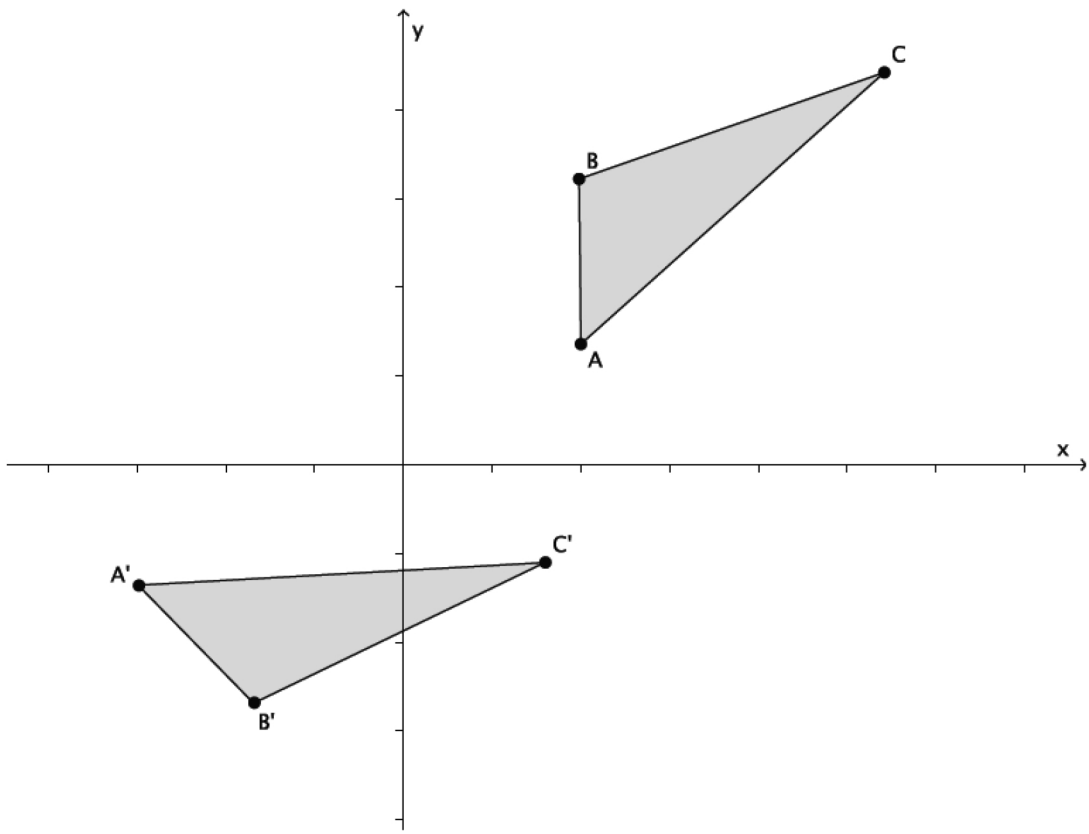
