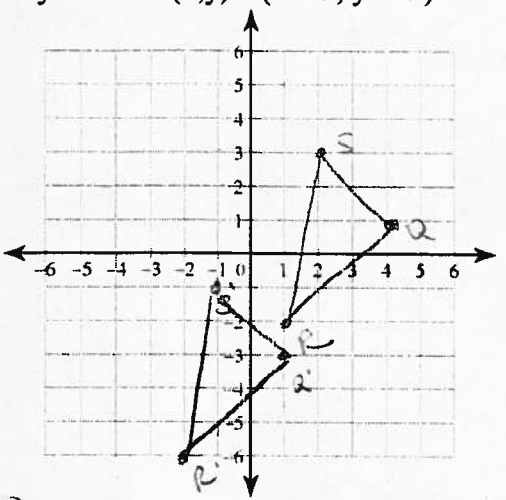
Geometry – Multiple Transformations Name: Key

The following worksheet is for you to discover how to do MULTIPLE TRANSFORMATIONS!
You should already know how to do the following:

- Translations (slides)
- Reflections (flips, like with a mirror)
- Rotations (spins or turns)

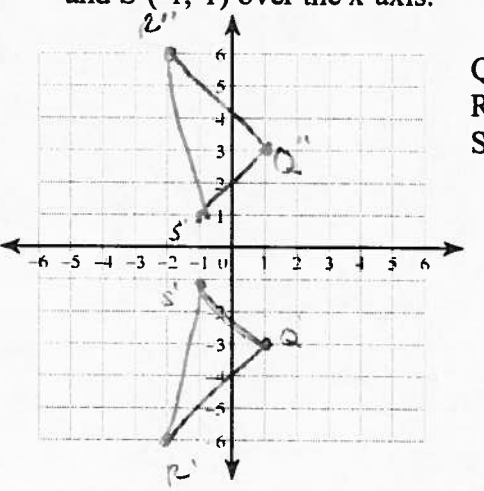
Let's start out with some easier single-transformations to get "warmed-up".

1) Translate ΔQRS if Q(4,1), R(1,-2), S(2,3) by the rule $(x,y) \rightarrow (x-3, y-4)$



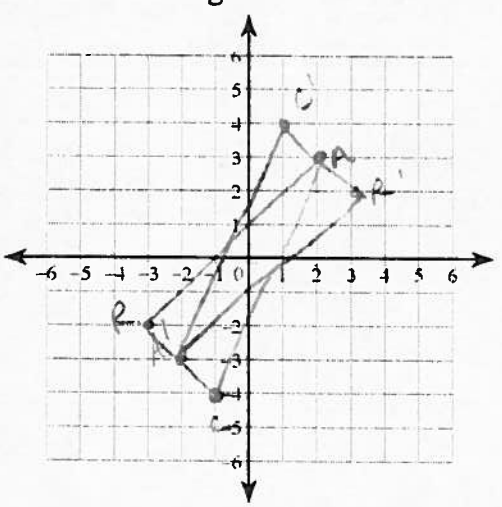
Q' (1, -3)
R' (-2, -6)
S' (-1, -1)

2)Reflect $\Delta Q'R'S'$ if Q'(1,-3), R'(-2,-6), and S'(-1,-1) over the x-axis.



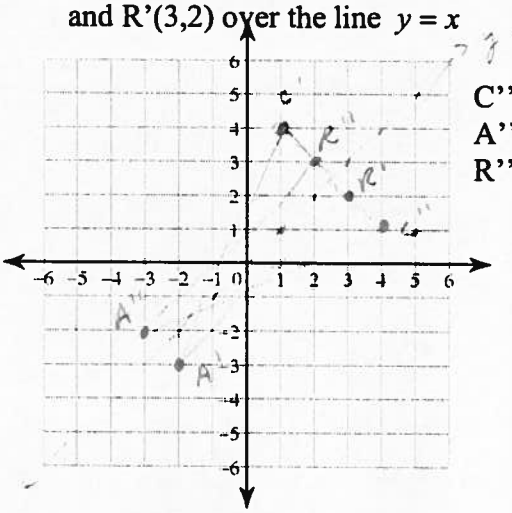
Q''(1, 3)
R''(-2, 6)
S''(-1, 1)

3) Rotate ΔCAR if C(-1,-4), A(2,3), R(-3,-2) 180^o about the origin.



