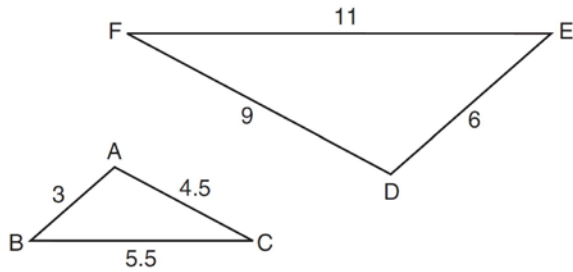


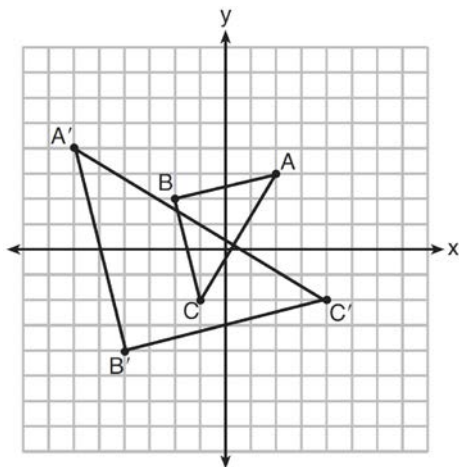
G.SRT.A.2: Compositions of Transformations 2

- 1 In the diagram below, $\triangle DEF$ is the image of $\triangle ABC$ after a clockwise rotation of 180° and a dilation where $AB = 3$, $BC = 5.5$, $AC = 4.5$, $DE = 6$, $FD = 9$, and $EF = 11$.



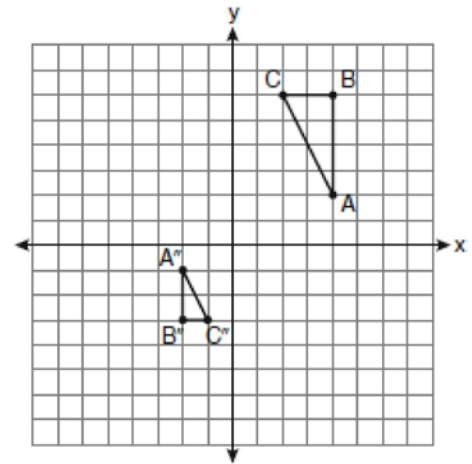
Which relationship must always be true?

- 1) $\frac{m\angle A}{m\angle D} = \frac{1}{2}$
 - 2) $\frac{m\angle C}{m\angle F} = \frac{2}{1}$
 - 3) $\frac{m\angle A}{m\angle C} = \frac{m\angle F}{m\angle D}$
 - 4) $\frac{m\angle B}{m\angle E} = \frac{m\angle C}{m\angle F}$
- 2 Which sequence of transformations will map $\triangle ABC$ onto $\triangle A'B'C'$?



- 1) reflection and translation
- 2) rotation and reflection
- 3) translation and dilation
- 4) dilation and rotation

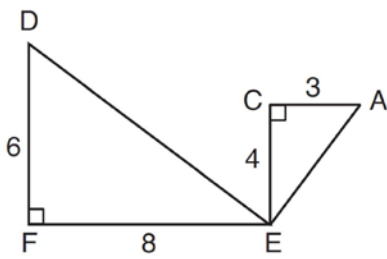
- 3 After a composition of transformations, the coordinates $A(4,2)$, $B(4,6)$, and $C(2,6)$ become $A''(-2,-1)$, $B''(-2,-3)$, and $C''(-1,-3)$, as shown on the set of axes below.



Which composition of transformations was used?

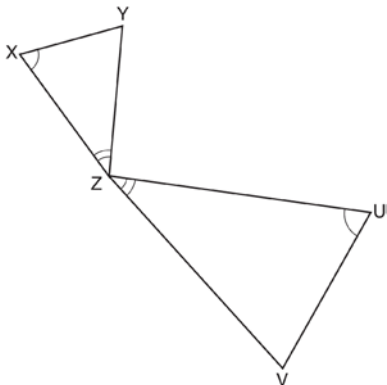
- 1) $R_{180^\circ} \circ D_2$
- 2) $R_{90^\circ} \circ D_2$
- 3) $D_{\frac{1}{2}} \circ R_{180^\circ}$
- 4) $D_{\frac{1}{2}} \circ R_{90^\circ}$