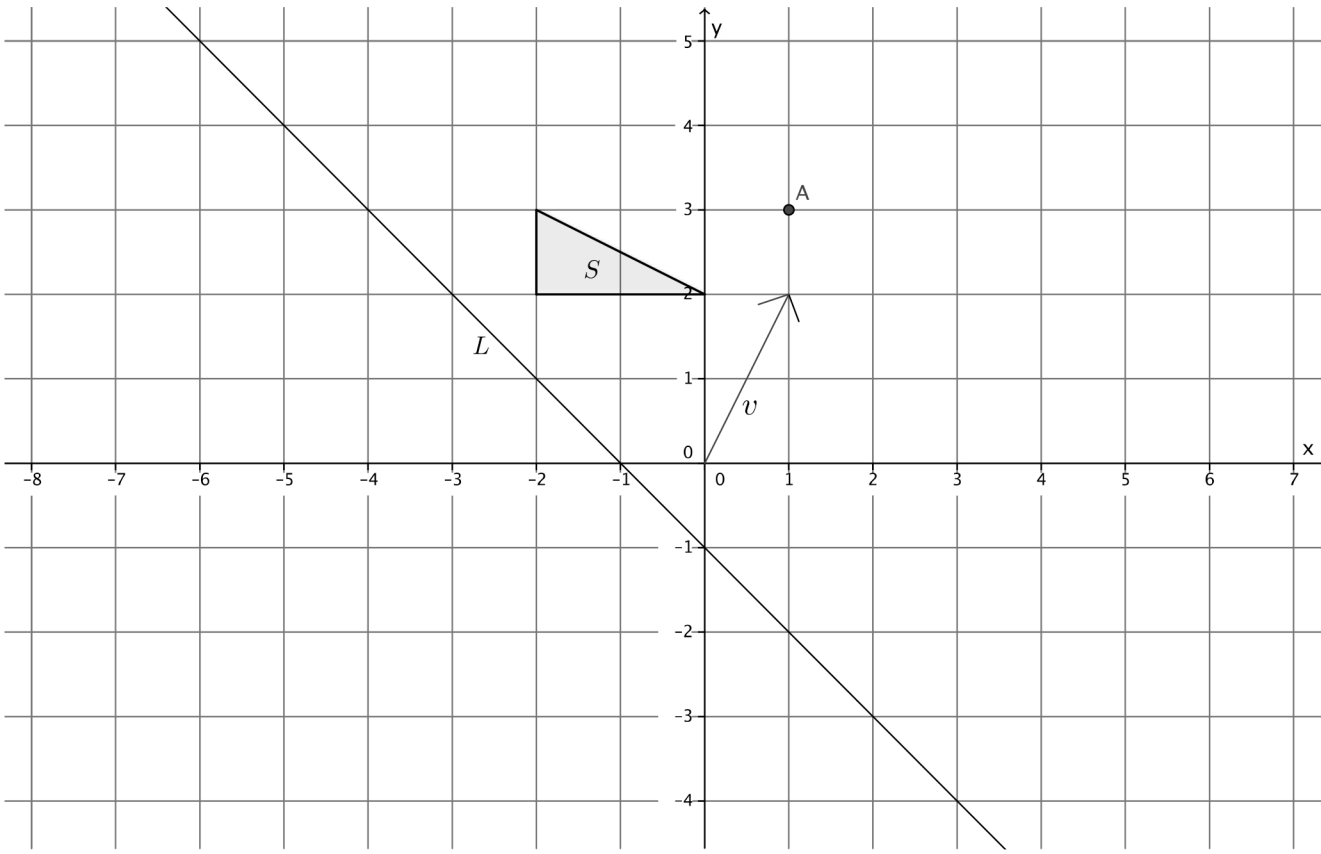
Name _____ Date _____

