1. Consider the pre-image triangle with vertices A(1,2), B(3,1), and C(1,1).
   a. Rotate the pre-image triangle ABC 90° about the origin and label this triangle A’B’C’.
      \[ A'(x, y) \rightarrow (-y, x) \]
      \[ A'(2, -1), \quad B'(1, 3), \quad C'(1, -1) \]
   b. Reflect the triangle A’B’C’ over the x-axis and label this triangle A”B”C”.
      \[ \text{Reflect over } x \rightarrow (x, -y) \]
      \[ A''(-2, 1), \quad B''(-1, 3), \quad C''(-1, 1) \]

2. Consider the pre-image quadrilateral with vertices A(1,1), B(1,2), C(2,1), and D(2,0).
   a. Dilate the quadrilateral by a factor of 2 from the origin and label the image quadrilateral A’B’C’D’.
      \[ \text{Dilation } (x, y) \rightarrow (2x, 2y) \]
      \[ A'(2, 2), \quad B'(2, 4), \quad C'(4, 2), \quad D'(4, 0) \]
   b. Translate the quadrilateral image A’B’C’D’ down 5 units and left 1 unit. Label this new image A”B”C”D”.
      \[ \text{Down 5 Left 1 } (x, y) \rightarrow (x-1, y-5) \]
      \[ A''(1, -3), \quad B''(1, -1), \quad C''(3, -3), \quad D''(3, -5) \]
   c. Reflect the quadrilateral image A”B”C”D” over the y-axis and label this image A””B””C””D””.
      \[ \text{Reflect over } y \rightarrow (-x, y) \]
      \[ A'''(-1, -3), \quad B'''(-1, -1), \quad C'''(-3, -3), \quad D'''(-3, -5) \]
3. Describe two transformations that would map quadrilateral ABCD onto quadrilateral A’B’C’D’

**Transformation #1**

Rotate □ ABDC 90° about the origin

**Transformation #2**

Translate □ A’B’C’D’ left 1 and up 2

4. Describe two transformations that would map triangle ABC onto triangle A”B”C”

**Transformation #1**

Dilate △ ABC by scale factor of 2 from the origin

**Transformation #2**

Reflect △ A’B’C’ over the y-axis

5. First reflect quadrilateral ABCD over the y-axis and label the triangle A’B’C’D’. Then, reflect quadrilateral A’B’C’D’ over the x-axis and label this quadrilateral A”B”C”D”.

**Y-axis reflect**

\((x,y) \rightarrow (-x,y)\)

A’: (-1,1)

B’: (-2,2)

C’: (-4,1)

D’: (-1,4)

**X-axis reflect**

\((x,y) \rightarrow (x,-y)\)

A”: (-1, -1)

B”: (-2, -2)

C”: (-4, -1)

D”: (-1, -4)

6. Anytime you use a double reflection, there should be a rotation about the intersection of the reflection lines that maps the pre-image onto the final image. In this example what is the amount of the rotation?

**Rotation of 180° about the origin.**
7. Given that pentagon DGHIJ is first reflected over \textit{line m} to create the image D’G’H’T’J’. Then, the image D’G’H’T’J’ is reflected over the \textit{line l} to create the image D"G"H"I"J". What is a different transformation that would also map DGHIJ onto D"G"H"I"J"?

\begin{align*}
\text{A rotation of } 120^\circ \\
\text{about the intersection point of the two lines of reflection.}
\end{align*}