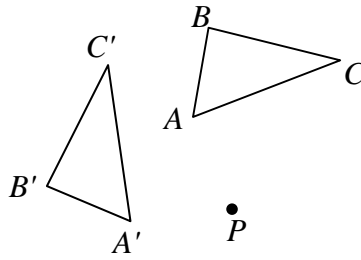
<div style="display: flex; align-items: center;"> <div style="font-size: 2em; margin-right: 10px;">}</div> <div style="margin-right: 10px;">                 Translations                  Rotations                  Reflections             </div> <div style="font-size: 2em; margin-right: 10px;">}</div> <div>are all rigid motions.</div> </div>	Also, any composition of translations, rotations and/or reflections will be a rigid motion.
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## Orientation

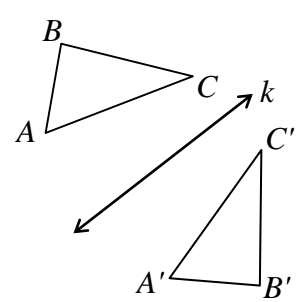
Ex: Translation



Rotation



Reflection



Definition: *Orientation* of a plane figure refers to

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

Which isometries *preserve orientation*?

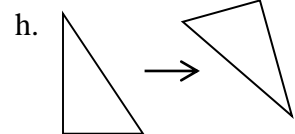
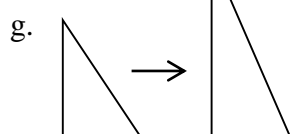
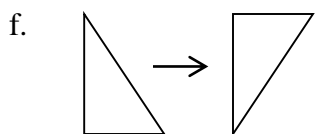
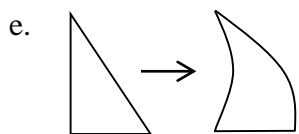
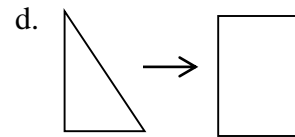
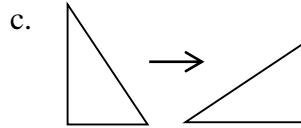
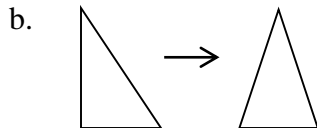
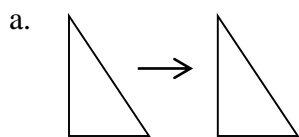
These are called

A transformation that changes all distances by the same ratio is called a

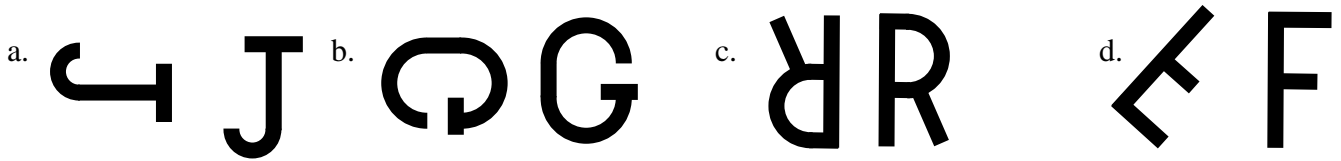
## Geometry HW: Transformations – 8 Rigid Motions

1. a. What is an *isometry*? Name the three basic ones.
  - b. In an isometry,
    - 1) Is collinearity always preserved?
    - 2) Is angle measure always preserved?
    - 3) Is parallelism always preserved?
    - 4) Are midpoints always preserved?
    - 5) Is orientation always preserved?
    - 6) Is slope always preserved?
  
2. Which of the following transformations is *not* an isometry?
  - (1) Line reflection      (2) Rotation      (3) Translation
  - (4) Dilation              (5) Glide reflection
  
3. Which of the following transformations do *not* preserve orientation? (Give all correct choices.)
  - (1) Line reflection      (2) Rotation      (3) Translation
  - (4) Dilation              (5) Glide reflection
  
4. Identify each of the following as a direct isometry (D), opposite isometry (O), or neither (N).
  - a. Line reflection      b. Rotation      c. Translation      d. Dilation
  - e. Glide reflection      f.  $(x, y) \rightarrow (-x, y)$       g.  $(x, y) \rightarrow (2x, 2y)$       h.  $(x, y) \rightarrow (x + 2, y - 3)$
  - i.  $(x, y) \rightarrow (-x, -y)$       j. A composition of two line reflections
  - k. A composition of three line reflections

5. Tell whether each figure represents a rigid motion. If not, give a reason why not.



6. In each diagram below, identify a rigid motion that would take the figure on the left onto its image on the right. (Note: there can be more than one right answer.)



7. In each diagram below, identify a specific rigid motion that would take  $\triangle ABC$  onto its image as shown.