C'(1, 4)
A'(-2, -3)
R'(3, 2)

4) Reflect $\Delta C'A'R'$ if C'(1,4), A'(-2,-3), and R'(3,2) over the line $y = x$



C''(4, 1)
A''(-3, -2)
R''(2, 3)

5) What did you notice in problems 1&2 and problems 3&4. How were the shapes related? Explain how you could translate ΔQRS by the rule $(x,y) \rightarrow (x-3, y-4)$ and then reflect the image of the x-axis. Where does the final image end up?

The image is the preimage to #2
•Subtract 3 from x, subtract 4 from y and make y opposite

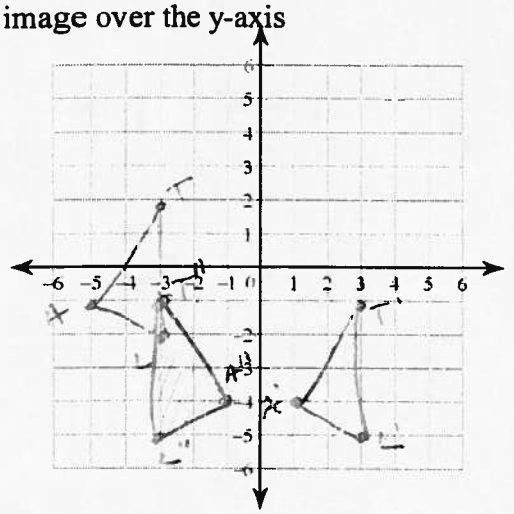
How would you rotate ΔCAR 180^o about the origin and then reflect it over the line $y = x$?

Switch (x,y) twice for 180°
then take the image coordinate
and switch the x and y coordinates.

6) Also notice that on the previous page, when we did two transformations, the first image had one prime notation (one `), and the second image (after the second transformation) has two prime notations (``). This is the notation we are going to use. How many transformations would have been applied to a figure if it had four prime notations? (````)? 4 Transformation

7) Now you are going to try some multiple transformations:

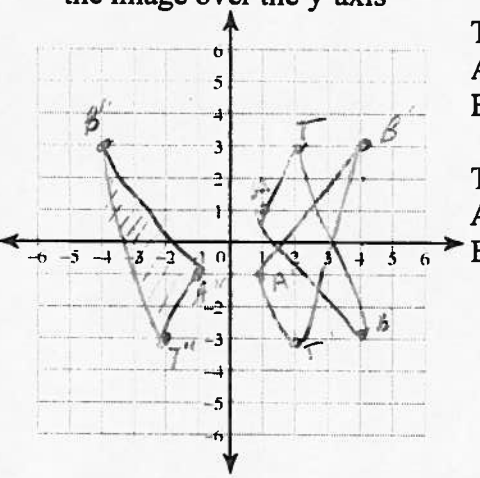
a) Translate Δ ALT if A(-5,-1), L(-3,-2), T(-3,2) by the rule (x,y)→(x +6, y – 3), then reflect the image over the y-axis



A' (1, -4)
L' (3, -5)
T' (3, -1)

A''(-1, -4)
L''(-3, -5)
T''(-3, -1)

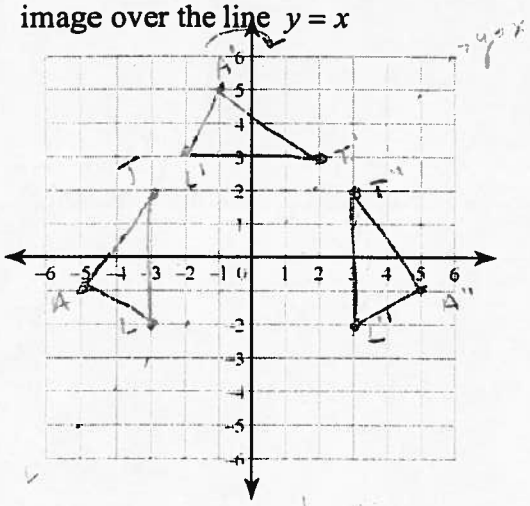
b)Reflect Δ TAB if T(2,3), A(1,1), and B(4,-3) over the x-axis, then reflect the image over the y-axis



T'(2, -3)
A'(1, -1)
B'(4, 3)

T''(-2, -3)
A''(-1, -1)
B''(-4, 3)