- 4 Given: $\triangle AEC$, $\triangle DEF$, and $\overline{FE} \perp \overline{CE}$



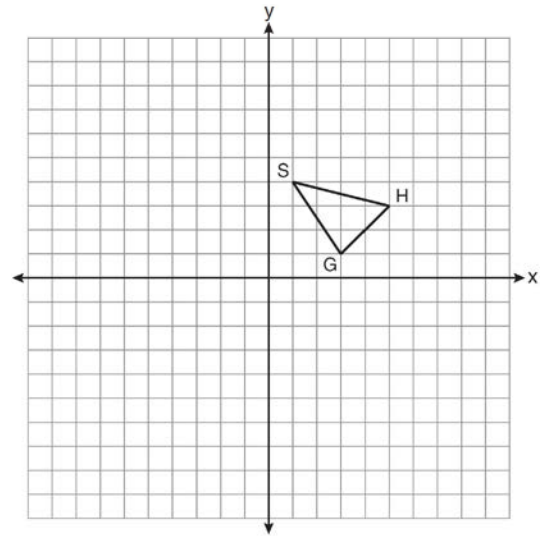
What is a correct sequence of similarity transformations that shows $\triangle AEC \sim \triangle DEF$?

- 1) a rotation of 180 degrees about point E followed by a horizontal translation
 - 2) a counterclockwise rotation of 90 degrees about point E followed by a horizontal translation
 - 3) a rotation of 180 degrees about point E followed by a dilation with a scale factor of 2 centered at point E
 - 4) a counterclockwise rotation of 90 degrees about point E followed by a dilation with a scale factor of 2 centered at point E
- 5 In the diagram below, triangles XYZ and UVZ are drawn such that $\angle X \cong \angle U$ and $\angle XZY \cong \angle UZV$.

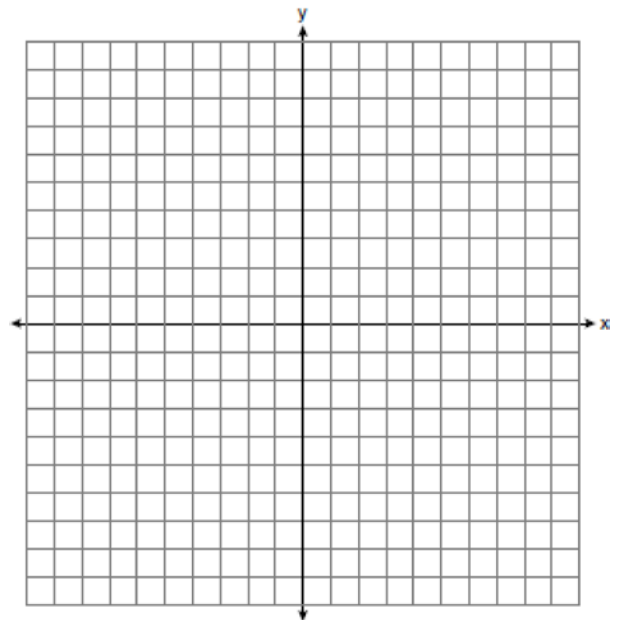


Describe a sequence of similarity transformations that shows $\triangle XYZ$ is similar to $\triangle UVZ$.

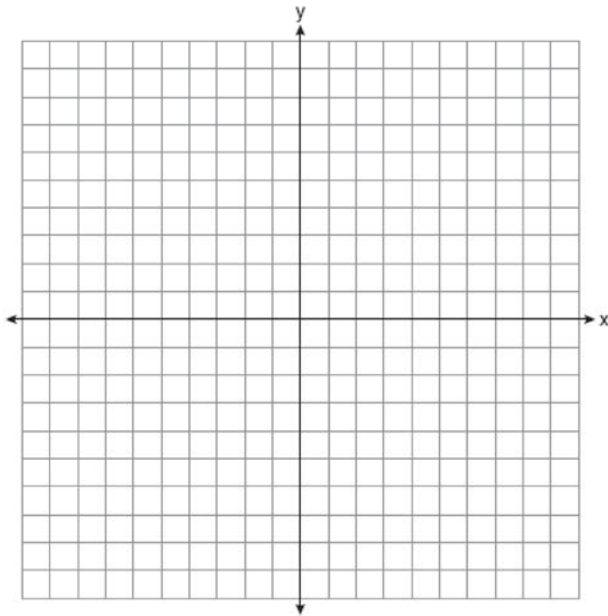
- 6 As shown on the set of axes below, $\triangle GHS$ has vertices $G(3,1)$, $H(5,3)$, and $S(1,4)$. Graph and state the coordinates of $\triangle G''H''S''$, the image of $\triangle GHS$ after the transformation $T_{-3,1} \circ D_2$.



