Lesson 2: Definition of Translation and Three Basic Properties

Classwork

Exercise 1

Draw at least three different vectors, and show what a translation of the plane along each vector looks like. Describe what happens to the following figures under each translation using appropriate vocabulary and notation as needed.

A STORY OF RATIOS

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G8-M2-SE-1.3.0-05.2015

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Exercise 2

The diagram below shows figures and their images under a translation along \( \overrightarrow{HI} \). Use the original figures and the translated images to fill in missing labels for points and measures.
Lesson Summary

Translation occurs along a given vector:

- A vector is directed line segment, that is, it is a segment with a direction given by connecting one of its endpoint (called the \textit{initial point} or \textit{starting point}) to the other endpoint (called the \textit{terminal point} or simply the endpoint). It is often represented as an “arrow” with a “tail” and a “tip.”
- The length of a vector is, by definition, the length of its underlying segment.
- Pictorially note the starting and endpoints:

\[
\begin{align*}
\overrightarrow{AB} & \quad \text{B} \\
A & \quad \text{A} \\
\overrightarrow{BA} & \quad \text{A} \\
B & \quad \text{B}
\end{align*}
\]

A translation of a plane along a given vector is a basic rigid motion of a plane.

The three basic properties of translation are as follows:

(Translation 1) A translation maps a line to a line, a ray to a ray, a segment to a segment, and an angle to an angle.

(Translation 2) A translation preserves lengths of segments.

(Translation 3) A translation preserves measures of angles.

Terminology

\textbf{TRANSLATION (description):} For vector \(\overrightarrow{AB}\), a translation along \(\overrightarrow{AB}\) is the transformation of the plane that maps each point \(C\) of the plane to its image \(C’\) so that the line \(\overrightarrow{CC’}\) is parallel to the vector (or contains it), and the vector \(\overrightarrow{CC’}\) points in the same direction and is the same length as the vector \(\overrightarrow{AB}\).