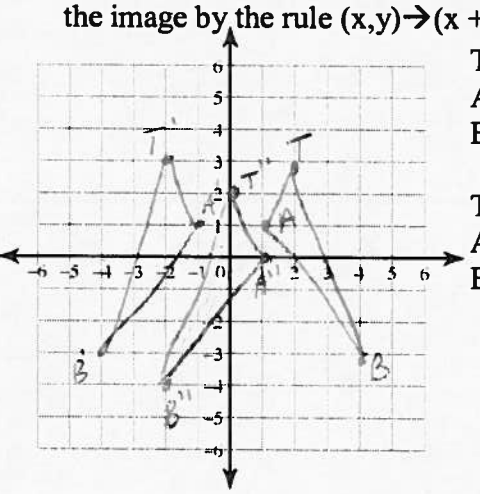
c) Rotate Δ ALT if A(-5,-1), L(-3,-2), T(-3,2) 90° clockwise about the origin, then reflect the image over the line $y = x$



A' (-1, 5)
L' (-2, 3)
T' (2, 3)

A''(5, -1)
L''(3, -2)
T''(3, 2)

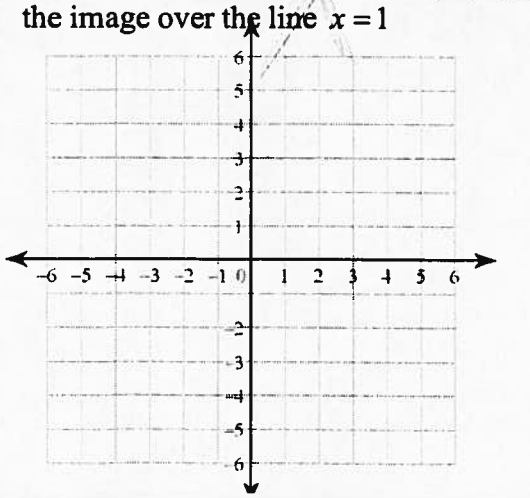
d)Reflect Δ TAB if T(2,3), A(1,1), and B(4,-3) over the y-axis, then translate the image by the rule (x,y)→(x +2, y – 1)



T'(-2, 3)
A'(-1, 1)
B'(-4, -3)

T''(0, 2)
A''(1, 0)
B''(-2, -4)

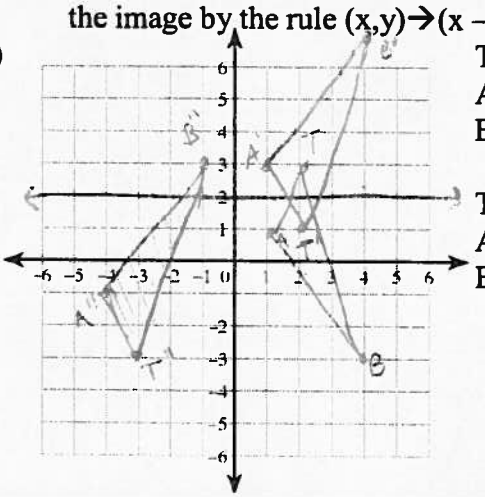
e) Rotate Δ ALT if A(-5,-1), L(-3,-2), T(-3,2) 180° clockwise about the point (-1,-1), then reflect the image over the line $x = 1$



A' (____, ____)
L' (____, ____)
T' (____, ____)

A''(____, ____)
L''(____, ____)
T''(____, ____)

f)Reflect Δ TAB if T(2,3), A(1,1), and B(4,-3) over the line y = 2, then translate the image by the rule (x,y)→(x – 5, y – 4)



T'(-3, 1)
A'(-4, -1)
B'(-1, -5)

T''(-8, -3)
A''(-9, -5)
B''(-6, -9)

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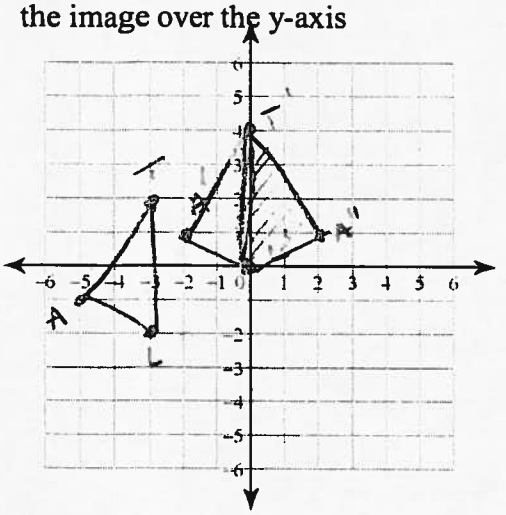
8) Now we are going to explore if the order in which you do multiple transformations matters.