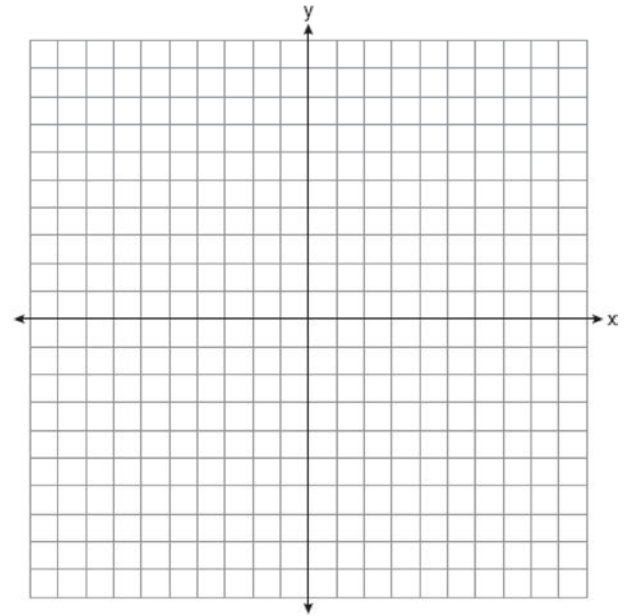
- 7 Triangle ABC has vertices $A(5,1)$, $B(1,4)$ and $C(1,1)$. State and label the coordinates of the vertices of $\triangle A''B''C''$, the image of $\triangle ABC$, following the composite transformation $T_{1,-1} \circ D_2$.
 [The use of the set of axes below is optional.]



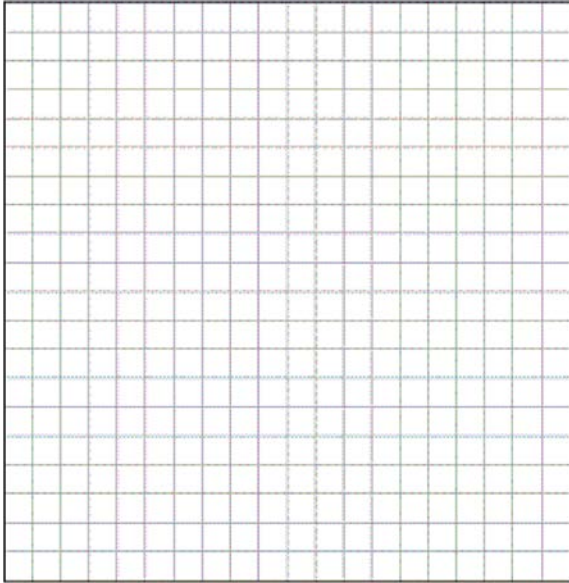
- 8 The coordinates of the vertices of parallelogram $SWAN$ are $S(2, -2)$, $W(-2, -4)$, $A(-4, 6)$, and $N(0, 8)$. State and label the coordinates of parallelogram $S''W''A''N''$, the image of $SWAN$ after the transformation $T_{4, -2} \circ D_{\frac{1}{2}}$. [The use of the set of axes below is optional.]



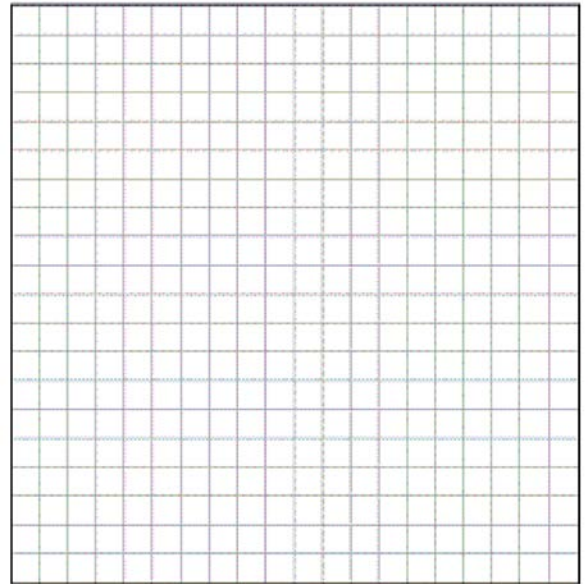
- 9 Triangle ABC has coordinates $A(3, -2)$, $B(8, 2)$, and $C(5, 10)$.
- On the grid below, graph and label $\triangle ABC$.
 - Graph and state the coordinates of $\triangle A'B'C'$, the image of $\triangle ABC$ after a half-turn (R_{180°).
 - Graph and state the coordinates of $\triangle A''B''C''$, the image of $\triangle ABC$ after ($D_2 \circ T_{-5, -2}$).
 - What is the ratio of the area of $\triangle ABC$ to the area of $\triangle A''B''C''$?