Sequences of Rigid Motions

Triangle ABC has been moved according to the following sequence: a translation followed by a rotation followed by a reflection. With precision, describe each rigid motion that would map $\triangle ABC$ onto $\triangle A'B'C'$. Use your transparency and add to the diagram if needed.

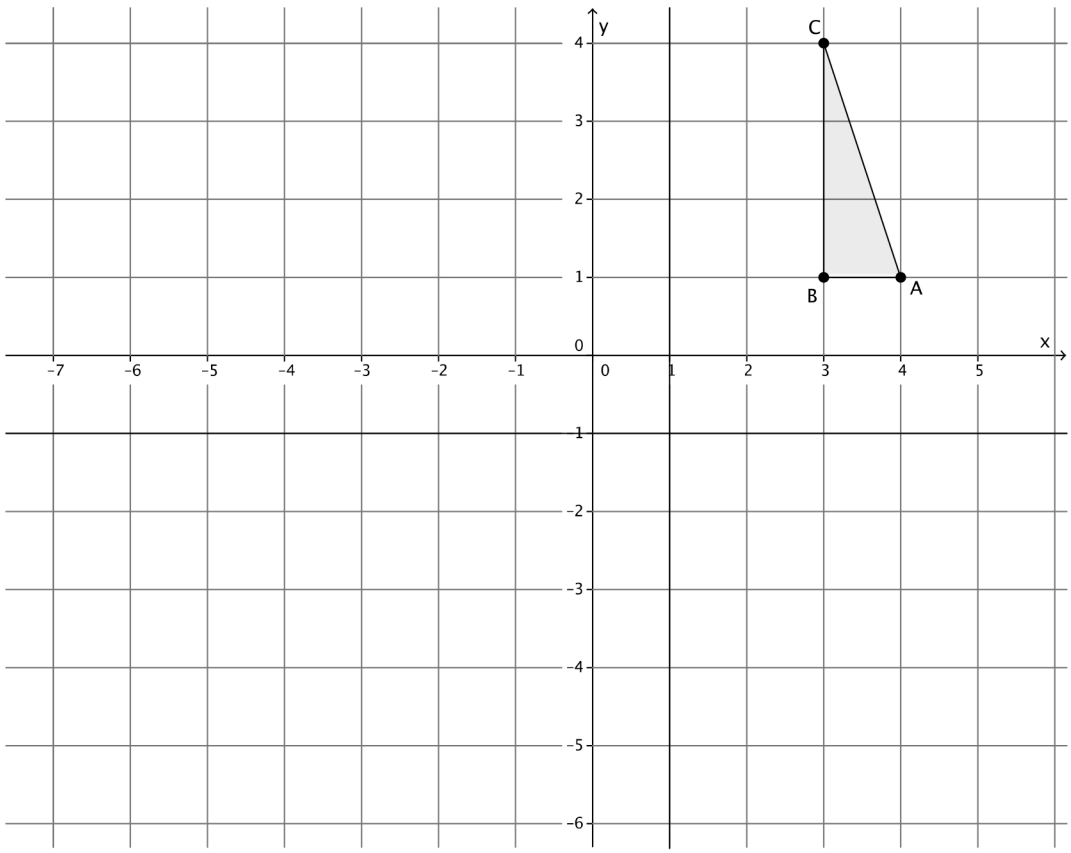


1. Let there be the translation along vector $\vec{v}$, let there be the rotation around point A, -90 degrees (clockwise), and let there be the reflection across line L. Let S be the figure as shown below. Show the location of S after performing the following sequence: a translation followed by a rotation followed by a reflection.



2. Would the location of the image of S in the previous problem be the same if the translation was performed last instead of first, i.e., does the sequence: translation followed by a rotation followed by a reflection equal a rotation followed by a reflection followed by a translation? Explain.

3. Use the same coordinate grid to complete parts (a)–(c).

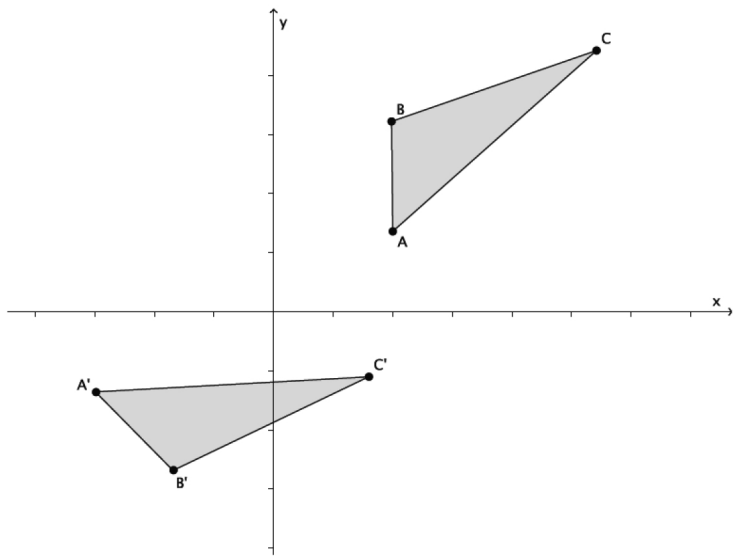


a. Reflect triangle ABC across the vertical line, parallel to the y-axis, going through point $(1, 0)$. Label the transformed points A, B, C as A', B', C', respectively.

b. Reflect triangle $A'B'C'$ across the horizontal line, parallel to the x-axis going through point $(0, -1)$. Label the transformed points of A', B', C' as A'', B'', C'', respectively.

c. Is there a single rigid motion that would map triangle ABC to triangle $A''B''C''$?