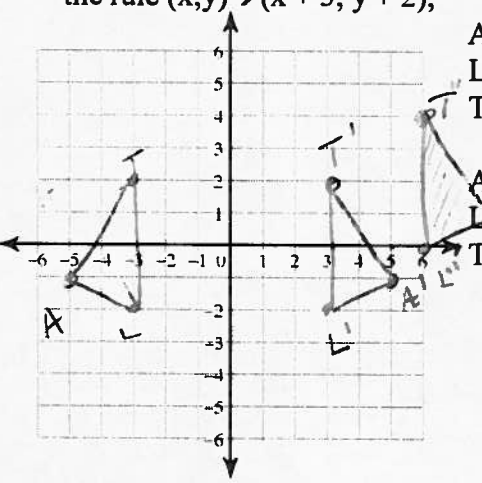
a) Translate Δ ALT if A(-5,-1), L(-3,-2), T(-3,2) by the rule (x,y)→(x + 3, y + 2), then reflect the image over the y-axis



A' (-2, 1)
L' (0, 0)
T' (0, 4)

A'' (2, 1)
L'' (0, 0)
T'' (0, 4)

b)Reflect Δ ALT if A(-5,-1), L(-3,-2), T(-3,2) over the y-axis, then translate the image by the rule (x,y)→(x + 3, y + 2),



A'(5, -1)
L'(3, -2)
T'(3, 2)

A''(8, 1)
L''(6, 0)
T''(6, 4)

Did the order you did the transformations change the final image?

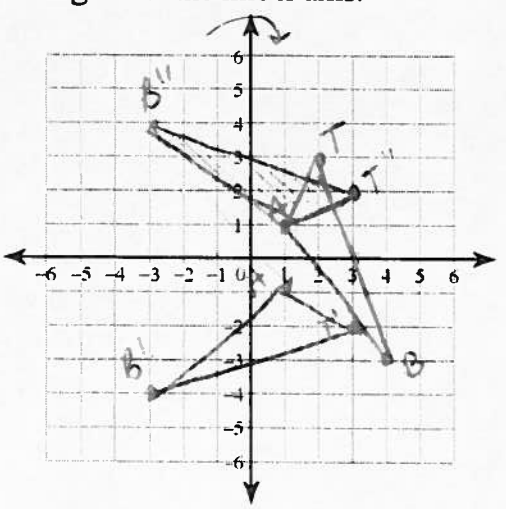
Yes

So, does order matter?

Yes

What about with rotations and reflections?

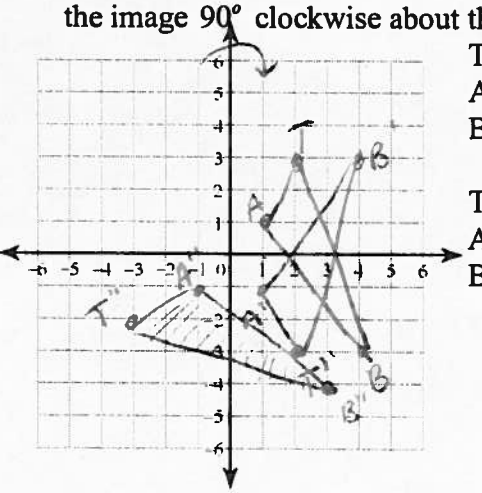
c) Rotate Δ TAB if T(2,3), A(1,1), B(4,-3) 90° clockwise about the origin, then reflect the image over the line x-axis.



T' (3, -2)
A' (1, -1)
B' (-3, 4)

T''(3, 2)
A''(1, 1)
B''(-3, 4)

d)Reflect Δ TAB if T(2,3), A(1,1), and B(4,-3) over the x-axis, then rotate the image 90° clockwise about the origin,



T'(2, -3)
A'(1, -1)
B'(4, 3)

T''(3, -2)
A''(-1, -1)
B''(3, -4)

Did the order you did the transformations change the final image?

yes

So, does order matter?

yes

So, if you want to get the correct answer, should you do the transformations in the order given?