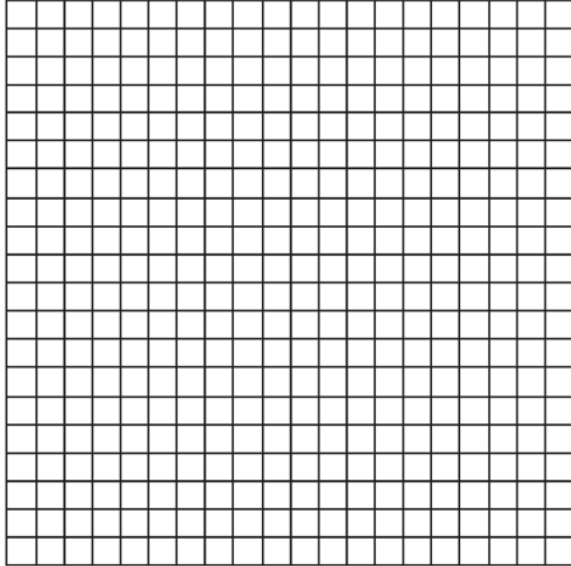
- 10 The coordinates of the vertices of $\triangle ABC$ are $A(1,3)$, $B(-2,2)$ and $C(0,-2)$. On the grid below, graph and label $\triangle A''B''C''$, the result of the composite transformation $D_2 \circ T_{3,-2}$. State the coordinates of A'' , B'' , and C'' .



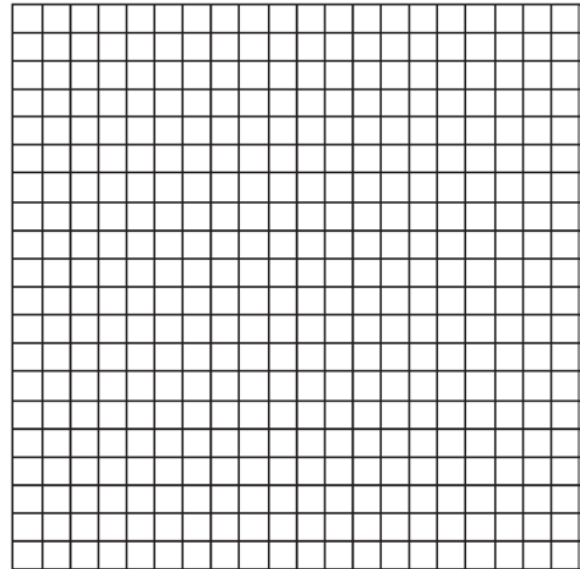
- 11 The coordinates of the endpoints of \overline{AB} are $A(2,6)$ and $B(4,2)$. Is the image $\overline{A''B''}$ the same if it is reflected in the x -axis, then dilated by $\frac{1}{2}$ as the image is if it is dilated by $\frac{1}{2}$, then reflected in the x -axis? Justify your answer. (The use of the accompanying grid is optional.)



- 12 Triangle ABC has vertices $A(1,0)$, $B(6,3)$, and $C(4,5)$. On the accompanying grid, draw and label $\triangle ABC$. Graph and state the coordinates of $\triangle A'B'C'$, the image of $\triangle ABC$ after the composition $D_2 \circ r_{(0,0)}$.



