MATRIX REPRESENTATIONS AT THE FINE ARTS CENTER

Instructions. We've just learned about how matrices can be used to represent linear maps. Linear maps are all around us; one way they show up is in describing symmetries of objects. Our activity for today is to explore objects at the FAC and figure out how to represent their symmetries using matrices. As you explore the collection at the FAC, I'd like for you to identify as many different kinds of symmetries. For each symmetry that you find, you should...

(1) Make a note of the work of art and the artist.
(2) Make a rough doodle of the object (nothing fancy, just enough so that I can basically see what symmetry you've noticed).
(3) Draw basis vectors over your sketch to indicate where you'd like the origin to be and how you'd like the coordinate axes to look.
(4) Write down a matrix representing the linear map that realizes the symmetry you've found with respect to the basis that you've chosen.

Try to find at least 3 different kinds of symmetries (so, for example, don't just breeze through the collection looking for paintings that stay the same after reflecting across the y-axis). Also, try to represent at least one of the symmetries where you use a different basis on the domain than the codomain. If you notice a symmetry but are having trouble formalizing it, come find me and I'll do my best to help!

Dimensions. The collection at the FAC has both paintings and sculptures. I encourage you to use your imagination to "pass between dimensions." For example...

• For a painting, you can certainly look for 2-dimensional symmetries, but you might also look for a 3-dimensional object that is depicted in the painting, and then describe the symmetries of that object as you imagine it sitting inside of 3-dimensional space.
• For a sculpture, you can certainly look for 3-dimensional symmetries, but you might also imagine taking a picture of the sculpture from some particular angle, and then thinking about the symmetries of that imagined 2-dimensional photograph.

Symmetry 1.

Symmetry 2.

Symmetry 3.

Symmetry 4.

Symmetry 5.

Symmetry 6.

Symmetry 7.