Yes

For #s 35-44 just state whether each transformation from one triangle to the other in the below diagram is a ....

REFLECTION, TRANSLATION, ROTATION, or GLIDE REFLECTION.

35. $\triangle ABC \rightarrow \triangle EDC$ Rotation 180° Center C

36. $\triangle EDC \rightarrow \triangle PQM$ Glide Reflection

37. $\triangle MNJ \rightarrow \triangle EDC$ Translation

38. $\triangle HIF \rightarrow \triangle HGF$ Reflection

39. $\triangle PQM \rightarrow \triangle JLM$ Reflection

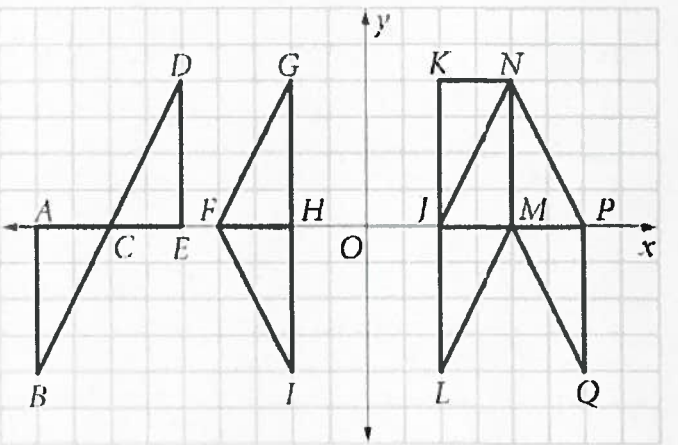
40. $\triangle MNP \rightarrow \triangle EDC$ Reflection

41. $\triangle JLM \rightarrow \triangle MNJ$ Rotation

42. $\triangle PQM \rightarrow \triangle KJN$ Glide Reflection

43. $\triangle KJN \rightarrow \triangle ABC$ Translation

44. $\triangle HGF \rightarrow \triangle KJN$ Rotation



For #s 51-54 you should realize that P' is given and that you need to follow the given glide reflection backwards to determine the original point P. Use the grids below as needed.

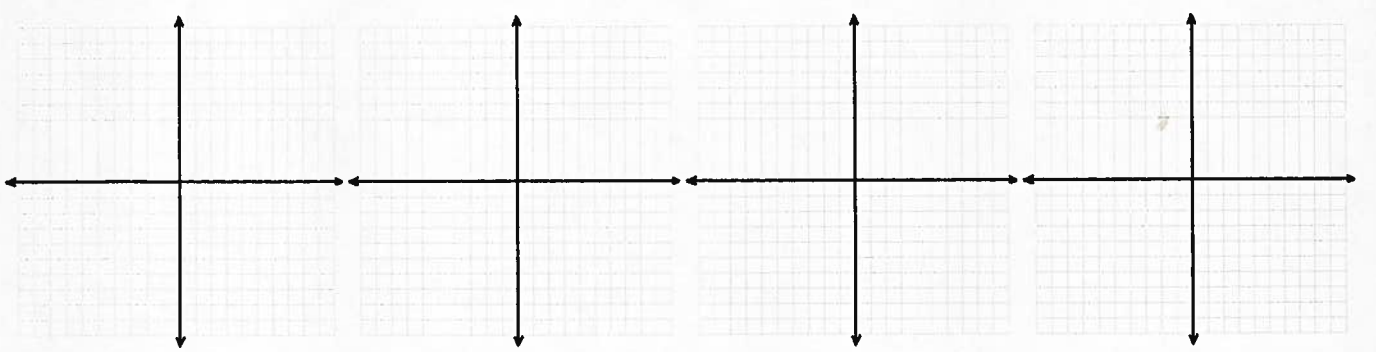
$P \rightarrow P'(3, -1)$ for the given translation and reflection line. Find the coordinates of *P*.

51. $(x, y) \rightarrow (x - 3, y); y = 2$ (6, 5)

52. $(x, y) \rightarrow (x, y - 3); y = 2$ (1, 2)

53. $(x, y) \rightarrow (x - 3, y - 3); y = x$ (2, 6)

54. $(x, y) \rightarrow (x + 4, y - 4); y = -x$ (-3, 1)



51.) P:_____ 52.) P:_____ 53.) P:_____ 54.) P:_____