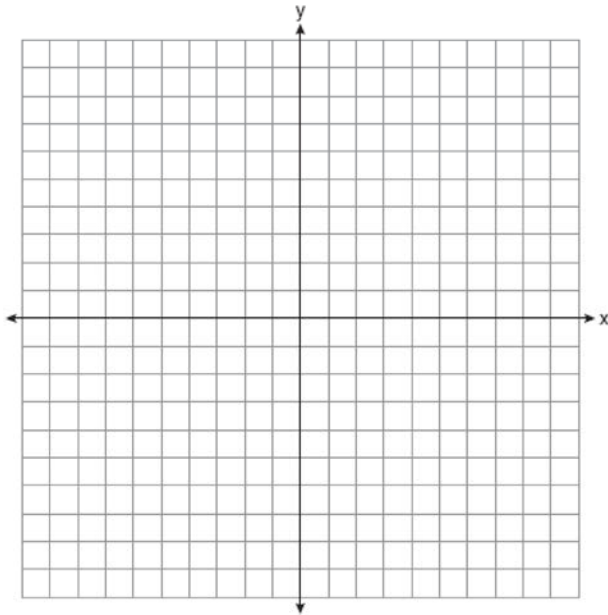
- 13 Farmington, New York, has plans for a new triangular park. If plotted on a coordinate grid, the vertices would be $A(3,3)$, $B(5,-2)$, and $C(-3,-1)$. However, a tract of land has become available that would enable the planners to increase the size of the park, which is based on the following transformation of the original triangular park, $R_{270^\circ} \circ D_2$. On the grid below, graph and label both the original park $\triangle ABC$ and its image, the new park $\triangle A''B''C''$, following the transformation.



- 14 *a* Triangle ABC has coordinates $A(0,9)$, $B(-3,0)$, and $C(-6,9)$. On the graph below, draw and label triangle ABC .
- b* Reflect the graph drawn in part *a* in the origin. State the coordinates of A' , B' , and C' , the images of A , B , and C .
- c* Dilate the graph drawn in part *b* using $D_{\frac{1}{3}}$.

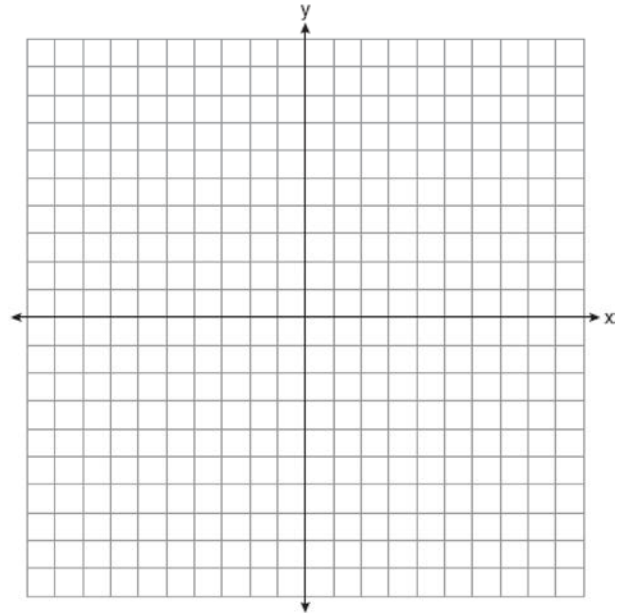
State the coordinates of A'' , B'' , C'' , the images of A' , B' , and C' .

- d* Translate the graph drawn in part *c* using $T_{(5,4)}$. State the coordinates of A''' , B''' , and C''' , the images of A'' , B'' , and C'' .



- 15 On the graph below, sketch the triangle formed by points $A(3,-3)$, $B(-1,-5)$, and $C(5,-4)$. On the same set of axes, graph and state the coordinates of
- a* $\triangle A'B'C'$, the image of $\triangle ABC$ after the rotation R_{90° .
- b* $\triangle A''B''C''$, the image of $\triangle A'B'C'$ after the translation $T_{(-4,-1)}$.
- c* $\triangle A'''B'''C'''$, the image of $\triangle A''B''C''$ after the dilation D_3 .

Is the composite transformation $\triangle ABC \rightarrow \triangle A'''B'''C'''$ an isometry? Explain your answer.



