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**Geogebra Lesson: Understanding Geometry Translations; Reflections, Rotations, Translations.**

Grades: 8-10

1. Open up Geogebra and open up the grid by holding down **CTRL and RIGHT CLICK** and click on **GRID.**



Then click on the icon that says **POLYGON** and input the points A**= (1, 1), B= (2, 3), and C (5, 2)** to form a triangle**.**



1. Then after connecting points A, B, C, label the figure by going to the icon that says **TEXT** and label it original figure then press **OK.**



1. Once you have labeled your picture you then can go ahead and reflect Triangle **ABC** along the **x-axis** first**.** Click on the icon that says **REFLECT ALONG LINE** and then highlight the triangle and click the x-axis and it will reflect. Once reflecting over the **x-axis** you will get **D= (1, -1) E= (2, -3) F= (5, -2).** After you reflect it you can then label it Reflection over x-axis.


Draw some conclusions:

1. What would happen when you reflect over the x-axis**?**

**(x,y) 🡪(\_\_\_,\_\_\_\_)**

1. After reflecting over the **x-axis,** then reflect over the **y-axis,** which you will then have to negate the x- coordinate only, so again click the **REFLECT OVER LINE** icon and highlight the triangle and press the y-axis line and reflect it**. G= (-1, 1) H= (-2, 3) I= (-5, 2).**



1. What would happen when reflecting over y- axis?

(x,y) 🡪(\_\_\_\_,\_\_\_\_)

**On your own:** Reflect over line y=x. \_\_\_\_\_\_\_\_\_\_

(x,y) 🡪(\_\_\_\_,\_\_\_\_)

Once you reflect the Triangle ABC over the x and y axes your diagram should look like this:



1. Keep the original triangle ABC with the same points from before and now we want to rotate the triangle about a point say **D (6, -2).**
* Go to the icon where you can reflect about a point or line and click on **ROTATE AROUND POINT**, then click on the triangle and then point D and the screen below will pop up.



* When the screen above pops up change it to 90 degrees and counterclockwise then click **OK.** You can see the triangle ABC is rotated about point D 90 degrees counterclockwise.



Some other examples you may want to try for fun would be rotating along some different points and see what you can find:

1. Rotating 180 degrees clockwise. \_\_\_\_\_\_\_\_\_\_\_\_\_
2. Rotating 270 degrees counterclockwise. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. Point (0, 0)
4. Next we will want to Translate triangle ABC along the x and y axes. Create triangle ABC same as before and go to the icon **REFLECT BY LINE** from before but click on **TRANSLATE BY VECTOR.** Once you have clicked on that click on point D = (4, -1). You will then move the line created over to E= (-1, 0) and click.



* Once that is complete you can see that triangle ABC has shifted 4 units to the left horizontally.

 

* Keep triangle ABC and now translate 4 units down vertically. Go to **TRANSLATE BY VECTOR** again and from point D= (6, 1), and click on the triangle and then point D and drag it down to point E = (6, -3).



Now try some examples translating triangle ABC:

1. V= $\left〈-2,2\right〉$ \_\_\_\_\_\_\_\_\_\_.
2. V=$\left〈-3,-2\right〉$ \_\_\_\_\_\_\_\_\_\_.
3. V= $\left〈4,4\right〉$\_\_\_\_\_\_\_\_\_\_.
4. Now we want to dilate triangle ABC from a point say D which will be (-1, 1).



We know the rule for dilating a shape is **Dk(x, y) = (kx, ky).** This means whatever factor you make **K** is what you multiply x and y by. Once you have clicked on **DILATE FROM A POINT**, click on the triangle and then point D and a box will come up asking to input the factor…



* When this box appears input 2 and you will see the coordinates of triangle ABC will be multiplied by 2 and Triangle ABC’ will be shown by dilating by 2 from point (1, -1).



1. Dilate triangle ABC by 3.\_\_\_\_\_\_\_\_\_\_\_
2. Dilate triangle ABC by 4.\_\_\_\_\_\_\_\_\_\_\_