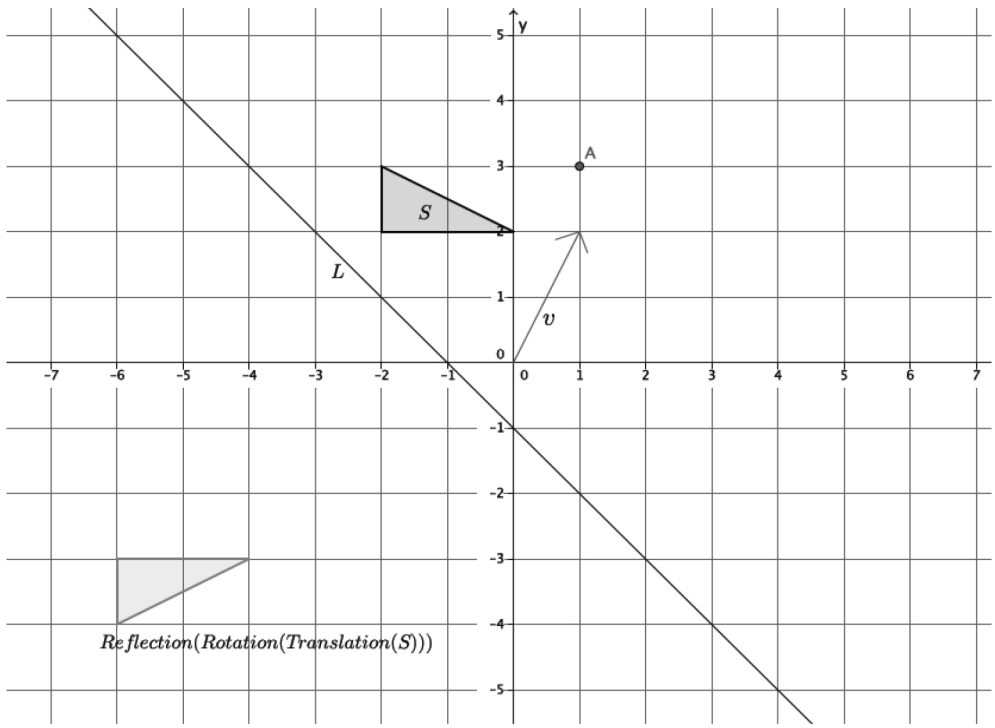
Triangle ABC has been moved according to the following sequence: a translation followed by a rotation followed by a reflection. With precision, describe each rigid motion that would map $\triangle ABC$ onto $\triangle A'B'C'$. Use your transparency and add to the diagram if needed.



Let there be the translation along vector $\overrightarrow{AA'}$ so that $A = A'$. Let there be the clockwise rotation by d degrees around point A' so that $C = C'$ and $AC = A'C'$. Let there be the reflection across $L_{A'C'}$ so that $B = B'$.

1. **Let there be the translation along vector $\vec{v}$, let there be the rotation around point A, -90 degrees (clockwise), and let there be the reflection across line L. Let S be the figure as shown below. Show the location of S after performing the following sequence: a translation followed by a rotation followed by a reflection.**

   Solution is shown in red.

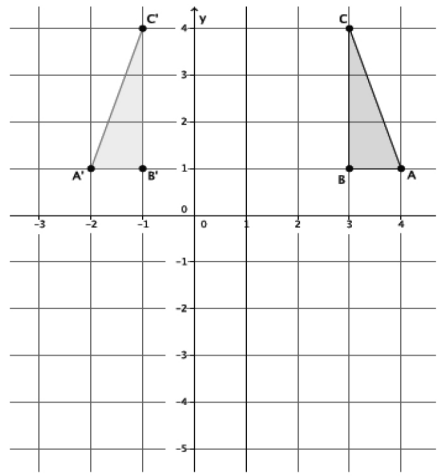


2. **Would the location of the image of S in the previous problem be the same if the translation was performed last instead of first, i.e., does the sequence: translation followed by a rotation followed by a reflection equal a rotation followed by a reflection followed by a translation? Explain.**

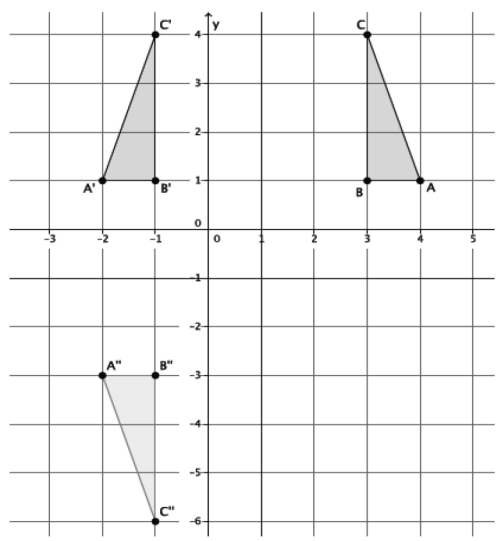
   No, the order of the transformation matters. If the translation was performed last, the location of the image of S, after the sequence, would be in a different location than if the translation was performed first.

3. Use the same coordinate grid to complete parts (a)–(c).

a. Reflect triangle ABC across the vertical line, parallel to the y-axis, going through point $(1, 0)$. Label the transformed points A, B, C as A', B', C', respectively.



b. Reflect triangle $A'B'C'$ across the horizontal line, parallel to the x-axis going through point $(0, -1)$. Label the transformed points of A', B', C' as A'', B'', C'', respectively.



c. Is there a single rigid motion that would map triangle ABC to triangle $A''B''C''$?

Yes, a $180°$ rotation around center $(1, -1)$. The coordinate $(1, -1)$ happens to be the intersection of the two lines of reflection.