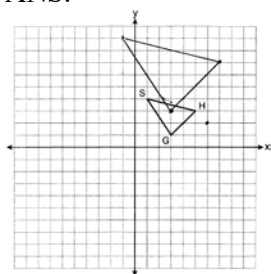
G.SRT.A.2: Compositions of Transformations 2 Answer Section

- 1 ANS: 4 REF: 081514geo
- 2 ANS: 4 REF: 061608geo
- 3 ANS: 3 REF: 060908ge
- 4 ANS: 4 REF: 081609geo
- 5 ANS:

Triangle $X'Y'Z'$ is the image of $\triangle XYZ$ after a rotation about point Z such that \overline{ZX} coincides with \overline{ZU} . Since rotations preserve angle measure, \overline{ZY} coincides with \overline{ZV} , and corresponding angles X and Y , after the rotation, remain congruent, so $\overline{XY} \parallel \overline{UV}$. Then, dilate $\triangle X'Y'Z'$ by a scale factor of $\frac{ZU}{ZX}$ with its center at point Z . Since dilations preserve parallelism, $\overline{X'Y'}$ maps onto \overline{UV} . Therefore, $\triangle XYZ \sim \triangle UVZ$.

REF: spr1406geo

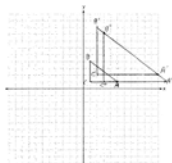
- 6 ANS:



$G''(3,3), H''(7,7), S''(-1,9)$

REF: 081136ge

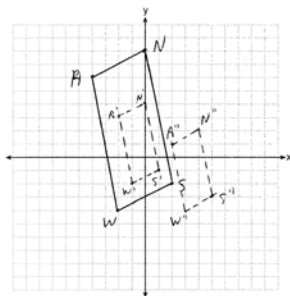
- 7 ANS:



$A''(11,1), B''(3,7), C''(3,1)$

REF: 011336ge

- 8 ANS:



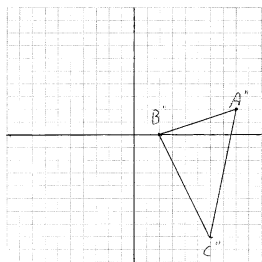
$S''(5,-3), W''(3,-4), A''(2,1), \text{ and } N''(4,2)$

REF: 061335ge

9 ANS:
 $A'(-3,-2), B'(-8,-2), C'(-5,-10); A''(-4,0), B''(6,0), C''(0,16); 1:4$

REF: 089437siii

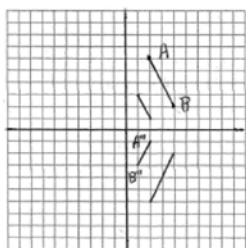
10 ANS:



$A''(8,2), B''(2,0), C''(6,-8)$

REF: 081036ge

11 ANS:



If \overline{AB} is reflected first, the coordinates of the endpoints of $\overline{A'B'}$ are $A'(2,-6)$ and $B'(4,-2)$.

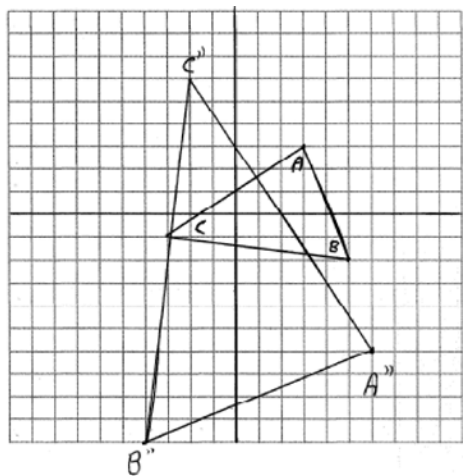
When the reflection is dilated, the coordinates of the endpoints of $\overline{A''B''}$ are $A''(1,-3)$ and $B''(2,-1)$. If \overline{AB} is dilated first, the coordinates of the endpoints of $\overline{A'B'}$ are $A'(1,3)$ and $B'(2,1)$. When the dilation is reflected, the coordinates of the endpoints of $\overline{A''B''}$ are $A''(1,-3)$ and $B''(2,-1)$. The images are the same.

REF: 080028a

12 ANS:
 $A'(-2,0), B'(-12,-6), C'(-8,-10)$

REF: 068941siii

13 ANS:



REF: 010930b

14 ANS:

 $A'(0, -9), B'(3, 0), C'(6, -9); A''(0, -3), B''(1, 0), C''(2, -3); A'''(5, 1), B'''(6, 4), C'''(7, 1)$

REF: 069038siii

15 ANS:

 $A'(3, 3), B'(5, -1), C'(4, 5); A''(-1, 2), B''(1, -2), C''(0, 4); A'''(-3, 6), B'''(3, -6), C'''(0, 12);$ No, length is not preserved.

REF: 069938siii